S. HRG. 113–465, PT. 7

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2015 AND THE FUTURE YEARS DEFENSE PROGRAM

HEARINGS

BEFORE THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

ONE HUNDRED THIRTEENTH CONGRESS

SECOND SESSION

ON

S. 2410

TO AUTHORIZE APPROPRIATIONS FOR FISCAL YEAR 2015 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

MARCH 5, 12; APRIL 2, 9, 10, 2014

Printed for the use of the Committee on Armed Services

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DEPARTMENT OF DEFENSE AUTHORIZATION OF APPROPRIATIONS FOR FISCAL YEAR 2015 AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, MARCH 5, 2014

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

NUCLEAR FORCES AND POLICIES

The subcommittee met, pursuant to notice, at 2:41 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, Sessions, Fischer, and Vitter.

OPENING STATEMENT OF SENATOR MARK UDALL, CHAIRMAN

Senator UDALL. Let me bring today's hearing to order. Ladies and gentlemen, if you will have a seat. Thank you for your forbearance. I am running a little bit late and I apologize.

This afternoon, we will hear testimony from the Department of Defense (DOD) regarding nuclear matters for fiscal year 2015. I want to thank all of you for taking the time to testify today.

I want to start by giving some perspective to the general topic of our nuclear stockpile. Since the first detonation of a nuclear weapon 69 years ago, we have debated whether they should exist and whether they remain relevant today. That debate will continue for the foreseeable future.

It seems to me, however, that the negative aspects of this debate, particularly the relevancy of the mission, have had a negative impact on the morale of those serving us in the field. I believe we must emphasize that as long as these weapons exist. The mission performed by the men and women of our nuclear enterprise is relevant and essential to our national security. We must be clear that we place the highest trust in their ability to carry out their duty because it involves nuclear weapons, and we must be clear that we expect a great deal from them. But above all, we must demonstrate that we care about their well-being, their families, and their future. I am sure that our witnesses understand this, but I want to assure them that I do too.

General Wilson, I would like to congratulate you on assuming command of the Air Force Global Strike Command. I suspect a

large portion of today's hearing will be centered on the recent incident involving cheating at Malmstrom Air Force Base. I hope your testimony will provide insight into your impressions so far and what we can constructively learn from this incident. I would add that I am, of course, sensitive to the ongoing reviews by the Services and the Secretary of Defense.

General Harencak, you are the point person on the air staff trying to deconflict the various missions of the Air Force with respect to nuclear weapons. I plan to ask you about what I perceive as a gap in coordinating the Air Force's nuclear command and control.

Admiral Benedict, I would like to congratulate you as well on your promotion. This was long overdue and consistent with the recommendations of the 2008 Schlesinger Report. I would like to know your perspective as a naval officer on the recent Intercontinental Ballistic Missile (ICBM) cheating incident. You are the senior naval officer responsible for the warhead and its delivery systems, and I want to hear your insight in this matter from a Navy perspective.

Ms. Bunn, welcome to the subcommittee. DOD is eliminating the Office of Assistant Secretary of Defense for Global Strategic Affairs, Madelyn Creedon's office. This office has a 40-year history of overseeing policy related to nuclear weapons and proliferation, as well as space and cyber. I understand your office will be separate from these other offices which have a long and synergistic relationship with you. While you are not Senate-confirmed, I would like your honest and frank assessment to Congress of what effect this move will have on the long-term health of the policy mission you oversee even past your tenure.

With that, let me turn to my colleague and the ranking member, Senator Sessions, for his opening statement, and then we will turn to our witnesses' opening statements and questions.

Senator Sessions?

STATEMENT OF SENATOR JEFF SESSIONS

Senator SESSIONS. Thank you, Mr. Chairman.

I would like to share a few thoughts, just take a few minutes. I do not pretend to be the guru on nuclear and strategic weapons, but having been on this committee since I came to the Senate 17-plus years ago, they have come before me. I would just share with you a few things.

It has been my concern, which I have raised publicly, that the Nuclear Posture Review (NPR) statement that had some 30-odd references to a world without nuclear weapons was stunning to me. I just was shocked. The President has said he wants a world without nuclear weapons. Secretary Hagel, within a year of confirmation, had signed on to a report titled "Nuclear Zero." So I raised concerns about it. Maybe some would think that was just politics as usual. But I am concerned about it. I think it creates a dangerous perception perhaps that either we are going to go to zero or we are not going to use the weapons if we have them and create instability and a lack of confidence in our allies around the world. They have expressed that to us repeatedly. So, I was concerned about it.

I will say, Mr. Chairman, it does appear that the budget request from the administration gets this pretty close to where we need to

go, and I would like to hear your positions. It seems like we have had a move that recognizes the triad's importance and the need to modernize nuclear weapons. This is a right step, in my view. Particularly in this time of Russia and China's aggressiveness, we do not need to be sending any signal that somehow we are not willing to modernize or utilize even—God forbid—the weapons that we have.

I would share a couple of things. This was from the U.S. National Intelligence Council Global Trends Report of 2030. It said, "the nuclear ambitions in the United States and Russia over the last 20 years have evolved in opposite directions. Reducing the role of nuclear weapons in U.S. security strategy is a U.S. objective, while Russia is pursuing new concepts and capabilities for expanding the role of nuclear weapons in its security strategy." In fact, we know that in 1999 they did a war game in which they invaded Belarus, and part of it was to utilize tactical nuclear weapons, in their words, to de-escalate the conflict. We know in recent years they have talked about using tactical nuclear weapons out there. So that is an important thing.

China. I am looking at a report from October of last year from the state-controlled media in China, the Global Times. It says, "because the Midwest States of the United States are sparsely populated, in order to increase the lethality of our nuclear attacks, we should mainly target the key cities on the west coast of the United States, such as Seattle, Los Angeles, San Francisco, or San Diego." They go on to say, "if we launch our DF31A ICBMs over the North Pole, we can easily destroy a whole list of metropolises on the east coast in the New England region of the United States, including Annapolis, Philadelphia, New York, Boston, Portland, Baltimore, and Norfolk, whose populations account for one-eighth of the American total residents."

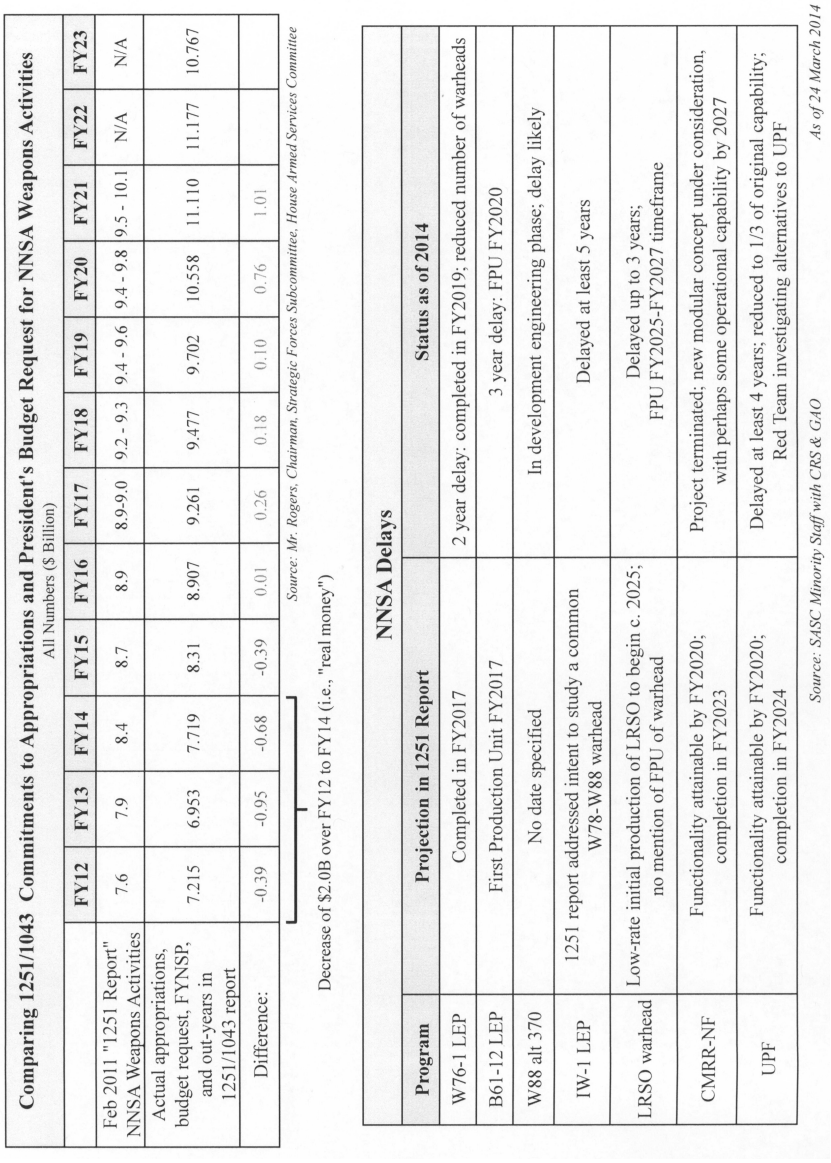
Now, Admiral, Annapolis must get the Navy's attention. I do not know. Put them in that list.

What I would say to all of our colleagues, and we do not like to think about this, but Russia is thinking about it, China is thinking about it, Iran is thinking about it, and a lot of other countries are thinking about it. It is said that Pakistan may have the most active nuclear program today, and North Korea is developing their nuclear launch missiles. India activated the reactor of its first indigenously built ballistic nuclear submarine. India and China now have submarines capable of launching nuclear weapons.

In the Quadrennial Defense Review (QDR) that just came out, the headline, "Protect the Homeland," I thought it was interesting for our committee that DOD says this. We will continue to size and shape the joint force based on the need to defend the U.S. Homeland, our most vital national interest. The first recommendation is missile defense, and it talks about what we need to do there. Nuclear is the second one listed. The third one is cyber. We need to talk about modernizing our forces. The first three listed on the QDR fall within our subcommittee. I am thinking, history being what it is, we do not want to wake up a few years from now and having a 9/11 report wondering why the subcommittee was not on top of these issues.

So, where are we financially? We have this chart. Could you all bring it up a little closer maybe so you could see this?

[The chart referred to follows:]



Comparing 1251/1043 Commitments to Appropriations and President's Budget Request for NNSA Weapons Activities

All Numbers ($ Billion)

	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23
Feb 2011 "1251 Report" NNSA Weapons Activities	7.6	7.9	8.4	8.7	8.9	8.9-9.0	9.2 - 9.3	9.4 - 9.6	9.4 - 9.8	9.5 - 10.1	N/A	N/A
Actual appropriations, budget request, FYNSP, and out-years in 1251/1043 report	7.215	6.953	7.719	8.31	8.907	9.261	9.477	9.702	10.558	11.110	11.177	10.767
Difference:	-0.39	-0.95	-0.68	-0.39	0.01	0.26	0.18	0.10	0.76	1.01		

Decrease of $2.0B over FY12 to FY14 (i.e., "real money")

Source: Mr. Rogers, Chairman, Strategic Forces Subcommittee, House Armed Services Committee

NNSA Delays

Program	Projection in 1251 Report	Status as of 2014
W76-1 LEP	Completed in FY2017	2 year delay: completed in FY2019; reduced number of warheads
B61-12 LEP	First Production Unit FY2017	3 year delay: FPU FY2020
W88 alt 370	No date specified	In development engineering phase; delay likely
IW-1 LEP	1251 report addressed intent to study a common W78-W88 warhead	Delayed at least 5 years
LRSO warhead	Low-rate initial production of LRSO to begin c. 2025; no mention of FPU of warhead	Delayed up to 3 years; FPU FY2025-FY2027 timeframe
CMRR-NF	Functionality attainable by FY2020; completion in FY2023	Project terminated; new modular concept under consideration, with perhaps some operational capability by 2027
UPF	Functionality attainable by FY2020; completion in FY2024	Delayed at least 4 years; reduced to 1/3 of original capability; Red Team investigating alternatives to UPF

Source: SASC Minority Staff with CRS & GAO

As of 24 March 2014

Senator SESSIONS. Secretary Hagel said, "we are going to invest in the modernization we need to keep the deterrent stronger than it has ever been, and you have my commitment on that." So I like that. I was glad to hear him be clear on that because, as I said, his record caused me concerns.

Now, these numbers—I had to cross examine my staff to be sure I got this. These numbers include ICBMs, submarines, and bombers, not just the weapons themselves, so that is the good news. This represents what percentage of the defense budget we spend on the nuclear triad and the weapons that go with it. It was high in the 1990s.

The last time we modernized was in the 1980s. We have the oldest nuclear arsenal in the world. That is undisputed. Our warheads are 30 to 40 years old. The B–52s are 52 years old. ICBMs are 34 years old. Submarines are 23 years old. I went on a nuclear submarine and spent the night on it. I was surprised how old it was, and things are always breaking. They spend a considerable amount of time on our nuclear submarines fixing the smaller things.

What about affordability? According to the Congressional Budget Office (CBO), if we get this system back up—all right. So here is what we need to do. The neglected modernization since the end of the Cold War requires replacement of the triad. It just does. We have to be planning to replace it. Exactly what year, I guess, we could dispute, but the goal is there.

We need to modernize the whole nuclear complex, as we well know and as we have been talking about. Therefore, we have to have a funding up in the next decade to make sure that we get our funding up to the right amount, and that could take around $35 billion a year which, at $35 billion a year, will represent about 5 percent of our defense budget. It is not impossible for us to reach that. If we could get to the point where we modernized in the right way, we would be on the right path.

Now, of the new spending, only 2 percent of this amount is for the weapons modernization itself. That is relatively inexpensive, and it is a small price to pay for the Nation's ultimate insurance policy and for an arsenal that has maintained great power and peace really for 70 years.

I remember having lunch with a member of the Russian parliament and professor, and I asked what about their tactical weapons. I have told you all this before. The professor popped up and said do you know how many troops China has on our border. We are never giving up tactical nuclear weapons. So that is the real world we live in.

This shows this peak up here, and as I said, this would fund the submarine modernization, the aircraft, the new bomber, at least that portion of it dedicated to nuclear weapons and to the ICBMs which, as I said, are getting awfully old too.

This has been a little bit of an epiphany for me as we have been looking at these numbers. I hope you all take this in the spirit of pure reality and what the United States needs to do, and we do not need to fail. If we need to accelerate some of this, it is a relatively small part of the budget overall, and I think we have to do it. At a time where the will of the United States is being questioned, I think it may be even more significant that we stay on track to leave no doubt that we are going to have an arsenal, we are going to use it only, only, only if we have to. But we have the will to defend ourselves if need be, and you do not want to launch a nuclear attack on us because that would be a grave mistake.

Anyway, that is my 2 cents worth. Thank you for letting me ramble on. I look forward to working with you, Senator Udall. You have been good on this, and we are all learning together. I think we are coming back into the right path. I think we are getting close to what we need to do.

Senator UDALL. Thank you, Senator Sessions. I think the Senator points out the importance of this committee's role as an authorizing body and also an oversight body. We are going to hold a series of very important hearings over these next months as we prepare for the National Defense Authorization Act (NDAA) markup itself. I know we will hope to have the kind of attendance that Senator Fischer and Senator King and Senator Donnelly always display on this committee. They are always here and they are always engaged.

With that, let me make a short comment on questions and timing. I would like to aim to end the hearing by about 4 p.m. We are going to have, I think, eight votes starting at 4 p.m., for my colleagues that are here. We have four witnesses. I think we can get the job done. I would ask each of you to keep your statements at 3 to 5 minutes, and then we will open the floor for 7-minute rounds.

I think we will start on my left with Ms. Bunn, and then we will work across the panel here. Ms. Bunn, the floor is yours for 3 to 5 minutes.

STATEMENT OF M. ELAINE BUNN, DEPUTY ASSISTANT SECRETARY OF DEFENSE, NUCLEAR AND MISSILE DEFENSE POLICY

Ms. BUNN. Thank you, Mr. Chairman, Ranking Member Sessions, other distinguished members of the subcommittee. I really appreciate the opportunity to testify today, and I appreciate your support for nuclear forces.

With your permission, I will submit my written statement and only highlight a few points now.

The QDR, which was submitted yesterday with the fiscal year 2015 budget, makes clear the key role of nuclear forces in our strategy. It says that our nuclear deterrent is the ultimate protection against a nuclear attack on the United States, and through extended deterrence, it also serves to reassure our distant allies of their security against regional aggression. It also supports our ability to project power by communicating to potential nuclear-armed adversaries that they cannot escalate their way out of failed conventional aggression.

Also, the Chairman of the Joint Chiefs of Staff, in his risk assessment for the QDR, ranked maintaining a secure and effective nuclear deterrent at the top of his list of mission prioritization.

DOD's budget request for fiscal year 2015 supports our nuclear policy goals, as laid out in the 2010 NPR, in the President's June 2013 Nuclear Employment Strategy, and in the current QDR.

We continue to ensure that this President and future Presidents have suitable options for deterring, responding to, and managing a diverse range of current and future situations, including regional deterrence challenges.

We continue to work closely with our allies, some of whom live in very dangerous neighborhoods, to ensure continuing confidence in our shared national security goals, including assurance of our extended nuclear deterrence commitments.

Preserving the nuclear triad of strategic delivery vehicles and investing to maintain a safe, secure, and effective nuclear force is critical for success in all those efforts.

The 1043 Report, which we will provide to Congress this spring, will address these issues and the budget issues in more detail, but let me just say that our modernization goals have not changed since 2010. We have made considerable progress, but we have had to make some adjustments due to fiscal constraints.

Three other issues I would like to address briefly. One, is the New Strategic Arms Reduction Treaty (START) force structure. The administration is considering how to reduce nondeployed strategic delivery vehicles to comply with the limits of the New START treaty by February 2018, and we will make a final force structure decision and inform Congress prior to the start of fiscal year 2015.

Two, Intermediate-Range Nuclear Forces (INF) Treaty compliance. We are concerned about Russian activity that appears to be inconsistent with the INF Treaty. We have raised the issue with Russia. They provided an answer that was not satisfactory to us, and we told them that the issue is not closed and we will continue to raise this.

Three, the nuclear enterprise reviews. With regard to recent issues with a few Air Force/Navy nuclear personnel, the Secretary of Defense has created two special review panels, one an internal review and one an external review. Those reviews are not about assigning blame. They are about identifying, assessing, and correcting any systemic deficiencies that we might uncover and applying the best practices for carrying out our nuclear mission across the nuclear force.

Again, Mr. Chairman, other members, thank you very much for letting me testify today. I look forward to your questions.

[The prepared statement of Ms. Bunn follows:]

PREPARED STATEMENT BY MS. M. ELAINE BUNN

Chairman Udall, Ranking Member Sessions, distinguished members of the Strategic Forces Subcommittee, thank you for the opportunity to testify for the first time on our nuclear forces and the National Defense Authorization Request for Fiscal Year 2015 and Future Years Defense Program. I am joined by Vice Admiral Terry Benedict, Director of Strategic Systems Programs for the U.S. Navy; Lieutenant General Stephen W. Wilson, Commander of Air Force Global Strike Command; and Major General Garrett Harencak, Assistant Chief of Staff for Strategic Deterrence and Nuclear Integration for the Air Force.

You asked me specifically to address the policies and programs that the Defense Department has in place to sustain our nuclear forces and ensure that our deterrence is sound following the 2010 Nuclear Posture Review and the New Strategic Arms Reduction Treaty (START). But let me first start by thanking this committee for your continued support of the nuclear forces and the nuclear enterprise.

Translating the goals of "sustainment" and "deterrence" into effective plans and capabilities is more than a little challenging, as this committee knows quite well. U.S. policies and programs concerning nuclear weapons have to reflect considerations that range far beyond the purely military, because the weapons, their deployment and posture, and what we say about them can entail issues of foreign policy, diplomacy, intelligence, science and technology, and homeland security, for example.

We want an arsenal that contributes to effective deterrence. We want an arsenal that is kept qualitatively up to date, that is survivable and flexible but that is no

larger than necessary to meet our national security needs. We want an arsenal that is an effective deterrent against the advent of regional nuclear powers whose intentions and decision processes are far from transparent. But most of all we want an arsenal that is safe, secure, and effective, and that will contribute to deterrence as long as nuclear weapons exist.

The path to accomplishing these goals will necessarily be adapted as required based on changes in the strategic environment and the financial and technical resources available. But there are two principal, mutually supporting components to our efforts. The first is working to ensure that this and future Presidents have suitable options for deterring, responding to, and managing a diverse range of 21st century security challenges. The second is working constantly with our allies to ensure continuing confidence in our shared national security goals, including assurance in our extended nuclear deterrence posture, and strengthening strategic stability with Russia and China.

STRENGTHENING THE PRESIDENT'S OPTIONS

Since 2010, we have made significant progress in strengthening the President's options for deterring, responding to, and managing 21st century security challenges. Deterrence is not limited solely to nuclear weapons. Non-nuclear strategic capabilities, such as ballistic missile defenses and investments in a capability for conventional prompt strike systems, play an important role in our strategic posture; however, they are not substitutes for our nuclear forces.

New Nuclear Employment Strategy

With regard to policy, the most significant development since the Nuclear Posture Review and the entry into force of the New START treaty is the nuclear employment guidance issued by the President last June. This new Nuclear Employment Strategy was the culmination of an 18-month effort that reviewed U.S. nuclear deterrence requirements, developed a range of nuclear employment strategy options, and analyzed potential implications of each strategy option for U.S. nuclear force requirements and achieving U.S. and allied objectives if deterrence fails.

Both an unclassified and classified report on this guidance were provided to Congress in June 2013 and subsequent classified briefings have gone into greater detail. There are five important aspects of the new employment strategy:

- It affirms that the fundamental purpose of nuclear weapons remains to deter nuclear attack on the United States and our allies and partners. The United States will maintain a credible deterrent, capable of convincing any potential adversary that the adverse consequences of attacking the United States or our allies and partners far outweigh any potential benefit they may seek to gain through an attack.
- It affirms that the United States will 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 guidance narrows U.S. nuclear strategy by directing that planning should focus on only those objectives and missions that are necessary in the 21st century, including deterring nuclear use in escalating regional conflicts. The regional deterrence challenge may be the "least unlikely" of the nuclear scenarios for which the United States must prepare, and continuing to enhance our planning and options for addressing it is at the heart of aligning U.S. nuclear employment policy and plans with today's strategic environment.
- At the completion of the study, the President determined that we can ensure the security of the United States and our allies and partners and maintain a strong and credible strategic deterrent while safely pursuing up to a one-third reduction in deployed strategic nuclear weapons from the level established in the New START Treaty. The President indicated in his Berlin speech that the administration would pursue such reductions through negotiations with Russia.
- The Nuclear Employment Strategy reaffirms our commitment to a safe, secure, and effective arsenal that the United States will maintain the nuclear Triad, and that U.S. nuclear forces will continue to operate on a day-to-day basis that maintains strategic stability with Russia and China, deters potential regional aggressors, and assures U.S. allies and partners.
- It adopts an alternative approach to hedging against technical or geopolitical risk, which could lead to future reductions in the non-deployed nuclear weapon stockpile. The United States is investing in a more modern, responsive infrastructure; however, modernizing this infrastructure will take at least a decade or more to achieve.

Sustaining and Modernizing Nuclear Forces

We have analyzed the different types of adversaries we must deter and the range of scenarios for which we must prepare, and we have concluded that the range of options provided by the nuclear Triad offers the flexibility needed for the range of contingencies we might face. A sustained long-term investment in the enterprise is required; the strategic delivery vehicles we rely on today grew out of investments the Nation made in the 50s, 60s, 70s, and 80s. Many of these systems are aging out of service, and we must now invest in extending the life of some and replacing others. The force structure choices we make today will determine the capabilities a President will have in 20, 30, and 40 years. We cannot say what mix of capabilities the United States will need that far into the future, but modernizing the Triad will provide the next generation of U.S. policymakers with a flexible and resilient range of capabilities.

The fiscal year 2015 budget and FYDP reflect our plans for maintaining and modernizing the Triad. The 1043 report which the Department of Defense (DOD) and the Department of Energy plan to provide to Congress in April will address these issues in more detail. We appreciate Congress providing 30 days from the release of the fiscal year 2015 budget request to submit the 1043 report.

Strategic Delivery Vehicles

With regard to the strategic submarine force, the construction of the first of 12 *Ohio*-class replacement submarines is scheduled to begin in 2021, with long-lead item procurement beginning in 2016. The first new U.S. SSBNs will enter the force beginning in fiscal year 2031 to maintain the minimum number of submarines necessary to meet strategic requirements. These submarines will include new advances in nuclear reactor design that eliminate the need for midlife refueling, thereby providing greater operational availability for each submarine. Eliminating the need for the midlife nuclear refueling will allow a force of 12 *Ohio*-class replacement submarines to replace the 14 SSBNs needed for deterrence missions today and provide significant long-term cost savings. The service life for the Trident D–5 SLBM has been extended so that transition to the *Ohio*-replacement submarine will occur before we need to begin replacing the missiles.

To sustain the Minuteman (MM) III, Intercontinental Ballistic Missiles (ICBMs) through 2030, the fiscal year 2015 budget funds critical upgrades and component replacements. The Air Force Analysis of Alternatives (AOA) is examining options for a post-2030 follow-on system known as the Ground-Based Strategic Deterrent. This will enable development of a comprehensive plan to modernize and extend the life of the MMIII or to develop a follow-on ICBM. Follow-on ICBM activities will be closely coordinated and aligned with steps taken to modernize the MMIII through 2030 in order to achieve cost savings. This AOA should be finished in late spring or early summer.

Our nuclear-capable strategic bombers can be used to demonstrate our commitment to allies and our capabilities to our adversaries. The United States will continue to maintain two B–52H strategic bomber wings and one B–2 wing. Both bomber types are aging. Sustained funding and support is required to ensure operational effectiveness through the remainder of their respective service lives. The fiscal year 2015 budget continues funding for the Long Range Strike Bomber (LRS–B) which is currently in development.

Nuclear Command, Control, and Communications

The President is the only one who can authorize the use of nuclear weapons and our Nuclear Command, Control, and Communications (NC3) systems are critical to providing the President situational awareness in a crisis, responses for consideration, and transmitting the President's orders to strategic forces. The Department is formulating a long-term strategy to modernize critical NC3 capabilities including enhanced NC3 support for regional contingencies. The Department continues to prioritize resources to address known capability gaps while incrementally building toward a modern NC3 architecture that will ensure timely decision-making support for the President.

Nuclear Weapons, Stockpile, and Infrastructure

Along with delivery vehicles and NC3, strengthening a President's options requires sustained commitment to warhead life extension programs (LEP) and infrastructure modernization. Thanks to the measure of budgetary relief Congress provided for fiscal year 2014, we have been able to continue uninterrupted production of modernized W76–1 submarine launched ballistic missile warheads, and have completed the first system-level engineering development test of the B61–12 bomb.

The administration has outlined a concept that we refer to as the "3+2" strategy. This strategy, when completed decades from now, would result in five types of warhead designs in place of the twelve unique warhead types in today's active nuclear weapons stockpile. The strategy envisions three interoperable warheads compatible with both submarine and land-based ballistic missiles, and two aircraft-delivered weapon types. This modernization and consolidation of warhead types would allow for more efficient hedging and therefore reductions in the non-deployed stockpile.

One of the two air-delivered weapons, the B61–12 gravity bomb and its accompanying tail kit assembly (TKA), are scheduled for first production in 2020. This LEP will enable us to consolidate and retire several different variants of the B–61 and shift our surveillance resources to other areas of the stockpile. Most importantly, over time, the B61–12 will become the sole nuclear gravity bomb in the United States inventory and will be carried by both dual-capable aircraft (e.g., F–15E, and in the future F–35), as well as the B–2 bomber and the Long Range Strike Bomber. The second air delivered weapon, the air-launched cruise missile (ALCM) will be maintained as our standoff weapon until a follow on system, the long-range standoff (LRSO) missile, achieves first unit production in fiscal year 2025–fiscal year 2027.

Development of the Interoperable Warhead-1 (or W78/88–1), part of the "3+2" strategy, is being delayed beyond the National Nuclear Security Administration's (NNSA) future years nuclear security plan. This delay is the result of prioritizations due to the current fiscal climate.

Budget and Fiscal Uncertainties

Thanks to the 2-year budget agreement that Congress recently approved, we are now facing a more certain fiscal environment, at least in the short term. Ultimately, sustained and reliable funding profiles are necessary to avoid cost increases and to meet our modernization timelines.

Personnel Review for the Nuclear Enterprise

The recently publicized issues concerning a few Air Force and Navy personnel involved with the nuclear forces pose no threat to the reliability and effectiveness of our nuclear forces. There are nonetheless serious issues of professionalism and discipline that must be addressed. The Secretary of Defense has created two special review panels to assess the reasons for these failures and to propose corrective actions.

The internal review, co-chaired by Assistant Secretary of Defense Madelyn Creedon and Rear Admiral Peter Fanta from the Joint Staff, will examine the nuclear mission in both the Department of the Air Force and the Department of the Navy regarding personnel, training, testing, command oversight, mission performance, and investment. They will report their findings to Secretary Hagel no later than April 30, 2014. Additionally, General Larry Welch, USAF (Ret) and Admiral John Harvey, USN (Ret) will lead an independent review to provide a broader, external examination of the DOD nuclear enterprise. They have been asked to provide findings and recommendations to the Secretary no later than June 2, 2014. These reviews are not about assigning blame, but about identifying, assessing, and correcting systemic deficiencies, and applying best practices for DOD nuclear enterprise personnel.

STRENGTHENING EXTENDED DETERRENCE AND ASSURANCE AND STRATEGIC STABILITY

Since 2010, we have made considerable progress in strengthening extended deterrence and assurance, and we continue to engage Russia and China on efforts toward mutually beneficial steps for enhancing strategic stability.

Extended Deterrence and Assurance: We will continue to assure our allies and partners of our commitments to their security, and demonstrate it through forward deployment of U.S. forces in key regions, strengthening U.S. and allied conventional and missile defense capabilities, and the continued provision of U.S. extended nuclear deterrence. U.S. nuclear weapons have played an essential role in extending deterrence to U.S. allies and partners against nuclear attack or nuclear-backed coercion by states in their region that possess or are seeking nuclear weapons. A credible "nuclear umbrella" has been provided by a combination of means—the strategic nuclear forces of the U.S. Triad, non-strategic nuclear weapons currently forward deployed in Europe in support of the North Atlantic Treaty Organization (NATO) and U.S.-based nuclear weapons that could be forward deployed quickly to meet regional contingencies. Security relationships in key regions will retain some nuclear dimension as long as nuclear threats to allies and partners remain. Extended nuclear deterrence can also serve our nonproliferation goals by reassuring non-nuclear

allies and partners that their security interests can be protected without a need to develop their own nuclear weapons.

As outlined in the 2010 Nuclear Posture Review, we have been working with allies and partners on how best to strengthen regional deterrence—beginning formal dialogues on the topic where they had not existed, and maintaining and refreshing the NATO deterrence dialogue which has long existed.

Extended Deterrence in Northeast Asia

Our allies in Northeast Asia live in a dangerous neighborhood, and in the year following the Nuclear Posture Review, we initiated formal deterrence dialogues with both South Korea and Japan. Our Extended Deterrence Policy Committee with the Republic of Korea (ROK) and our Extended Deterrence Dialogue with Japan address relevant nuclear and missile defense issues with each ally. Exploring concepts such as extended deterrence, assurance, and strategic stability through table top exercises and frank discussion helps us develop shared understandings with each ally and prepare for a range of security challenges and scenarios. Also, in October 2013 the U.S.-ROK alliance agreed upon a bilateral, tailored deterrence strategy to address the growing North Korean nuclear threat.

These high-level dialogues underscore that the United States is unequivocally committed to the defense of Japan and the Republic of Korea, and that both allies are committed to working with the United States in deterring aggression and promoting peace and stability throughout the region. Our ability to send strategic bombers and tactical nuclear-capable aircraft to the region to signal resolve resonates with our allies, as the B–52 and B–2 flights over South Korea last March during a period of heightened tension on the peninsula demonstrated.

North Atlantic Treaty Organization

NATO's 2012 Deterrence and Defence Posture Review affirms that nuclear weapons and missile defense are core components of NATO's overall capabilities for deterrence, and that as long as nuclear weapons exist, NATO will remain a nuclear alliance. NATO will continue to seek conditions and consider options for further reductions of non-strategic nuclear weapons, and we will continue to work closely with our NATO allies on all issues related to the Alliance's nuclear capabilities through the Nuclear Planning Group and the High Level Group. These fora provide a critical venue for discussions among NATO allies on a broad range of nuclear policy matters, including the continued safety and security of nuclear weapons, shared perceptions of potential threats to Alliance members, and the development and evolution of common alliance positions on nuclear policy.

The United States currently forward deploys dual-capable aircraft (F–15Es and F–16s) and B–61 gravity bombs in Europe in support of NATO. In line with the 2013 Nuclear Employment Strategy and the 2010 Nuclear Posture Review, we will maintain the capability to deploy dual-capable aircraft as well as bombers globally, if needed. The Department will integrate nuclear delivery capability into the F–35 Joint Strike Fighter during follow-on development block upgrades of the aircraft at the end of calendar year 2024.

The longstanding special relationship between the United States and the United Kingdom remains strong. The Common Missile Compartment for the next generation of our respective SSBN fleets is a cooperative effort that will provide cost-sharing benefits to both countries. In the current era of declining defense budgets and overall fiscal uncertainty, this type of collaboration is prudent.

Strategic Stability

We would welcome the opportunity to take additional steps with Russia to enhance strategic stability, including exploring opportunities for missile defense cooperation and further nuclear reductions. The administration has said that it will pursue further reductions negotiated with Russia.

Even as we pursue new opportunities for cooperation, strategic stability also requires that we are vigilant in verifying compliance with existing arms control obligations. The U.S. takes treaty compliance very seriously and utilizes all measures that are available to us through the New START treaty. As of February 5, 2014, the United States and Russia have each conducted 54 on-site inspections under the New START treaty verification regime. We have met our inspection quotas for the Treaty's first 3 years, and we have begun the fourth year of inspections. Delegations from the United States and Russia have also met six times under the Treaty's Bilateral Consultative Commission to address issues related to implementation of the Treaty.

Although China's arsenal is smaller than Russia's, China continues to modernize its nuclear weapons and delivery systems. As it has for several years now, the United States continues to urge China to engage in discussions on strategic issues

in a variety of venues. Both countries have said they want to address the other's concerns about their strategic postures. A sustained dialogue on our broad strategic postures and greater transparency between our two nations would be an opportunity for both countries to make those goals more credible.

One final word about strategic stability: for the United States, strategic stability, however we define it, must entail security for our allies and respect for their interests.

CONCLUSION

The National Defense Authorization Request for Fiscal Year 2015 and Future Years Defense Program underscores our commitment to ensuring effective options for this and future Presidents; ensuring a safe, secure, and effective nuclear arsenal for as long as nuclear weapons exist; assuring U.S. allies; and continuing to engage Russia and China on strengthening strategic stability. The overall goals have not changed since 2010 and we have made considerable progress, but we have had to make adjustments due to budget constraints, and may have to do so again as the budget landscape becomes more clear. Thank you for the opportunity to testify; I look forward to your questions.

Senator UDALL. Thank you, Ms. Bunn.

General Wilson?

STATEMENT OF LT. GEN. STEPHEN W. WILSON, USAF, COMMANDER, AIR FORCE GLOBAL STRIKE COMMAND

General WILSON. Chairman Udall, Ranking Member Sessions, distinguished members of the subcommittee, thank you for allowing me to appear for the first time today as Commander of Air Force Global Strike Command. This summer our command will celebrate its fifth anniversary. The command was stood up to provide a singular focus on the stewardship, the safe, secure, and effective operations of two-thirds of our Nation's nuclear triad.

Advancements and modernization taking place in the nuclear arsenals of other nations of concern are a clear indicator that the role of nuclear deterrence operations has not declined, as some would have us believe, but has actually become more critical.

We have provided a credible nuclear deterrent for the past 50 years. It can be easy to lose sight of the fact that there are almost 25,000 airmen in our command doing the mission absolutely right 24-hours-a-day, 7-days-a-week, 365-days-a-year. We must continue to show them that they are important and relevant, and that we value the critical work that they carry out every day with pride, discipline, and precision.

Our mission is unwavering. We develop and provide combat-ready forces for nuclear deterrence and global strike operations to support the President of the United States and combatant commanders. The command's priorities provide the clear path to mission success.

First, we will deter and assure with a safe, secure, and effective nuclear force.

Second, we are going to win the fight both in our overseas contingencies where we have nearly 1,000 airmen deployed around the world today and with the 1,100-plus deterrent force who are every day deployed to the missile fields of Montana, North Dakota, Wyoming, Nebraska, and Colorado.

We will strengthen and empower the team by continuing to improve both the quality of life of our airmen and their families, aware of the unique demands both of the mission and the locations in which they live.

Finally, we will shape the future by staying focused on the people, our human capital development, and a nuclear force modernization and initiatives.

Mr. Chairman, thank you for this opportunity to appear before the subcommittee and to discuss things going on in Air Force Global Strike Command. I look forward to your questions, and with your permission, I would like to enter my written testimony into the record.

Senator UDALL. Without objection.

[The prepared statement of General Wilson follows:]

PREPARED STATEMENT BY LT. GEN. STEPHEN W. WILSON, USAF

INTRODUCTION

Chairman Udall, Ranking Member Sessions, and distinguished members of the subommittee; thank you for allowing me to represent the over 25,000 Air Force Global Strike Command (AFGSC) airmen and civilians, and to appear before you as their Commander for the first time. 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

AFGSC will mark its fifth anniversary this year. Our command was created in 2009 to provide a singular focus on the stewardship and safe, secure and effective operation of two legs of our Nation's nuclear Triad. The Triad is an enduring construct that is just as relevant today as it was at its inception. Advancements and modernization taking place in the nuclear arsenals of other nations are a serious concern and indicate AFGSC's Nuclear Deterrence Operations mission is not losing relevance, but has actually become even more critical. In order for us to participate in every spectrum of conflict from humanitarian operations to nuclear engagement, we must be ready and effective at every point along that continuum, and we can never fail in nuclear operations. Our Nation has successfully avoided the unthinkable by having a credible deterrent for over 50 years. Continuing in the proud heritage of Strategic Air Command tailored for the 21st Century, AFGSC's mission is 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."

Air Force Global Strike Command Nuclear Mission

At the core of our mission statement are three reinforcing, key 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 to underpin every nuclear-related activity in AFGSC, from the discipline adhered to 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.

Air Force Global Strike Command Conventional Mission

Our conventional bomber forces defend our nnational interests by deterring or, should deterrence fail, defeating an adversary. Two capabilities are fundamental to the success of our bomber forces: 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 anywhere on the globe at any time. The United States' fleet of penetrating and stand-off heavy bombers is second to none, capable of long-range and long-endurance missions. These bombers carry our latest high-tech munitions in vast quantities to ensure the USAF can meet our Nation's global responsibilities, and remain in high-demand by the regional combatant commanders.

AIR FORCE GLOBAL STRIKE COMMAND FORCES

The two Numbered Air Forces under AFGSC, Eighth Air Force and Twentieth Air Force, serve critical national security roles as Component Numbered Air Forces to United States Strategic Command and as Task Forces for on-alert nuclear forces.

Twentieth Air Force

Twentieth Air Force (20 AF) is responsible for the Minuteman III intercontinental ballistic missile (ICBM) force and our UH–1N helicopter force. The 450 dispersed and hardened missile silos maintain strategic stability by presenting any potential adversary a near insurmountable obstacle should they consider a disarming attack on the United States. No potential adversary can credibly destroy this force without depleting their own arsenal. Every day a force of over 1,100 airmen is deployed to our three missile fields, executing effective deterrence operations. 20 AF maintains a 24-hour-per-day, 7-day-per-week, 365-day-per-year no-fail mission. Accomplishing this mission demands we focus on sustaining our current systems while modernizing for the future. How we will accomplish this is outlined in the paragraphs below.

Minuteman III

We continue efforts to sustain the Minuteman III ICBM (MM III). This includes upgrading the command, control and communications systems, and support equipment.

The ICBM Cryptography Upgrade (ICU), Code System Media (CSM), and the Strategic Targeting and Application Computer System (STACS) programs are 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 enhance security while reducing the number of operations, maintenance, and security forces man-hours required for the annual cryptographic code change at our Launch Facilities (LFs) and Launch Control Centers (LCCs). We project fielding the new CSM in 2014, new STACS in 2015 and the new ICU in 2019.

We are also equipping ICBM LCCs with modernized communications systems that will upgrade or replace other aging and obsolescent systems. Beginning in 2015, we will start replacing Voice Control Panels and Ultra-High Frequency radio receivers, accomplishing recurring Higher Authority Communications/Rapid Message Processing Element life extensions, and upgrading extremely high frequency (EHF) communications, which provide connectivity through the National Military Command System (NMCS). Furthermore, we advanced the Minuteman Minimum Essential Emergency Communications Network Program, which upgrades, modernizes and secures the Emergency Action Message network, with operational fielding scheduled for March 2015.

We conducted four MM III flight tests in fiscal year 2013, the first time we've accomplished four flight tests in 1 year since 2006. This, along with two successful Simulated Electronic Launch tests in the operational environment, demonstrates the operational credibility of the nuclear deterrent force and the Command's commitment to sustaining that capability. Operational testing is currently funded through the fiscal year 2015 Future Years Defense Program (FYDP), with four operational test launches funded per year to satisfy test requirements outlined by U.S. Strategic Command and the National Nuclear Security Administration.

We continue to examine emerging technologies to ensure the MM III weapon system remains reliable and ready through 2030. Additionally, we are looking into how investments in these technologies can transfer to and provide savings for the future Ground-Based Strategic Deterrent (GBSD) program.

Ground-Based Strategic Deterrent

The Minuteman missile system, currently on its third model, has been on continuous alert since the 1960s, over 50 years ago, and has proven its value in deterrence well beyond the platform's intended 10-year lifespan. The GBSD program is intended to replace or evolve the MM III. All parts of the Triad are complementary; the ICBM provides the responsive portion of that balance. Initial ICBM capability gaps were identified, validated by the Joint Requirements Oversight Council (JROC), and approved in August 2012 by the Air Force Chief of Staff, resulting in an Analysis of Alternatives (AoA). The AoA commenced in September 2013, and will identify an affordable, viable, flexible concept for the next generation ground-based strategic deterrent force. This analysis is critical to inform near-term MM III sustainment programs to ensure technologies and components can be utilized in GBSD acquisition. Our U.S. Navy partners 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 their strategic systems. Our GBSD AoA results are due to the Office of the Secretary of Defense (OSD) in June

2014. I ask for your support of GBSD as we move forward, ensuring it will lead to a viable replacement for the MM III ICBM.

UH–1N

AFGSC is the lead command for the Air Force's fleet of 62 UH–1N helicopters. The vast majority of these aircraft support two critical national missions: Nuclear Security in support of the ICBM force, and the Continuity of Operations/Continuity of Government mission in the National Capital Region.

Although the UH–1Ns are 45 years old, we currently plan to fly them for at least another decade. We must sustain the helicopter's current capabilities, while selectively upgrading them to reduce existing capability shortfalls and avoid increased sustainment costs due to obsolescence. Safety improvements currently underway include the installation of crashworthy aircrew seats across the fleet by 2015 and night vision goggle-compatible cockpits that will be fully integrated by 2016. In addition, the command has begun fielding the Helicopter Terrain Avoidance and Warning System and Traffic Collision Avoidance System to improve aircraft situational awareness and survivability. Finally, Air Force Global Strike Command is currently in the process of arming our UH–1Ns in order to meet OSD and U.S. Strategic Command (STRATCOM)-mandated security requirements for the missile fields. We have completed training our initial helicopter aircrew cadre, and initiated the development of tactics, techniques, and procedures for integrated operations with Security Forces personnel. We anticipate initial operational capability by the end of March 2015.

While we can to some extent mitigate the UH–1N's deficiencies in range, speed, and payload, no amount of modification will close these critical gaps entirely. This can only be accomplished by fielding a replacement aircraft that meets validated mission requirements. The Air Force cancelled the planned UH–1N replacement program, the Common Vertical Lift Support Platform, in 2013. However, we continue to explore replacement options, including acquiring aircraft currently possessed within the Department of Defense through the Excess Defense Articles program. At my predecessor's request, RAND recently completed a Business Case Analysis of the costs and mission effectiveness of sustaining the UH–1N as well as 19 other military and commercial replacement options. We will continue to pursue affordable replacement options while safely flying the UH–1N.

Eighth Air Force (8 AF)

Eighth Air Force is responsible for the B–2A Spirit (B–2) and B–52H Stratofortress (B–52) bomber forces. This includes maintaining the operational readiness of both the bombers' nuclear and conventional missions. The B–2 gives the United States the ability to attack heavily defended targets while the B–52 serves as the Nation's premier stand-off weapon delivery platform. The B–52 may be the most universally recognized symbol of American airpower . . . its contributions to our national security through the Cold War, Vietnam, Desert Storm, Allied Force, Iraqi Freedom and Enduring Freedom are remarkable. Our flexible dual-capable bomber fleet is the most visible leg of the nuclear Triad, allowing decision makers the ability to demonstrate resolve through generation, dispersal or deployment, which includes the ability to quickly place bomber sorties on alert ensuring their continued survivability to meet commander requirements.

B–52H

Our airmen have worked tirelessly to keep the venerable B–52 in the air. The B–52 is able to deliver a wide variety of stand-off, direct attack, nuclear and conventional weapons in the Air Force. This past year, we maintained 100 percent coverage of our Nuclear Deterrence Operations requirements while supporting overseas Continuous Bomber Presence (CBP) commitments, despite a 26 percent reduction in B–52 flying hours. Although we were able to balance aircrew readiness to meet United States Strategic Command requirements during these reductions, we only recently returned to pre-sequestration readiness levels to meet all combatant commander mission requirements.

AFGSC continues work toward completing the Combat Network Communications Technology (CONECT) upgrade. This upgrade resolves sustainability issues with aging cockpit displays and communications while also providing a "digital backbone" enabling integration into the complex battlespace of the future. CONECT replaces aging displays, adds a radio, provides beyond-line-of-sight communications and situational awareness, and adds machine-to-machine retargeting. The CONECT program is currently funded to field the upgrade across the entire B–52 fleet. The first B–52 CONECT installation will complete in April 2014, and the second B–52 is scheduled to begin conversion in July 2014.

We are working on an upgrade 1,760 internal weapons bay upgrade to the B–52's bomb bay that greatly improves flexibility and precision weapon capacity for all smart weapons. Configuring the aircraft to internally carry these smart weapons and the pathway for integration of the Joint Air to Surface Stand-Off Missile-Extended Range (JASSM–ER) will give the warfighter an additional advantage over an adversary, and will provide increased capability to our joint force commanders.

Continuing to upgrade and modernize the B–52 will keep this platform relevant, viable and an integral part of AFGSC's contribution to the fight, providing vital long-range strike and massive firepower until the Air Force determines the requirement for a suitable B–52 replacement.

Last year, we successfully executed six Air Launched Cruise Missile (ALCM) flight test evaluations, meeting STRATCOM ALCM test requirements for the third straight year. The ALCM, employed only on the B–52, remains a strong and capable stand-off nuclear weapon, but some critical components are nearing the end of their service life. To ensure the B–52 remains a credible part of the Triad, we have initiated an ALCM Service Life Extension Program (LEP). The ALCM will remain viable through 2030, when the Long Range Stand-off Missile (LRSO) is scheduled to reach its initial operational capability.

Minot Air Force Base (AFB), ND, has one of the oldest runways in the U.S. Air Force and has been deteriorating for years. We developed a multi-phased plan to completely replace the runway and widen the existing taxiway. The $70.5 million plan also includes the repair and upgrade of airfield lighting. To date, we have replaced both ends of the runway and widened the taxiway. Starting on 1 April 2014, we will close the runway and begin replacing the center section which is slated to be complete by 1 October 2014. During this 5 month runway closure, we will utilize the improved taxiway to meet STRATCOM requirements. For day-to-day training, we will relocate a portion of our B–52 force to Ellsworth AFB, SD. The end state will be a new runway capable of supporting strategic operations through 2050. This multi-year construction plan has been an operational challenge. However with the outstanding performance by our airmen, proper oversight, and risk management, we are ensuring both safe operations and combat capability. For your continued support of this vital construction project, we thank you.

B–2

The B–2 continues to deter and assure. We saw a vivid demonstration of this on 28 March 13 when we flew two B–2s from Whiteman AFB, MO, on a 75 hour, 6,500 mile combined training mission to South Korea. This high-visibility B–2 mission sent a strong and timely message of assurance to our South Korean, Japanese and Australian allies.

We emphasized 2013 as the "Year of the B–2" by celebrating the 20th anniversary of the first delivery of the B–2 Spirit bomber to Whiteman AFB, MO. For 20 years, the B–2 has defended America as a visible strategic deterrent. In each of our Nation's last four armed conflicts, the B–2 has led the way in combat. This is a direct result of the outstanding airmen who keep the aircraft flying. The B–2 with its long-range and stealth capability is able to penetrate heavily defended enemy defenses and deliver a wide variety of nuclear and conventional weapons in the Air Force inventory.

We will preserve and improve the B–2's capability to penetrate hostile airspace and hold any target at risk without subjecting the crew and aircraft to undetected threats. To do this, we secured JROC validation of the Defensive Management System-Modernization (DMS–M) Capabilities Development Document, allowing the program to enter into the engineering and manufacturing design phase of the acquisition process. This upgrade provides the B–2 aircrew with improved threat situational awareness and increased survivability by replacing the current DMS Threat Emitter Locator System and display system with modernized and sustainable systems capable of addressing modern threats. In sum, this program will keep the B–2 viable in future anti-access environments.

AFGSC continues to evolve B–2 conventional combat capability by fielding vital programs such as the Massive Ordnance Penetrator (MOP). Our Nation's ability to hold hardened, deeply buried targets at risk was bolstered by successful fielding of the 30,000-pound MOP. Additionally, MOP dolly and rail system prototype functional testing was successful. The dolly and rail system will increase storage capacity and create more efficient handling of the MOP. We would like to thank Congress for your support on this critical program.

We continue striving to maintain the proper balance of fleet sustainment efforts, testing, 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 (AFMC) 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

CBP increases regional stability and supports allies in the United States Pacific Command area of responsibility. In 2014 we celebrate the 10th consecutive year of conducting CBP operations. CBP is an enduring requirement and we have taken steps to reduce the cost of squadron rotations. Specifically, over the past year we worked closely with Pacific Air Forces to reduce the logistics footprint of these rotations by standardizing and positioning a permanent maintenance equipment package at Andersen Air Force Base.

Additionally, we coordinated Jet A fuel conversion from JP–8 at all AFGSC bases to ensure this seamless fuel transition without any mission impacts. This effort aligns AFGSC with the USAF initiative to reduce aviation energy costs. AFGSC plans to completely transition to Jet A by mid-2014. Once complete, AFGSC projects $6 million in annual savings.

Long-Range Strike Bomber (LRS–B)

The combat edge our B–2 provides will be challenged by next generation air defenses and the proliferation of these advanced systems. The LRS–B program works to extend American air dominance against advanced air defense environments. We continue to work closely with Air Combat Command to develop the LRS–B and field a fleet of new dual-capable bombers. This new bomber, scheduled to become operational in the mid-2020s, will hold any target on the globe at risk. We request your support for this essential program to ensure we maintain the ability to penetrate the most advanced integrated air defense systems.

Long-Range Stand-Off Missile (LRSO)

The LRSO is the replacement for the aging ALCM. In a similar manner to LRS–B, the LRSO is necessary to ensure we maintain a credible deterrent in the future. We need LRSO to maintain the safety of our aircrew and protect our aircraft, while maintaining the ability to strike at targets from outside contested airspaces in anti-access and area denial environments. The LRSO will be compatible with the B–52, B–2, and LRS–B platforms. The LRSO AoA is complete and JROC approved while the Draft Capabilities Development Document has completed staffing through the AFROC Process. In December 2013, the Office of the Secretary of Defense deferred program funding due to concerns over the National Nuclear Security Administration (NNSA) funding profile for the associated warhead as well as other nuclear enterprise priority bills such as the B61 Tail Kit Assembly. We are working closely with NNSA and AFMC to develop a new acquisition and funding strategy that will maintain LRSO's ability to replace ALCM in a timely manner. Recent Congressional NDAA language directed us to sustain the Conventional Air Launched Cruise Missile (CALCM) until we retire both the ALCM and CALCM concurrently. Sustaining the CALCM, slated for retirement in fiscal year 2015, would drive a significant bill. Currently, the USAF plans to replace CALCM with the modern JASSM–ER until the future conventional version of LRSO is available.

B61

The B61–12 LEP will result in a smaller stockpile, less special nuclear material in the inventory, and B61 surety. AFGSC is the lead command for the B61–12 Tail Kit Assembly program, which is required to meet STRATCOM requirements with the B61–12. The B61–12 Tail Kit Assembly program is in the Engineering and Manufacturing Development Phase 1 and is synchronized with NNSA efforts. The design and production processes are on schedule and within budget to meet the planned fiscal year 2020 First Production Unit date for the B61–12 Tail Kit Assembly, and support the lead time required for the March 2020 B61–12 all-up round. This joint AFGSC/NNSA endeavor allows for continued attainment of our strategic requirements and regional commitments.

SECURITY

Nuclear surety and security are at the forefront of the Command's mission. We partnered with DOE, NNSA and the U.S. Navy (USN) using the Joint Integrated Lifecycle Surety methodology to assess the relative vulnerabilities of the nuclear enterprise. Additionally, our Command-level Strategic Security Plan (SSP) integrates multiple security initiatives and projects across AFGSC, allowing me to make decisions that improve overall security performance.

A major AFGSC initiative continues to be designing new Weapon Storage Facilities (WSF) to consolidate nuclear maintenance, inspection, and storage. We have put forward a $1.3 billion program to replace all deficient and worn buildings across our aging 1960s-era Weapon Storage Areas with single modern and secure facilities at each location. This initiative eliminates security, design, and safety deficiencies and improves our maintenance processes. 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 DOE and USN input to explore ways to standardize across all organizations. We will attain 35 percent design completion for the first facility at Francis E. Warren AFB, WY, by April 2014. Our goal is to include the military construction (MILCON) for this new weapon storage facility in fiscal year 2016, with the MILCON for the remaining facilities in future years. In sum, these facilities are needed to meet requirements for a safe, secure, and effective nuclear arsenal.

We continue to work within the Air Force to complete the $337 million LF secondary door modifications that provides rapid closure and security for all LFs. As of January 2014, 390 of 450 sites are complete. We would like to thank Congress for your support during the life of this program.

NUCLEAR COMMAND, CONTROL, AND COMMUNICATIONS

Assured communications connectivity continues to be the linchpin to credible, secure strategic deterrence. The ability to receive presidential orders and convert those orders into action for the required weapon system is critical to performing the nuclear mission. As the Nuclear Command, Control, and Communications (NC3) Chief Architect, AFGSC plays a pivotal role in providing reliable and survivable NC3 systems to support national objectives. In addition to the ICBM sustainment and modernization actions previously discussed, we are addressing water intrusion issues at LCCs across the missile fields of Minot AFB, ND, and Malmstrom AFB, MT, averting communication failures, and ensuring uninterrupted ability to transmit and receive command and control message traffic. Additionally, cryptographic modernization upgrades allowed Air Force nuclear operations to transition to more secure equipment and satellite communications networks. These transitioned networks greatly improved security of sensitive nuclear command and control message traffic. We are also working multiple modernization efforts to replace legacy equipment on the Strategic Automated Command and Control System (SACCS). Finally, we are partnered with Air Combat Command and STRATCOM in relocating the SACCS Operations Center in preparation for the demolition of the current STRATCOM headquarters building.

Global Aircrew Strategic Network Terminal

The Global Aircrew Strategic Network Terminal (ASNT) program will provide a fixed and transportable system of survivable NC3 Command Posts. These Command Posts support nuclear-tasked bomber, tanker, National Airborne Operations Center, Take Charge and Move Out aircraft, reconnaissance forces, and nuclear reconstitution teams. Global ASNT is one part of the ground element of the larger Minimum Essential Emergency Communications Network. Global ASNT replaces degraded legacy NC3 systems in AFGSC, Air Combat Command, Air Mobility Command, U.S. Air Forces Europe, Air National Guard, and Air Force Reserve Command providing redundant strategic communications paths in executing STRATCOM war plans.

NEW STRATEGIC ARMS REDUCTION TREATY PROGRESS

The Russian Federation was notified in February 2014 that the last of 50 Peacekeeper LFs near Francis E. Warren AFB, WY (formerly the 400th Missile Squadron) have been removed from New Strategic Arms Reduction Treaty (NST) accountability. The process involves removing and burying the 110-ton launcher closure door and filling the launch tube and associated underground structures with gravel. Following the completion of elimination actions for the remaining 50 non-operational LFs at Malmstrom AFB, MT (formerly the 564th Missile Squadron) and 3 test LFs at Vandenberg AFB, CA, the demolition contractor will return to the sites and accomplish remediation actions necessary to prep the sites for disposition. The original landowners will have the first option to purchase the sites. The completion of these actions marks a key milestone in U.S. efforts to reduce the number of non-deployed launchers accountable under NST. The LF elimination in Montana began in February 2014. 40 of the 50 LFs are on contract using fiscal year 2013 funding with completion expected in July 2014.

NUCLEAR DETERRENCE OPERATIONS CORE FUNCTION

We continue to improve and strengthen the nuclear enterprise through our long-range planning efforts. To this end, we conducted an AFGSC-wide review to ensure a coherent 20-year comprehensive investment strategy for the Air Force Nuclear Deterrence Operations (NDO) Core Function. This plan will bolster our ability to provide the President and combatant commanders vital 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 these systems.

One of the methods we use to inform our NDO long-range planning and investment strategy efforts is wargaming. Our first wargame, Strategic Vigilance, was conducted in December 2013 as an analytic tool to explore new concepts and capabilities, study and refine emerging operational concepts, prevent technological, strategic and operational surprise, and evaluate the Air Force Strategic Plan & Vision. Moreover, Strategic Vigilance explored the ability to conduct combat operations across the spectrum of conflict. The results from this and future wargames will provide us insight into the employment of global strike assets that will allow us to better organize, train and equip AFGSC for years ahead.

2014 FOCUS AREAS (OUR PRIORITIES)

Deter and Assure with a Safe, Secure and Effective Nuclear Force. Nuclear weapons demand a culture where safety, security and effectiveness permeate all aspects of this critical national mission to include our people who embody this special trust and responsibility through all aspects of their life. The greatest Air Force in the world will only remain dominant through their professionalism, dedication, and commitment to service—and living our Air Force core values. Although we will continue to be challenged with sustaining aging weapon systems, we will leverage the innovation of our great airmen to get the most out of our resources.

Win the Fight. Whether that fight is in overseas contingencies where we have nearly 1,000 airmen deployed, or with our over 1,100 nuclear deterrent forces deployed to the missile fields conducting the mission today and every day, we will forge ahead to keep both our nuclear and conventional forces combat ready.

Strengthen and Empower the Team. We will continue to 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 continue focused education and development at all levels. Furthermore, we will continue to strengthen, broaden, and deepen our culture around our command values of:

Individual responsibility for mission success
Critical self-assessment of our performance
Uncompromising adherence to all directives
Superior technical and weapon system expertise
Persistent innovation at all levels
Pride in our nuclear heritage and our mission
Respect for the worth and dignity of every airman
Safety in all things large . . . and small

Shape the Future. We will stay focused on our human development and our weapon system modernization initiatives. Our responsive and resilient MM III, providing the foundation for strategic stability, must be sustained to 2030 and we will advocate for a follow-on system based on our Ground-Based Strategic Deterrent work. The B–52 will remain the stand-off platform of choice well past 2040, and will prove a versatile platform with unmatched battlefield persistence in lower threat environments. The B–2 will be our strategic penetrating platform denying safe haven to any adversary. The Long Range Strike Bomber will ensure we can continue to hold any target on the globe at risk. As our Air Launched Cruise Missile becomes obsolete and unsupportable, we will field a credible and flexible deterrent with the stealthy Long-Range Stand-Off missile.

Uphold the Standard. We understand the importance of ensuring compliance at all levels, and we uphold our standards through inspections. We recently implemented the new Air Force Inspection System. The foundation of this new system, the Commander's Inspection Program (CCIP), is being executed by our wing Inspectors General (IG) for organizations below the wing level. The CCIP is monitored virtually by our command IG and validated by a Unit Effectiveness Inspection (UEI) Capstone event every 2 years. The first formal UEI Capstone event is scheduled for the second Bomb Wing in April 2014. Additionally, we conducted Initial Nuclear Surety Inspections at the 307th Bomb Wing in March 2013 and 131st Bomb Wing

from July through August 2013, resulting in the first Air Reserve component and Air National Guard units certified to employ nuclear munitions. Going forward, we will continue to utilize our rigorous inspection process to ensure the highest of standards and determine areas of the mission that require improvement. All three ICBM wings will undergo NSIs in 2014—the 91st Missile Wing just passed this inspection in January 2014.

CONCLUSION

Thank you for your continued support of Air Force Global Strike Command and the nuclear deterrent and global strike missions. 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; fourth, to solidify and sustain a culture where our airmen are proud to serve in and embrace the great importance of the deterrent mission.

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 account for less than 1 percent of the DOD budget, AFGSC nuclear forces represent two-thirds of the Nation's nuclear Triad, providing the ultimate guarantee of national sovereignty, while AFGSC conventional forces provide joint commanders rapid global combat airpower.

It is my absolute privilege to lead this elite team empowered with special trust and responsibility, and I can assure you that we at Air Force Global Strike Command will meet our challenges head-on in order to provide our Nation with ready forces for nuclear deterrence and global strike operations—safe, secure, and effective.

Senator UDALL. Thank you for that testimony.

Admiral Benedict?

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

Admiral BENEDICT. Chairman Udall, Ranking Member Sessions, distinguished members of the subcommittee, thank you for the opportunity to testify here today. I represent the men and the women of our Navy's Strategic Systems Programs (SSP). Your continued support of our deterrence mission is greatly appreciated. Thank you.

The Navy provides the most survivable leg of the U.S. nuclear triad with the ballistic missile submarines and the missiles that they carry. My mission, as the Director of SSP, is to design, develop, produce, support, and ensure the safety and the security of the Navy's sea-based strategic deterrent capability, the Trident II (D5) strategic weapons system (SWS). My written statement, which I respectfully request be submitted for the record, addresses my top priorities.

Senator UDALL. Without objection.

Admiral BENEDICT. Due to time constraints, I would briefly like to touch on three of these topics: nuclear weapons safety and security, SSP's Trident II (D5) life extension efforts, and solid rocket motors.

First, my top priority is the safety and the security of the Navy's nuclear weapons. Custody and accountability of the nuclear assets entrusted to the Navy are the cornerstone of our program. Our approach to the nuclear weapons mission is to maintain a culture of excellence and self-assessment that produces the highest standards of performance and integrity. This culture is grounded in procedural compliance, level of knowledge, a questioning attitude, forceful backup, and formality. It is emphasized at all levels of the en-

terprise and forms a fundamental element of an integrated, layered approach to ensuring a safe, secure, and effective strategic deterrent.

Second, 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's service life and to serve as the initial baseline mission payload for the *Ohio*-replacement submarine platform. This is being accomplished through a life extension program (LEP) to all Trident II (D5) SWS subsystems to include launcher, navigation, fire control, guidance, missile, and reentry.

Finally, I remain concerned with the decline in demand for solid rocket motors. While the Navy is maintaining a continuous production of solid rocket motors, the demand from both the National Aeronautics and Space Administration (NASA) and the Air Force has declined. Not only did this decline result in higher costs for the Navy as practically a sole customer, but it also put the entire specialized industry at risk for extinction. While the efforts of our industry partners and others have created short-term cost relief, the long-term support of the solid rocket motor industry remains an issue. I continue to work with our industry partners, DOD, senior NASA leadership, Air Force, and Congress to do everything we can to ensure this vital national industry asset is preserved.

Our Nation's sea-based deterrence has been critical to our Nation's security since the 1950s and will continue to assure our allies and deter potential adversaries well into the future.

Thank you for the opportunity to testify today, and at the appropriate time, I will take any questions, sir.

[The prepared statement of Admiral Benedict follows:]

PREPARED STATEMENT BY VADM TERRY 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 Weapons 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, sailors, and coastguardsmen 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 Submarine Launched Ballistic Missiles (SLBMs) they carry. SLBMs will comprise a significant majority of the Nation's operationally deployed nuclear warheads, thus increasing the Nation's reliance on the sea-based leg. The Chief of Naval Operations has stated the *Ohio* Replacement Program—along with the propulsion and the SWS—remains one of Navy's highest priorities.

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 to support the program of record in fiscal year 2015 for the Trident II (D5) SWS. To sustain this capability, I am focusing on my 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.

NUCLEAR WEAPONS SAFETY AND SECURITY

The first priority, 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 SSBNs as they transit to and from their dive points. These coastguardsmen 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. My headquarters staff ensures that our nuclear weapons capable activities meet or exceed security, safety, and compliance criteria.

SSP' s efforts to sustain the safety and improve the security of these national assets continue at all levels of the organization. The Navy's nuclear weapons enterprise maintains a culture of self-assessment in order to sustain safety and security. This is accomplished through biannual assessments by the SSP headquarters staff, periodic technical evaluations, formal inspections, and continuous on-site monitoring and reporting at the Strategic Weapons Facilities. The technical evaluations, formal inspections, and on-site monitoring at the Strategic Weapons Facilities provide periodic and day-to-day assessment and oversight. The biannual SSP assessments conducted by my staff evaluate the ability of the local organizations to self-assess their execution of the assigned strategic weapons mission and compliance with requirements. The results of these biannual assessments are critically and independently reviewed through the Navy Nuclear Weapons Assessment and provided to the Secretary of the Navy and the Chief of Naval Operations for review. The most recent biannual SSP assessment was signed in January 2014 and will inform the Navy's Nuclear Weapons Assessment due later this month.

We also strive to maintain a culture of excellence to achieve the highest standards of performance and integrity for personnel supporting the strategic deterrent mission. 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 is SSP's life extension effort to ensure the Trident II (D5) SWS remains an 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. The submarine leg of the U.S. strategic deterrent is ready, credible, and effective, thereby assuring our allies and partners and deterring potential adversaries. However, we must watch for and resolve potential 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 nearly 25 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 strategic deterrent system. As a result, effort will be required to sustain a credible SWS.

The Navy is proactively taking steps to address aging and technology obsolescence in today's sea-based deterrent or SWS. 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 entering operational service in the 2030s. 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 to keep the deployed system as one homogeneous population, 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 through the introduction of the *Ohio* Replacement SSBNs.

While budgetary pressures and impacts of sequestration have resulted in some deferred or delayed efforts, strategic deterrence remains one of the Navy's highest pri-

orities. As such, the Navy is committed to minimizing, to the maximum extent possible, financial impacts to this program in order to meet strategic requirements.

One impacted effort is the change to our flight test program. In accordance with U.S. Strategic Command (STRATCOM) requirements, the Navy must flight test a minimum of four Trident II (D5) missiles per year in a tactically-representative environment. The purpose of flight testing is to detect any changes in reliability or accuracy. The fiscal year 2015 budget request reflects a reduction of two planned flight tests for affordability. The Navy has coordinated with STRATCOM to determine that this temporary reduction is manageable in the short-term, contingent upon our plan to ramp back up to four flight tests per year by fiscal year 2017. A prolonged or further reduction in planned flight tests would impact our ability to detect changes in system reliability and accuracy with the required degree of statistical confidence to meet STRATCOM requirements. I am strongly committed to ensure our flight testing returns to four flight tests per year in fiscal year 2017.

Despite budgetary pressures, the Navy's D5 life extension program is on track. In 2013, the Navy conducted the second flight test of the D5 life-extended (LE) guidance system and the first flight test of the D5 LE command sequencer. The D5 LE command sequencer began its initial fleet introduction earlier this year. The life extension efforts for the remaining electronics packages are on budget and on schedule. The life-extended missiles will be available for initial fleet introduction in fiscal year 2017.

Another major step to ensure the continued sustainment of our SWS is the SSP Shipboard Systems Integration efforts, which utilize open architecture and commercial off-the-shelf hardware and software for shipboard systems. This update will be installed on the final U.S. SSBN in April of this year completing installation on all fourteen U.S. SSBNs, all four U.K. SSBNs, and all U.S. and U.K. land-based facilities. This effort is a technical refresh of shipboard electronics hardware and software upgrades, which will extend the service life of the SWS, enable more efficient and affordable future maintenance of the SWS and ensure we continue to provide the highest nuclear weapons safety and security for our 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-l 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 Weapons 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

One of the Navy's highest priority acquisition programs is the *Ohio* Replacement Program, which replaces the existing *Ohio*-class submarines. 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 is taking the necessary steps to ensure the *Ohio* Replacement SSBN is designed, built, delivered, and tested on time with the right capabilities at an affordable cost.

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. A program to support long-term SWS requirements will have to be developed in the future to support the *Ohio*-Class Replacement SSBN through its entire service life, currently projected into the 2080s.

The Navy continues to leverage from the *Virginia*-class attack submarine program to implement lessons-learned and ensure the *Ohio* Replacement Program pursues affordability initiatives across design, construction, and life cycle operations and support. Maintaining this capability is critical to the continued success of our sea-based strategic deterrent.

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 U.S. ship construction has shifted from 2019 to 2021 as a result of the Budget Control Act of 2011, the Navy is maintaining the original program of record for the design, prototyping, and testing of the common missile compartment and SWS deliverables in order to meet our commitments to the United Kingdom. Any further delay to the common missile compa11ment will impact the United Kingdom'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. 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. Last year, marked 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 develop the common missile compartment. 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 sea-based leg of the Triad provides our assured second-strike capability thereby enhancing strategic stability. The *Ohio* Replacement will be a strategic, national asset whose endurance and stealth will enable the Navy to provide a continuous, uninterrupted strategic deterrent.

SOLID ROCKET MOTOR INDUSTRIAL BASE

The fourth priority is the importance of the defense and aerospace industrial base, in particular, the solid rocket motor industry. I remained concerned with the decline in demand for the solid rocket motor. While the Navy is maintaining a continuous production capability at a minimum sustaining rate of 12 rocket motor sets per year, the demand from both the National Aeronautics and Space Administration (NASA) and Air Force has declined. Not only did this decline result in higher costs for the Navy, as practically a sole customer, but it also put an entire specialized industry at risk for extinction—or at least putting it on the "endangered species list." That is not something we should risk. The Navy cannot afford to solely carry this cost, nor can this nation afford to lose this capability over the long-term. While the efforts of our industry partners and others have created short-term cost relief, the long-term support of the solid rocket motor industry remains an issue that must be addressed at the national level. At SSP, we will continue to work with our industry partners, DOD, senior NASA leadership, Air Force, and Congress to do everything we can to ensure this vital national industry asset is preserved.

COLLABORATION WITH THE AIR FORCE

The final topic 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.

As I testified last year, the Navy and the Air Force established an Executive Steering Group to identify and investigate potential collaboration opportunities and oversee collaborative investments for sustainment of our strategic systems. As a part of this effort, technology area working groups are studying collaboration opportunities in the areas of Reentry, Guidance, Propulsion, Launcher, Radiation Hardened Electronics, Ground Test and Flight Test systems, and Nuclear Weapons Surety.

Navy is also supporting an examination of the advantages of collaboration and commonality within the Air Force's Ground Based Strategic Deterrent Analysis of Alternatives. Members of my staff are participating with their Air Force counterparts to analyze the potential for commonality presented by each of the alternatives being examined. Additionally, an evaluation of the benefits, along with any potential risks, is being conducted as part of the overall effort.

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.

Many of the industries and required engineering skills sets are unique to strategic systems. Key to SSP's historical success has been our technical applications programs, which have provided a research and development foundation. As we evaluate maintaining this strategic capability to match the full service life of *Ohio* Replacement submarine, we will need to resume these critical efforts. Navy is developing a plan to reinvest in these technical applications programs.

CONCLUSION

SSP continues to maintain a safe, secure, and effective strategic deterrent 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 2015. 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 challenges 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 potential adversaries 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 UDALL. Thank you, Admiral Benedict.

General Harencak?

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

General HARENCAK. Chairman Udall, Ranking Member Sessions, members of the subcommittee, thank you for your continued support of our triad and our nuclear Air Force. As the headquarters Air Force A–10, I advocate and integrate for our Air Force nuclear forces. I appreciate the opportunity to update the subcommittee on all of our efforts here today.

I look forward to your questions. I respectfully request my written statement be entered into the record.

[The prepared statement of General Harencak follows:]

PREPARED STATEMENT BY MAJ. GEN. GARRETT HARENCAK, USAF

Chairman Udall, Ranking Member Sessions, distinguished members of the subcommittee, thank you for the opportunity to discuss Air Force nuclear 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 and continuous improvement of this mission remains a top Air Force priority, in support of the President's mandate that the United States maintain a safe, secure, and effective nuclear deterrent.

The stability that a safe, secure, and effective nuclear deterrent provides in today's increasingly complex, multi-polar, proliferated environment is essential to U.S. national security. In order to maintain this vital capability for our Nation and our allies who rely on it, the Air Force remains fully committed to making the necessary long-term investments in the development of our personnel and in the sustainment, modernization, and recapitalization of our nuclear forces and supporting infrastructure

DELIBERATE DEVELOPMENT OF OUR AIRMEN

The exacting nature of Nuclear Deterrence Operations requires a cadre of experienced, motivated professionals committed to the highest levels of performance and accountability. For that reason, the airmen we entrust with the special responsibility of supporting and conducting the nuclear mission are the single most important element of the enterprise and are foundational possess the necessary quality and depth of nuclear expertise is a multi-dimensional effort that incorporates force development, personnel management, education, and training processes. In our ongoing effort to strengthen the nuclear mission, we have worked hard in recent years

to institutionalize a more deliberate and holistic approach to human capital management.

In support of that effort, the Air Force instituted a Nuclear Enterprise Human Capital Strategy to strengthen manning and management of nuclear career fields. We recently formalized our processes and policies for identifying, designating, and tracking Key Nuclear Billets (KNB), select positions of responsibility within the nuclear enterprise that are vital to its health and sustainment. KNBs require defined levels of nuclear experience based on each specific position and are given the highest assignment priority. The program allows us to more effectively manage the assignment of qualified personnel to critical nuclear positions, and we rely on a periodic revalidation process to ensure KNBs are aligned to meet the constantly changing needs of the enterprise.

We are leveraging the best practices learned from the KNB process to address specific areas of need, for example, in the identification of personnel supporting the nuclear command, control, and communications (NC3) mission. This process allows us to better assess and address experience gaps in order to ensure a continuous pipeline of NC3 personnel with the right combination of training and expertise will be available in the years to come. Through a separate effort, we are in the early stages of establishing best practices for developing our civilian nuclear workforce, a critical facet of the enterprise on which we depend to provide continuity and highly specialized technical expertise. We are also revising the methods we use to select senior nuclear commanders to include a more robust screening and interview processes. Our efforts to instill are also progressing.

In order to more deliberately structure the career progression of our of Intercontinental Ballistic Missile (ICBM) officers, we stood up an ICBM-experienced career management team focused solely on the development of missileers. Beginning last February with the creation of a separate career field for ICBM operations (13N), a development team of senior nuclear leaders was established that now convenes regularly to manage the career field. This effort has led to increased competitive selection among missileers for developmental education opportunities, codification of the process used for managing the transition of officers from the ICBM force into other career fields, and the creation of a career pyramid aimed at producing seasoned leaders within the ICBM community.

Lastly, another important area of sustained effort is the streamlining of the Air Force's Personnel Reliability Program (PRP), a tool we use to ensure airmen with nuclear weapons-related duties meet the highest standards of individual reliability and trustworthiness. Our work to strengthen and restore this program's focus on its intended purpose is yielding results. We are in the process of finalizing new policies governing PRP that will standardize its implementation across the Air Force and reemphasize its role as a commander's program.

FOSTERING CONTINUOUS IMPROVEMENT IN OUR OPERATIONS

Excellence in nuclear operations is underpinned by a culture of compliance and accountability, adherence to high standards, and critical self-assessment. Upholding these values requires effective processes and structures to identify and correct systemic weaknesses across all realigned the Air Force's focus on the nuclear mission, we have applied persistent effort to institutionalizing a comprehensive system of problem identification and solving based on self-assessment, trend/root cause analysis, and communication that complements external inspection processes.

In support of that ongoing effort, we significantly strengthened the nuclear inspection process by revising the inspection guidance, establishing independent oversight, standardizing inspector training, and issuing guidance for root cause analysis. Our work to enhance trend analysis and resolution from nuclear surety inspections continues, one of five focus areas identified in 2010 as part of the Air Force's nuclear enterprise update to the Secretary of Defense. Additionally, we have carried forward our use of the Air Force Comprehensive Assessment of Nuclear Sustainment process to critically examine the sustainment activities needed to keep our aging weapon systems safe, secure, and effective.

We continue to apply sustained, senior-leader oversight and governance to the nuclear enterprise through the Nuclear Oversight Board, chaired by the Secretary and Chief of Staff of the Air Force, and the three-star level Nuclear Issues Resolution and Integration board. These structures provide a forum for resolution of issues affecting the enterprise, coordination of strategic guidance, and alignment of institutional priorities. As the Secretary of the Air Force recently emphasized, we will continue to examine policies, practices, and culture throughout the enterprise to uncover, and, when necessary, confront systemic institutional deficiencies that may be hindering innovation and improvement.

Despite the challenge of prioritizing investments within increasingly stringent fiscal constraints, the Air Force's fiscal year 2015 budget request for nuclear deterrence operations reflects a careful balance of investment between near-term readiness and long-term recapitalization requirements. The Air Force made a number of difficult cost and schedule adjustments to our programs in order to maintain affordability without incurring undue risk. Considerable work lies ahead as we endeavor to revitalize our delivery platforms, weapons systems, and NC3 systems. Accordingly, the Air Force appreciates Congress's continued recognition of the importance of nuclear deterrence to our national security, as well as your support for our major modernization and recapitalization plans.

The fiscal year 2015 budget request continues robust investment in the development of the dual-capable Long Range Strike-Bomber (LRS–B), one of the Air Force's top acquisition priorities. LRS–B's extended-range, significant payload, and ability to penetrate and survive in non-permissive airspace will provide unmatched operational flexibility to Joint commanders upon delivery in the mid-2020s.

The Long-Range Standoff (LRSO) missile, the follow-on to the aging AGM–86B Air Launched Cruise Missile (ALCM) first fielded in 1982, will serve as the next-generation nuclear-capable standoff weapon compatible with the B–52, B–2, and LRS–B. Although the fiscal year 2015 budget request delays the LRSO program for 3 years, the Air Force continues risk reduction and early systems engineering work, as well as coordination with the National Nuclear Security Administration (NNSA) to ensure the production schedule for a life-extended LRSO warhead is synchronized with operational requirements. To make sure deterrence requirements continue to extension program for the ALCM that will sustain this weapon system through 2030.

For our current generation of nuclear-capable bombers, the B–2 and B–52, the fiscal year 2015 budget request funds a range of modernization and sustainment initiatives that will extend the combat effectiveness of these long-range strike platforms through the 2020s and beyond. In particular, the budget request fully funds the installation across the entire B–52 fleet of the Combat Network Communication Technology (CONECT) system, a suite of technologies that equips the B–52 with 2lst century communications, retargeting, and situational awareness capabilities. Other enhancements include smart-weapon carriage capability in the internal weapons bay, anti-skid brake upgrades, and modem transponders that will ensure the B–52 is compliant with impending U.S. and international requirements. Key upgrades for the B–2 funded in the fiscal year 2015 budget request include the Defensive Management System Modernization, the Common Very Low Frequency/Low Frequency Receiver, and Flexible Strike, a capability that will allow for the eventual integration of advanced digital weapons such as the B61–12 and the LRSO. Together, these programs will ensure the B–2 retains its unique and highly valued ability to hold the global target set at risk.

The fiscal year 2015 budget request also supports significant modernization of the Air Force's ICBM force, comprised of 450 Minuteman III missiles geographically dispersed in hardened underground silos. America's venerable ICBM force, on continuous alert since 1959 when the Atlas ICBM went operational, provides unsurpassed stability and responsiveness at a cost far lower than other strategic systems. Several key modernization programs are continued in the fiscal year 2015 budget request that will sustain Minuteman III and its associated support and test equipment through 2030. These include upgrades to solid our Launch Control Centers, and a joint warhead fuze program that is leveraging commonality between Air Force and Navy systems to deliver a cost-effective material solution.

In July, we anticipate completion of the Analysis of Alternatives (AoA) for the Ground-Based Strategic Deterrent (GBSD) effort, an ICBM solution that will extend the Nation's land-based strategic deterrent beyond 2030. Final validation of the AoA is expected this October. The fiscal year 2015 budget supports a Milestone A decision for GBSD in fiscal year 2015.

Also funded in the fiscal year 2015 budget request are risk reduction activities associated with Dual Capable Aircraft (DCA) integration for the F–35 Joint Strike Fighter (JSF). Current plans have JSF DCA capability being fielded in Block 4B in 2024. This initiative, along with the related B61–12 Life Extension Program (LEP) and its associated Tailkit Assembly, are of high interest to our North Atlantic Treaty Organization allies who view the United States' continued support of extended deterrence capabilities as a visible and important commitment to the alliance.

NUCLEAR WEAPON MODERNIZATION PROGRAMS

Another area of sustained focus is our partnership with the Department of Energy (DOE) to extend the service life of the warheads and gravity weapons that form the

basis of the ground and air legs of the Triad. While the top priority is to prolong the lifespan of these systems, these LEPs represent an important opportunity to incorporate modem safety, security, and use-control features in systems that were first operationally deployed in the 1960s, 1970s, and 1980s. Among these programs, the life extension of the B61—which will eventually be the only gravity weapon employed by our long-range bombers and dual-capable aircraft to support extended deterrence request continues the Air Force's support of the B61–12 LEP. However, as a result of sequestration impacts, the fiscal year 2015 budget reflects a 1-year slip of the B61–12 LEP first production unit (FPU) from fiscal year 2019 to fiscal year 2020. Both the LEP and its associated Tailkit Assembly successfully completed all scheduled objectives and milestones for calendar year 2013 and are on-track for calendar year 2014.

Our work to life-extend the W78 warhead used on the Minuteman III ICBM continues. Last fall, the Nuclear Weapons Council (NWC) directed an adjustment of the W78/88-1 FPU from fiscal year 2025 to fiscal year 2030, and in January, the Consolidated Appropriations Act funded the study of a W78 LEP. Lastly, my staff continues to collaborate closely with the NWC and our DOE mission partners in support of the selection of a life-extended warhead for the LRSO missile, the follow-on program to the AGM–86B ALCM. The Air Force was recently invited by NNSA to participate in the commencement of a Phase 6.1 study for the LRSO warhead, an effort that is expected to commence in July of this year.

NUCLEAR COMMAND, CONTROL, AND COMMUNICATIONS

Our Nation's nuclear command, control, and communications (NC3) enterprise forms the backbone of a system that provides a secure and survivable communications capability between the President, senior leaders, and our nuclear forces. Day-to-day, these aging ground, air, and space systems are relied upon to provide assured connectivity across the spectrum of conflict, from peacetime to the most challenging wartime conditions. Our work to integrate efforts across the NC3 enterprise and to advocate for NC3 capabilities is producing steady progress. Internal have produced a strong collaborative framework for identifying requirements and synchronizing investment.

During the most recent Program Budget Review, we made strides toward prioritizing future NC3 funding. The Air Force Nuclear Weapons Center is building a strategic roadmap for NC3 sustainment. Air Force Global Strike Command (AFGSC) is working to more fully incorporate NC3 requirements into planning for nuclear deterrence operations. As part of that effort, AFGSC will host a first-ever user-level NC3 symposium in April. My staff is also partnering with AFGSC to identify, and if necessary, mitigate any NC3-related cyber vulnerabilities in the B–52 fleet, building on the success of a similar initiative we conducted for the Minuteman III system.

We are also working with Air Education and Training Command to better equip our NC3 warriors with the proper training experiences and curriculum so they will be ready to advocate for these capabilities in the future. Furthermore, we are developing an Air Force instruction that will codify NC3 roles and responsibilities across the Service. Lastly, my team continues to focus effort on extending assured communications capability to the bomber fleet, integral to ensuring these platforms remain mission capable in highly contested environments.

NEW START IMPLEMENTATION

Under the terms of the New Strategic Arms Reduction Treaty (New START), the United States and the Russian Federation have committed to reducing their strategic nuclear forces in accordance with the Treaty's central limits not later than February 2018. In support of that obligation, the Air Force has fully funded activities necessary to align our ICBM and heavy bomber forces with the baseline force structure previously reported to Congress.

While the Department of Defense anticipates making a final New START force structure decision before the end of fiscal year 2014, Air Force efforts to eliminate treaty-accountable ICBM silos and bombers no longer used to perform the nuclear mission are well underway. To date, we have completed elimination of 50 empty Peacekeeper ICBM silos and 39 non-operational B–52Gs, as well as modification of 2 B–52H ground maintenance trainers. In addition, the procurement of conversion kits necessary to render B–52Hs conventional-only is on schedule, as are previously planned eliminations of "phantom" silos.

CLOSING

Thank you for the opportunity to share the Air Force's views on Nuclear Deterrence Operations. Our focus on continually improving the nuclear mission-particularly through our support and development of the airmen entrusted with carrying out that mission—particularly through our support and development of the airmen entrusted with carrying out that mission—is ongoing, and will remain one of the Air Force's top priorities.

Senator UDALL. Thank you, General. Let me thank the panel.

I want to throw it first to Senator King for questions he may have. Let us do 7-minute rounds.

Senator KING. Thank you, Mr. Chairman.

First, Ranking Member Sessions, thank you for that chart. I learn visually and I think that is a very powerful piece of information up there. I appreciate your work to put the data together. It raises serious questions.

Ms. Bunn, perhaps you could react. This tells us that we are under-investing and that we have to change that, or otherwise we are just putting off investment decisions. It is like not rebuilding bridges and roads. We are going to have to pay for them eventually. Your thoughts on the data that is presented here?

Senator SESSIONS. Senator King, I would just note the green, if you cannot see it, is 2017, and that is when we are reconstituting the triad plan. We did hit about the lowest percentage of the defense budget in 2007, if you cannot see it.

But excuse me. Go ahead.

Senator KING. I am interested in your thoughts about whether the little glimmers of green at the end of the chart are sufficient.

Ms. BUNN. Yes, sir. It is clear that there will be recapitalization cost in the out-years that are not shown on the chart, and indeed, we think that those are both reasonable and necessary.

Senator KING. Are we going to be able to make them in light of the reinstitution of sequestration in 2 years?

Ms. BUNN. If there is sequestration after 2015, Senator, it will hurt this a lot. We would love to see stability and predictability in the funding for that recapitalization so we can do it most effectively and efficiently.

Senator KING. I just hope adequate provision is taken. We have to be realistic. Everybody around here hates sequestration, but it has a way of rearing its ugly head continuously. So this is going to have to be part of your long-term planning in DOD because I am just afraid this might be a lower priority than readiness or personnel costs and those kinds of things. This is an important investment.

General, help me with the pronunciation of your name.

General HARENCAK. "Har-en-cak", Senator.

Senator KING. "Harencak," thank you.

When I was a senior in college, I wrote my senior thesis on the subject of deterrence, and I am not going to incriminate myself by telling you what year it was, but I will tell you that Lyndon Johnson was President of the United States. [Laughter.]

But it seems to me that the theory of deterrence has fundamentally changed because at that time we were talking about state-to-state deterrence, and there was a certain presumption of rationality. We were really talking about the Soviet Union. Today we are talking about the possibility of non-state actors who are not par-

ticularly rational and who are potentially suicidal. The whole idea of mutually assured destruction was that you wanted to keep your life. Now we have people who are potentially suicidal.

Talk to me about the theory of deterrence as it applies in this utterly new set of circumstances, for instance, a nuclear bomb on a tramp steamer headed for Miami manned by fanatics who are prepared to die for the cause.

General HARENCAK. Senator, the theory of nuclear deterrence, having a credible nuclear deterrence, I do not believe has fundamentally changed. What it does do—and the forces that we provide the Nation protect against its only existential threat, and while a credible, stable, nuclear deterrent that is actually used every day, I get asked a lot of questions. People say, well, but you never use these weapons. But we use them every single day. That is the concept of deterrence. A continued at-sea deterrence that Admiral Benedict provides, our bomber forces, our missiles that are across five States——

Senator KING. How do all of those things deter 12 madmen on a ship? That is my question. Your answer is not responsive. Deterrence works with countries and rational people. How do you threaten and scare by deterrence this terrorist group that has a nuclear weapon in the hold of the ship?

General HARENCAK. You may not be able to do that, Senator, but that does not mean that our forces are not as relevant today as they are.

Senator KING. I am certainly not suggesting that we should abandon it. I am just suggesting should the theory not be updated to take account of modern realities.

General HARENCAK. I am not debating that, sir. I will say our capability as a Nation to do nuclear forensics, nuclear detection, and nuclear attribution is very good, and that alone, those three aspects, will allow us to know where this particular threat came from, and that is that ability to be able to respond to it.

Senator KING. I think that is the key, that intelligence is our first line of defense in this new world.

General HARENCAK. Absolutely, sir. Absolutely.

Senator KING. Ms. Bunn, do you have any thoughts on this question of the theory of deterrence as it applies in 2014?

Ms. BUNN. Yes, sir. I would agree that the fundamentals of deterrence are the same in that you are trying to convince a potential adversary that the cost and risk of aggression far outweighs any benefit that they hope to gain. When I have thought about how that might apply to deterrence, I am not sure that our nuclear forces are so relevant there, but the idea of trying to make sure that they do not gain what they are hoping to gain is the key. Terrorists are willing to die but they want to die accomplishing something. If you can keep them from believing that they are going to accomplish what they want to accomplish, then the theory of deterrence may apply in some way. It is different than it applies to state actors, I believe, and I have far less confidence in deterring terrorists than I would in deterring other states.

That is why our counterproliferation measures are so important. That is why trying to secure nuclear materials around the world, initiatives like the Proliferation Security Initiative where we work

with countries all over the world to interdict cargos that could contain nuclear materials, for instance. That is why those are so important. You want to be able to deny them the ability to have the capability, and then if somehow they got it, you want them to think that they are not going to succeed.

Senator KING. You have a lot of smart people to think about these things, and I just hope that there is some real thought being given to how we deal with the current reality. I do not want our current deterrent to be Maginot Line of the 21st century that does not deal with existing threats.

I was recently in the Middle East and I think it was an Israeli who said the terrorists are always very clever and nimble, and we have to be the same, it seems to me.

I have taken my time.

Admiral, I share your concern about the industrial base. I think that is something we really need to spend some time on because it is not something that can just be turned off and on when we need it. You guys need to be thinking about how do we maintain the industrial base.

The final thing I am concerned about is cyber, and that is where the next likely attack is going to be. Are we fully secure in terms of the nuclear architecture and the communications and command? Because that is also a place where terrorists are going to be very clever.

Thank you very much for your testimony.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator King.

Senator Sessions.

Senator SESSIONS. Thank you.

I do not know if Senator Donnelly has a schedule problem. I am going to be here.

Senator DONNELLY. Go ahead.

Senator SESSIONS. Thank you.

I understand, Admiral Benedict, that as the years go by, we are projected to rely more on our sub-sea nuclear deterrent capability. I have heard the figures. Are you able to tell us what those trends are and what percentage of our response force would be submarine-based?

Admiral BENEDICT. Yes, sir. If you are referring to after implementation of the New START treaty, the submarine-based leg of the deterrent will encompass approximately—and there are various ways to count—but approximately 70 percent of the deployed warheads accountable to the United States.

Senator SESSIONS. Which is very important.

Now we have the new submarine moving forward, and we have had it delayed—2 years it has been pushed back?

Admiral BENEDICT. Yes, sir.

Senator SESSIONS. Can you tell us the progress, or lack of it, on that, and share with us any thoughts?

Admiral BENEDICT. Yes, sir.

The new *Ohio*-replacement submarine was delayed 2 years. That was done in the NDAA for Fiscal Year 2013 as a result of the Budget Control Act of 2011. That was delayed from 2019 to 2021.

Those reductions, while 2 years to the platform—the Navy made a decision that we would not delay by those 2 years the build of what is called the common missile compartment, as well as all the strategic weapons system material, that which I deliver for the mission. That decision was made specifically to support our ally, the United Kingdom, which we are supporting under the Polaris sales agreement, which I execute.

So the platform was delayed. The platform is pressurized. We have re-baselined the program to deliver the platform by the necessary dates in order to replace the *Ohio* submarine as it is retired from service. It is an aggressive schedule, but it is fully funded in the fiscal year 2015 presidential budget submission and it fully supports the needs of the Navy and, most importantly, Commander of U.S. Strategic Command (STRATCOM).

Senator SESSIONS. I should know but I am not sure to what extent I do, the President's budget in that regard exceeds the Ryan-Murray spending limits. Do you know?

The President is asking for another $115 billion over 4 to 5 years, and I do not know if you are counting that money, which has not been approved because it would require us to burst through the spending caps we just agreed to 10 weeks ago. It is not a little matter. But we do need to keep that program on track.

Ms. Bunn, thank you for sharing with us. Things happen that makes the hair stand up on the back of your neck, like the Russian invasion of Ukraine. Having been there 3 years ago, I just did not see that coming. I did not see the democratic revolution coming either. So things happen rapidly.

The Wall Street Journal reported last year that the former Chief of Staff of the Soviet Strategic Rocket Forces, General Yesin, was interviewed, and he said, all in all, China may have 850 warheads ready to launch and that, "other warheads are kept in storage and intended to be employed in an emergency."

Now, in this open session, is there anything you can comment about that? Which would be about half of what we are projected to go to under the New START—more than half.

Ms. BUNN. What I could say, Senator, is that when we did the NPR and when we did the follow-on analysis that led to the guidance that the President issued in June, we did take account of not just Russia but other countries as far as we could see, as far as we could project. In addition to that, if we are wrong about how we project, we have a hedge. We have a hedge capability with our platforms because of the number of platforms we have and the ability to upload those if we needed to, if the world situation surprised us.

Senator SESSIONS. I am just curious about the concept we keep hearing about, "bilateral," as if China does not exist on the planet. I am afraid it does, and apparently it has a growing nuclear arsenal.

Do you think we could be reaching a point where nuclear reduction should be done on a trilateral basis, if at all?

Ms. BUNN. The Chinese are modernizing their nuclear forces. We do not see them growing. They are modernizing fairly steadily and increasing some. At some point—at some point—we will need to include others in arms control negotiations. I do not think it is the

next step. If we could ever get another reduction with the Russians, there might be one more round there.

Senator SESSIONS. That is a concern.

General Harencak, where are you on the new bomber? Are you the one to ask about that? Maybe General Wilson. What percentage of those bombers—has a decision been made to configure it, or at least some of them, for nuclear weapons?

General HARENCAK. Yes, sir. Senator, the long-range strike bomber is on track. It is exceptionally well run where we are, and 2 years after its initial operating capability, it will be nuclear certified, sir.

Senator SESSIONS. So that decision——

General HARENCAK. That decision has been made. Yes, sir.

Senator SESSIONS. It would be a considerable improvement over the B–52?

General HARENCAK. Many, many orders of magnitude.

Senator SESSIONS. My time is up. Thank you, Mr. Chairman. I thank all of you for your work.

I sense that the administration and DOD is thinking more clearly about this area, and some of the spending priorities represent a step in the right direction. I am pleased about that.

Senator UDALL. Thank you, Senator Sessions.

Senator Donnelly.

Senator DONNELLY. Thank you, Mr. Chairman.

This would be for anybody who would like to take a swing at this, but I will start with Ms. Bunn. Do you believe there is enough funding to sustain the current nuclear triad with the modernization steps necessary?

Ms. BUNN. Senator, I think we have a good path that we are on for modernization, and while we have had a few slips because of budget concerns, we are on the path. I think the key question is, are we on the path to get where we need to be in the time we need to be there, and I believe the answer is yes.

Senator DONNELLY. I would like to ask this of Lieutenant General Wilson. Who do you think is the biggest threat to the U.S. nuclear arsenal?

General WILSON. I would say right now our arsenal has served us well. Deterrence has served us. The capabilities across the board have served us for the past 50 years, but all of them are aging from the bombers to the submarines to the missiles. So the threat is we need to modernize them. We just cannot afford not to modernize them. I think we are on a path to be able to do that.

Senator DONNELLY. Admiral, what is it that in this area keeps you up at night?

Admiral BENEDICT. Sir, taking off on what General Wilson said, the programs do need modernization, and to me, the thing that keeps me up at night is ensuring that I have an experienced, expertised workforce that can do that modernization. As you can see by the chart, the programs were built many years ago. While they have been in some form of modernization, it is not nearly the type of modernization, the extent of modernization that we are talking about here, recapitalization of the force and that is required in the future. Having that experienced workforce, both civilian, contractors, and military, is what keeps me awake at night, sir.

Senator DONNELLY. As a follow-up to that—and that would be to you or any of the others—what has happened with our workforce in the nuclear forces area? With the challenges we have seen, the problems we have seen, why do you think this has occurred?

Admiral BENEDICT. Sir, I will take the first stab at that. There are certain areas of technology that only this group at the table exercise, specifically things like reentry mechanics, reentry materials, strategic guidance, strategic propulsion, rad-hard electronics to the level that we require to perform in the system. You can talk about those. You can do experiments on those, but until you are actually designing systems, fielding systems, and then supporting systems, that is experience and expertise that you just do not get out of a textbook.

Senator DONNELLY. What I am trying to find out is some of the cheating scandal headlines we have seen, some of the other things. What has caused these in your best judgment?

General WILSON. Part of it may be we focused on the culture of perfection, and we know that human beings are not perfect. I guess what we will shift to is how do we make sure we have flawless execution in the field through teamwork, make sure that people understand that they are important and they are relevant.

Young soldiers, sailors, airmen, and marines—they read things in the paper, and there are lots of things being said about the nuclear enterprise. I keep coming back to 99.5 percent of our airmen are people we are real proud of. They get it. They understand the importance of our mission. Regardless of what we read in the paper, they are dedicated. They are professional. They have pride in their work. They understand the importance of their work. Some of them do not. We had a small number recently, as you mentioned, that did not live up to our core values of integrity. It was not a failure of the mission. It is a failure of a small number of individuals, and the vast majority, 99.5 percent of them, are ones we are real proud of.

Senator DONNELLY. General Harencak, I wanted to follow up on what Senator King was asking too, and that would be in regards to the non-state actors, the tramp steamer that is out in the Atlantic somewhere. As part of preventing this, are you part of that loop or is that left more towards other parts of DOD?

General HARENCAK. Senator, the short answer is, yes. We are part of this loop. Everything we do, every time we try to modernize a particular weapons system—many of them—these are old. These were science experiments, if you will, that are sitting there. Every time we reinvest in the knowledge of how to do certain things to our forces and to our platforms, we are all contributing together to help in nuclear detection, nuclear forensics, nuclear attribution, the intelligence. So all of us at this table and so many more of us are all part of this.

There is not one particular solution to that tramp steamer thing you talked about. So the answer is, everything we do contributes to across the spectrum of conflict, across all the threats trying to fill gaps and seams and protect against it.

Senator DONNELLY. Do the intelligence forces meet with all of you as to what should we be looking for, what are the things you

think might be next on the list? Are those ongoing communications?

General HARENCAK. Absolutely.

Senator DONNELLY. Admiral Benedict?

Admiral BENEDICT. Yes, sir. As part of my requirement, I am obligated to deliver once a year what is called a vulnerability assessment on each one of my locations, and that is us, SSP, in direct collaboration with the local Intelligence Community (IC), as well as the national IC, so that we are well-prepared to address any threats at each one of my locations.

Senator DONNELLY. Then I would just like to finally ask about cyber, and that is, how do you make sure that with all the cyber attacks that go on, with all the changes almost on an hourly basis in those areas that our system will work, God forbid, if ever needed, but that our system is ready to go?

Admiral BENEDICT. So, sir, we take a very layered approach to that to address that question. First and foremost, our systems which launch we do not permit to be attached to any type of the gig or the Internet or the larger system. They are standalone systems. So with that, we are very concerned about things like counterfeit parts or viruses being introduced. Again, there is a very layered approach from information assurance certification, which I am required to comply with, as well as Nuclear Weapons Standing Safety Group inspections every 5 years that look at entry points into the architecture. We are very concerned about cyber, and so again, through a very measured, layered approach, we try to minimize any entry points to the standalone systems which launch.

Senator DONNELLY. Thank you all for your service.

Thank you, Mr. Chairman.

Senator UDALL. Senator Vitter.

Senator VITTER. Thank you, Mr. Chairman. Thanks to all of you for your service and for your testimony today.

I want to back up, and I apologize if any of this ground has already been covered. But from the 40,000-foot level, if you will, when the Senate passed the New START treaty, there was a very clear set of discussions and agreement that that would be accompanied by major resources and modernization, and that was a very important prerequisite to a lot of folks in the Senate voting for the New START treaty. I voted against it, in part because I did not have confidence that that stuff would happen.

In fact, in terms of those resources and that modernization, are we not significantly behind what was promised in those discussions? I am not blaming any of you, but as a factual matter, are we not well behind that modernization schedule and that level of resources? Anybody.

Ms. BUNN. They are looking at me.

Senator VITTER. Yes. [Laughter.]

Ms. BUNN. Sir, the updated 1251 Report—there have been some slips in schedule since then. Most of those are due to budget constraints. But I think what we see is last year, this year, the prioritization of the nuclear mission in large part probably because of those commitments that were made then.

Senator VITTER. Are we not about 34 percent short of the dollar commitment over 5 years that was promised, a $4.1 billion commitment? We are not close to that? Am I missing something?

Ms. BUNN. The precise numbers I would have to get for the record, sir.

[The information referred to follows:]

In November 2010, the administration pledged to modernize U.S. nuclear forces and the U.S. nuclear enterprise, and to spend the funds necessary to achieve these objectives.

The administration remains committed to these programs, although mandatory cuts due to sequestration and spending caps have had an effect. Actual and proposed spending on the National Nuclear Security Administration (NNSA) weapons activity programs from fiscal year 2012 through fiscal year 2017 is approximately 3 percent less than what was outlined in the updated report pursuant to section 1251 of the National Defense Authorization Act (NDAA) for Fiscal Year 2010.

[In billions of dollars]

	Fiscal Year						Total
	2012	2013	2014	2015	2016	2017	
NNSA Weapons Activity Request	$7.6	$7.6	$7.8	$8.3	$8.8	$8.9	$49.0
Updated Report Pursuant to Section 1251 of the NDAA for Fiscal Year 2010	7.6	7.9	8.4	8.7	8.9	9.0	50.5
Difference	0	-0.3	-0.6	-0.4	-0.1	-0.1	-1.5

Despite fiscal constraints, the administration is fulfilling its pledge to modernize strategic delivery systems. Actual and proposed spending on Department of Defense platforms and weapons delivery systems for fiscal years 2012–2021 is approximately 10 percent less than what was stated in the updated report pursuant to section 1251 of the NDAA for Fiscal Year 2010. The funding shortfall is primarily the result of three programs: the *Ohio*-class nuclear ballistic submarine replacement project, the Trident II submarine-launched ballistic missile, and the Minuteman III intercontinental ballistic missile. The *Ohio*-class Replacement Project spending is lower than originally projected due to a better projection of expected costs and a 2-year program slip. The Trident II spending is lower than originally projected due to significant cost savings in the rocket motor procurement. The Minuteman III spending is lower due to cancellation of contracts for some support helicopters that the Air Force determined are no longer required, delaying the W87/Mk21 Air Force fuze to align more closely with the Navy's fuze modernization program, and deferring the W78/88–1 Life Extension Program outside the Future Years Defense Program. The remainder of the funding shortfall is the result of across the board reductions from the spending limitations implemented after the commitments were made.

Additional details will be provided in the report pursuant to section 1043 of the NDAA for Fiscal Year 2012.

Senator VITTER. I am being told that a large part of what I am describing is Department of Energy (DOE) funding, but that was certainly part of the discussion, part of the commitment. Are we not well short on that?

Ms. BUNN. Senator, the funding is not what we thought in the updated 1251 report. I understand that the National Nuclear Security Administration (NNSA) will be here to present their budget in a few weeks, and I would defer to them on those NNSA warhead issues.

Senator VITTER. Here is what I am trying to wrap my head around. New START was premised on that. We are not keeping those promises for whatever reason. Also, I think it is very fair to say our relationship and trust level with Russia has hit a recent all-time low, and yet we are talking about further nuclear reductions. Why? None of that seems to add up to further nuclear reductions in my mind.

Ms. BUNN. Senator, the President did, as a result of the big study that was done over 18 months, say that we could reduce our nuclear forces and still maintain a safe, effective, and reliable deterrent and assure allies, but that we would pursue negotiations with Russia. We have suggested that to the Russians. They are not particularly interested. They say that they are focused on implementing New START by February 2018, and so I do not foresee that happening anytime soon.

Senator VITTER. Again, just for the record, I want to express concern with the fact that the funding and the modernization that New START was premised on is not happening. So to me, that calls into question the New START reductions to begin with, and yet we are discussing, at least theoretically, further reductions. Again, for the record, I want to underscore the fact that clearly since the passage of New START and the ratification of New START, our relationship and trust level with the Russians has taken a nose dive. I just think all of that should add up to extreme caution about further nuclear reductions and further agreements with the Russians.

With regard to existing agreements with the Russians, are there ongoing concerns of their not keeping their end of the bargain in significant circumstances?

Ms. BUNN. Senator, with regard to New START, we have just finished one of the 3-week compliance groups, and while there are small issues, there are no big problems with New START implementation.

Senator VITTER. I was actually talking about preexisting obligations of the Russians prior to New START.

Ms. BUNN. Yes, sir. As I mentioned in my statement, we do have concerns about the INF Treaty compliance.

Senator VITTER. So there are real concerns there about compliance?

Ms. BUNN. Yes, sir.

Senator VITTER. Has there been any positive resolution or movement toward positive resolution on those in the last year, say?

Ms. BUNN. Our concerns have been raised with the Russians. We raised them a number of times with the Russians. Senior officials have. We were not satisfied with their response and we will continue to raise it.

Senator VITTER. Okay.

General Wilson, I wanted to ask you. There were several recommendations with regard to 8th Air Force and Global Strike and some have been implemented and some have not been implemented in terms of some of the organizational recommendations. Would implementing all of those organizational recommendations not be helpful in terms of having a more effective command through both 8th Air Force and Global Strike?

General WILSON. Senator Vitter, I am not aware of what specific organizational challenge that we have not implemented.

Senator VITTER. I will come back to that.

Another issue with regard to Global Strike is recertification of a second weapons storage area (WSA). Where does that stand and how comfortable are you without our having that second WSA?

General WILSON. Certainly having one of anything presents risk. What we are working on now is to come up with a comprehensive

WSA update. All of our WSAs are old. Our oldest is 52 years and the average is just over 38 years. So we are building a plan with an investment strategy to bring forward to recapitalize all the WSAs at our bases over a 15-year period, and we will be working on that to bring forward this next year.

Senator VITTER. Let me jump back quickly. I am out of time. But to my previous comment, I think the recommendation to remove all non-bomber-related missions from 8th Air Force and Global Strike was implemented, but the recommendation to assign all bombers to the 8th Air Force was not. Specifically, do you think implementing that recommendation would be helpful?

General WILSON. We have a terrific relationship with Air Combat Command which maintains the B–1. Our focus has been on the dual-capable bombers, on the B–2 and the B–52, making sure they can be safe, secure, and effective in their nuclear mission, as well as to do their conventional mission. We have a terrific relationship with Air Combat Command who maintains the B–1.

Senator VITTER. Why did the Schlesinger Commission recommend that reassignment, and do you disagree with that thinking?

General WILSON. I cannot specify why the Schlesinger Report recommended that. I think there is goodness in the way we have it today. Right now, the B–1s are over in the Middle East. They have been over there for the last 13 years. Our B–52s have been in the continuous bomber presence for the last 10 years in the Pacific. We have been focusing, quite frankly, on rebuilding and reenergizing the nuclear enterprise. So that has been our number one priority to make sure our dual-capable bombers are capable of doing their mission.

We also have that Global Strike capability. Today our B–52s have been in the Pacific, and the B–1s have been in the Middle East in the fight since 2001.

Senator VITTER. Okay. Thank you.

Senator UDALL. Thank you, Senator Vitter.

Senator Fischer.

Senator FISCHER. Thank you, Mr. Chairman. I thank the witnesses for being here today.

Secretary Bunn, last year, Secretary Creedon testified that the analysis of alternatives (AOA) to replace the Minuteman III ICBM would be completed in 2014. Can you tell me the status of that study, and do you think we are going to see a completion date on it this year?

Ms. BUNN. Senator, the study is on course, and I do anticipate we will see that study completed this year.

Senator FISCHER. Thank you.

General Harencak and General Wilson, I know that the study is going to probably cover this in detail, but can you discuss the risks and the benefits that we are looking at in extending the current system?

General HARENCAK. I can start, ma'am, and then I will turn it over to General Wilson.

The Minuteman III system dates to 1970. While we are doing an extraordinary job in keeping this weapons system, our plan is to

keep it to 2030, and that means we are going to have to sustain and modernize this.

Everything we do to sustain and modernize the current Minuteman III will be applicable to any possible follow-on. For example, if we decide we are going to modernize with the propulsion or the guidance system, we are starting, if you will, with the Ground-Based Strategic Deterrence (GBSD) studies to make sure that whatever we do will be applicable to whatever comes out.

I will say that keeping the Minuteman III past 2030 just increases our risks. It is already, as I said, a system that dates to 1970.

General Wilson.

General WILSON. I do not have much to add from General Harencak. Built in the 1970s, designed for 10 years. We are going to maintain it and sustain it through 2030. Everything General Harencak just talked about, whether it be guidance, propulsion, fuses, we are going to need to modernize over the years, and we are doing that.

We will also make sure we can transition each of those technologies into the GBSD follow-on, and as Ms. Bunn just mentioned, that AOA will be complete this June.

Senator FISCHER. You said we are on track to do that. So the modernization is taking place and it is meeting the recommendations that you folks have for it.

General WILSON. Yes, ma'am.

Senator FISCHER. Good.

Admiral Benedict, in your opening statement, you talked about how the submarines were the most survivable leg of the deterrent. What about all the technological innovations that we are seeing? Are you concerned that in the future something may come about where it will not be, and how would you address that then?

Admiral BENEDICT. Yes, ma'am. We are concerned about that. As we did the initial design and did the analysis on the replacement for the *Ohio*-class submarine, which is called the *Ohio*-replacement platform, our largest focus was on survivability and the stealth aspects of that platform. Scheduled to start construction in 2021, that class of boat will be deployed through the early 2080s. So we have worked very closely with the IC and the technology analysts. We are looking out and we are ensuring that we have the flexibility built into that platform to address what we know but, most importantly, to adjust for what may come in the future, ma'am.

Senator FISCHER. Do you factor in the costs of any adjustments that may happen in the future? I know when we do not even know what is going to be that innovation that is out there that could be a detriment to us, is there any way that you can factor that in?

Admiral BENEDICT. What we do factor in when we look at the lifecycle cost of the platform are those known upgrades, modernization periods to address the known knowns. It would be impossible to address the unknown unknowns, ma'am.

Senator FISCHER. Thank you.

General Harencak, I understand that the Air Force is evaluating their technical feasibility and keeping empty silos warm. Is that correct? To have that warm status on them?

General HARENCAK. Yes, ma'am.

Senator FISCHER. In the NDAA for Fiscal Year 2014, Congress expressed its preference for keeping them in a warm status. Can you talk a little bit about the benefits on why they should be kept in a warm status?

General HARENCAK. There are two main reasons, ma'am. The number one reason is the way the system was built, it was interconnected separate systems. If we remove missiles, we need to keep the silos in a warm status so we maintain the continuity between them and the communication aspect that was built for many good reasons back in the 1960s. So it is much easier. It is much less expensive for us to remove a missile and then keep the communication system and the actual tactical unit which is in groups of 50s together. There is a very real operational reason why we would not want to do it.

In other words, if we do not keep it warm, we would eliminate the silo. By eliminating the silo, it cuts the connection, and it requires us to spend a lot of money, a lot of effort to now recertify the weapons system and to reconnect those communications links.

The second reason is by allowing us to remove missiles and still keep them in a warm silo, it allows us to pick those silos that are worst performing, that have the most water intrusion, that have the most infrastructure problems with it. It also allows us to recapitalize and sustain our system with the ease of being able to put a missile into a warm silo, then work on the other silo.

So those two main reasons, ma'am.

Senator FISCHER. With that interconnectedness, you said that was less expensive to keep the silo warm and that was one of the reasons?

General HARENCAK. Absolutely, ma'am.

Senator FISCHER. So if we are going to see any decommissioning of these missiles, would it be your recommendation that the silos would be kept warm?

General HARENCAK. It would be my highest recommendation.

Senator FISCHER. I assume you know there are proposals out there that we need environmental studies done on the ICBM areas in order to have them decommissioned. In your opinion, do you think that is a wise use of our resources?

General HARENCAK. Ma'am, the U.S. Air Force believes that we should maintain the silos in a warm status. I will leave it at that.

Senator FISCHER. That is a military decision.

General HARENCAK. That is the belief of our Chief, Under Secretary, and mine that it is in the best interest of us to keep our silos in a warm status.

Senator FISCHER. Thank you, General. I appreciate it.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator Fischer.

Let me recognize myself at this time.

General Wilson, we had a nice visit earlier today. I want to turn to the cheating scandal. I do not want to get ahead of the ongoing investigation, but my understanding is the missile combat crews are required to achieve almost 100 percent score on their readiness exams in order to succeed in their careers. Is this the most effective method for evaluating the knowledge and readiness of these launch

officers? What alternatives to the exam model are you investigating?

General WILSON. Thank you, Senator.

We are investigating all kinds of different alternatives of how we both train, test, and evaluate. As I mentioned to you earlier today, I think 100 percent is an unrealistic standard. It is not the right way to go. We have experts across the field. Air Education and Training Command (AETC) is helping us. We have behavioral psychologists. We have a lot of folks looking at the problem as to what is, again, the best way to train, test, and then evaluate.

As I mentioned to you, I have recently, within the last few days, taken the out-brief from all the work we have going on. We have three main efforts today. We have a command-directed investigation that I ordered looking into this problem. We have what I call a force improvement program that we have modeled, quite frankly, off of Navy, work that they have done and taken their best practices, and what that is, is a grass roots effort to get to the people doing the job and understand those things that are inhibiting them from doing their job better. I took the first initial out-brief from the force improvement program on Monday. We are going to take those two efforts and we have another effort underway, again, with some scientists, as well as AETC to help us look through the problem set. We are going to roll all those up with surveys from the families, as well as the leadership, and to provide those recommendations back to the Secretary of Defense to meet his deadline here later in March.

Senator UDALL. Given the importance of your mission, we look with anticipation to what those studies and recommendations will be.

I understand upwards of 92 missile officers were implicated. That has meant you have had to bring in additional crews from elsewhere, and then you have had to increase the workload of existing crews. A couple of questions along that theme.

How long do you anticipate this to last? Has the readiness of the missile force suffered as a result?

I want to point out, as we all have, that the tireless, quiet professionalism of the vast majority of the men and women of our nuclear enterprise should not be damaged by the alleged actions of a few.

General WILSON. Yes, sir. Let me answer the second question first. The readiness has not suffered, to start with. What we have done is we have taken crews from Minot and F.E. Warren, and they have augmented the team at Malmstrom Air Force Base. We will shift the output coming out of the schoolhouse at Vandenberg Air Force Base, and we expect to be back up to full strength by late spring on the number of crews that we have available to do the mission.

As a side thing that came out of this, what we found is that the crews coming from both Minot and F.E. Warren to Malmstrom are learning a great deal, and so as we work the standardization amongst all the missile crews, we found that the folks are each learning from each other. We are taking this opportunity to make each of the teams better.

They are spending about a month from each of the bases at Malmstrom. Then they are going back and rotating crews. The crews are on the same work schedule. They are typically doing eight alerts a month, and nobody is exceeding that. We have not increased their workload. What we have done is we found out we were able to take best practices and best ideas at all the bases because all the bases are, quite frankly, now working at Malmstrom Air Force Base.

Senator UDALL. Admiral Benedict, could I turn to the discussion that you had in the Navy, I think about a year and a half ago, about the interoperable warhead (IW). It would combine the W78 with the W88. Do you still have the concerns that were expressed some 18 months ago?

Admiral BENEDICT. Sir, 18 months ago, we expressed concerns about doing the necessary technology work, commonly referred to within the domain space as 6.2, 62A, exploratory engineering analysis, as well as the costing of that. We expressed those concerns to the Nuclear Weapons Council (NWC). We were able to work through those concerns with both NWC, as well as DOE and NNSA. We were on a path to fully support—the Navy is—the IW effort.

In the President's budget just recently submitted, the IW project is delayed to a date no earlier than 2030, and so that effort will be suspended until such time as appropriate with lead time to support that date, sir. When that happens, we will fully support it.

Senator UDALL. I know General Wilson will understand the spirit of the question I am going to ask you and you will as well. The ICBM cheating scandals. Give me another Service's perspective. How do you test the readiness of your missile crews?

Admiral BENEDICT. The first thing that I would like to say is I truly appreciate General Wilson's and the Air Force's transparency in sharing with the Navy what they are learning and what they are doing. I would also like to assure you that as soon as we found out, we, the Navy, both myself, as well as Vice Admiral Connor, called General Wilson and other general officers in the Air Force and offered whatever assistance we could. So there is great transparency between the Navy and the Air Force as we work to support the Air Force in this.

From a Navy standpoint, one of the things that I have the fortunate opportunity to leverage off of is the nuclear power culture that exists on a submarine. That is an innate culture that is trained and instilled in every officer and enlisted individual who goes to sea on a submarine. The absolute high levels of standards and ethics that when reports are made and individual actions are assigned and reported as complete, that for the safety of the boat, for your individual safety, and the safety of your crew member, that those are taken as absolute.

We work off of five fundamental principles, and I think that is what we tried to share—Admiral Connor did—with General Wilson: procedural compliance, level of knowledge, questioning attitude, forceful backup, and formality. All of these, those five traits, give us a level and layered approach to ensure that while we are all human and capable of making mistakes, that we as a team are much stronger if we implement those five. So those are the things

that we are sharing with the Air Force, and fortunately the Air Force is sharing with us what they are learning. We will, I assure you, integrate their lessons learned into our training programs.

Senator UDALL. Secretary Bunn, I want to turn to you for my last question, but I did want to share with the committee—I guess we are a subcommittee, but we are proud of what we do—Senator King's comments earlier that from the early days, Senator King, DOE has been studying small nuclear devices. I am told that Albert Einstein, of all people, urged FDR to do the kind of research into so-called suitcase bombs. That work has proceeded apace in DOE. But your question about deterrence in the 21st century is a fundamental one and I hope this subcommittee can continue to consider it, study it, and discuss it. It is a challenging environment, as we know.

I mentioned, Madam Secretary, in my initial remarks my interest in your comments on the fact that we are breaking up the functions of the Global Strategic Affairs Office. You know the details of how that is going to operate. Do you think that having your office separated from other functional areas will make it easier or harder to perform your duties? I ask that in the context of the command of this hearing. There is a real focus on modernization, efficiency, safety, training.

Ms. BUNN. Senator, in this case, I do not think it will make much difference. I say that because there is some logic to having cyber, space, and nuclear missile defense together in an Assistant Secretary of Defense shop. There is also logic in having, where we are moving to, strategy, plans, and capabilities to having nuclear missile defense policy there as well. So no matter where my office sits on the organization chart, I will continue to work across policy with the relevant offices, cyber, space, plans, strategy, and the regional offices in Asia and Europe. We will continue to do that.

I think the important issue is senior attention, and with the Secretary—Senator Sessions mentioned earlier the Secretary's remarks on the importance of the nuclear mission with the nominees that we have for Deputy Secretary and Under Secretary, if they are confirmed, I think we will have that senior attention. That is what is important in the way my office operates.

Senator UDALL. Thank you for those insights. We will watch this with interest certainly on an ongoing basis.

I do not know if those are the bells for the series of votes to begin.

If I could turn to Senator Sessions for any other comments or questions he might have.

Senator SESSIONS. Briefly, Ms. Bunn, our understanding is that we could go back and modernize the triad over a period of years and keep the net cost of that in the modernization of the weapons at a level of around 5 percent of the defense budget. Is that consistent with what you understand?

Ms. BUNN. Senator, I hesitate to use a precise percentage because so much depends on what is counted and what assumptions are made. But I would say that it is a low digit, a low single digit percentage of the defense budget.

Senator SESSIONS. I think that is important to us because we need a healthy triad and healthy nuclear deterrent. As DOD wres-

tles with its priorities, I think they are going to have to put some of this in there.

The NWC is something I have felt good about. I have been openly questioning DOE. They are out there. They get a bunch of money and they get to do it on their own time. But I think our NWC is an effective way to begin to make sure that what they do is what DOD needs and not a dime more is spent than necessary.

Do you participate with that, and do you think it could be strengthened? Are there any changes needed to it?

Ms. BUNN. Senator, I participate at the next level down from the NWC. That is at the Under Secretary level, and I am a layer below. But I do participate in the group that supports our principals. I think you are right that the NWC has been very active in making sure that what DOD needs, what our needs are, and what NNSA puts forth are closely synchronized. DOD has also given a lot of attention to cost estimation and program management and those kinds of issues and even volunteered some assistance of the DOD Office of Cost Analysis and Program Evaluation (CAPE) in past years looking at some of the facility modernization at NNSA.

Senator SESSIONS. I hope that will continue. They have to participate with intensity in this effort.

I do not want to overstate my happiness about where we are financially and the way the programs are going. I think we have seen a more healthy approach in the last year, and I compliment DOD. But the ballistic missile submarine has been delayed 2 years, at least, as you have told us. The air launched cruise missile has been delayed 2 years or more. Right?

Ms. BUNN. One to 3 years. The budget reflects 3 years, but we will try to buy back as much of that as possible.

Senator SESSIONS. The follow-on ICBM. We do not have a decision on that yet to go forward. Right?

Ms. BUNN. Correct.

Senator SESSIONS. So that is still in limbo.

The B–51 LEP was delayed 2½ years, maybe more?

Ms. BUNN. Sir, since fiscal year 2014, there has been about a 6-month slip in the B–61–12.

Senator SESSIONS. I think that is it. I just think maybe I go back a little further. We previously projected it and then we extended it some more.

Ms. BUNN. Yes, sir.

Senator SESSIONS. I think it is now over 2½ years.

So we talked about the W–78/88 IW. That has been delayed considerably. Maybe up to 5 years now instead of 2. It was 2 years.

Then the plutonium handling facility is deferred at least 5 years, Admiral Benedict or Ms. Bunn?

Ms. BUNN. Yes, sir. The NWC has gone back to look at how to modernize what we need in a more modular——

Senator SESSIONS. I support a more frugal approach. I will give you an A, but it is delaying things.

The uranium processing facility is delayed 4 years, I understand, and DOE weapons activities are $2 billion short of New START commitments over the last 5 years.

In this place, words do not mean much. The QDR does not mean much. It is whether the money is getting out and whether the projects are getting completed.

Senator UDALL. I am still trying to get an A from Senator Sessions. [Laughter.]

Senator King, I think, had another comment or a question. We have a few more minutes before we have to head to the floor.

Senator KING. Ms. Bunn, I just wanted to tell you a story. You mentioned how the council was one level above you. 40 years ago, I worked as a staff member in this place, and one of my jobs was to set up hearings. I once called the Office of Management and Budget to get a witness for a particular hearing, and they gave me this title of Deputy Under Secretary or something, and I said, well, I do not really understand these titles. Can you tell me who this person is? The fellow on the other end of the line gave me an answer, which if I ever write a book about Washington, will be the title of my book. He said, he is at the highest level where they still know anything. [Laughter.]

What bothers me is that I know that I am now above that level. [Laughter.]

But I just wanted to try to make you feel better. You are around in that vicinity.

Thank you very much.

Ms. BUNN. Thank you, Senator.

Senator UDALL. Senator Fischer?

Senator FISCHER. If I can just have a short answer from the panel here. We hear about the importance of uploading the weapons, and I would just like to hear from you folks how important you believe it is to retain that ability if we are in a crisis scenario and where we have missiles stacked over here and a couple submarines over here, and if it is a crisis, how are we going to get it all done in time and if it is going to work. A long question but just give me your thoughts. Ms. Bunn?

Ms. BUNN. It is very important to maintain a hedge. The more surprised you are the longer time you have to bring it back.

Senator FISCHER. Is uploading vital in a crisis situation? If so, how can we better prepare for it? Besides intelligence, physically how are we going to prepare for it?

Ms. BUNN. There are two reasons that one might want to upload. One, if there were a technical failure in some of our systems or warheads and you needed to compensate for that; and two, if there were a geostrategic surprise. In other words, your projections—you got it wrong. That kind of surprise—you have probably a longer ramp-up time and you have longer to do it. I guess I would say, we believe that we have sufficient forces operationally deployed now to deal with short-term crises.

Senator FISCHER. General?

General WILSON. Senator, I would say that today we have 450 ICBMs out in the field. That is the bedrock of our strategic stability. We do not need to upload those.

For our bombers, certainly if we were loading weapons, that sends a very visible signal to any adversary. So it is a deter-and-assure piece for the bombers.

Senator FISCHER. But if we have these extra warheads at DOE facilities, you believe you would have enough time, as the Secretary said, to be able to move them to the silos. If all hell breaks loose, if we are going to have everything happen, you could still, hopefully, have the opportunity to upload more? No?

General WILSON. We do not plan to upload our silos. We are going to use them once, if we ever use them.

Senator FISCHER. Thank you.

Admiral BENEDICT. Yes, ma'am. We keep our weapons in a position where we would be able to upload and we routinely test to assure ourselves that the performance of the system in an uploaded position is measurable.

Senator UDALL. I want to thank the panel. I want to thank all the Senators who participated.

We will keep the record open for 3 days, through the end of the week.

I certainly had a number of questions. General Harencak, I did not get to the question I had for you, and five or six other questions, and for the rest of the panel, I had some as well. I didn't get them all answered this morning, so I might submit them for the record. Thank you for being here today.

The hearing is adjourned.

[Whereupon, at 4:07 p.m., the subcommittee adjourned.]

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR DAVID VITTER

GLOBAL STRIKE COMMAND

1. Senator VITTER. General Wilson, the U.S. National Intelligence Council report from December 2012 notes that in addition to "Russia pursuing new concepts and capabilities for nuclear weapons . . . other nuclear powers, such as Pakistan and potential aspirants Iran and North Korea, desire nuclear weapons as compensation for other security weaknesses." Do you believe these are of concern and add to the value of Global Strike Command and are they examples of why this command should be expanded and strengthened despite the pressures to downsize the Department of Defense (DOD)?

General WILSON. Absolutely, these developments are a concern. They certainly reinforce the importance of having and maintaining a robust and credible nuclear deterrent led by a command with a primary focus on stewardship of these capabilities. I believe our post-New Strategic Arms Reduction Treaty (START) force structure is sufficient to deter our adversaries while assuring our allies. Air Force Global Strike Command (AFGSC), and the entire DOD, face a significant challenge as we balance national priorities and fiscal realities. We continue to look through the strategic lens and balance risk as we systematically prioritize threats. Although we account for less than 1 percent of the DOD budget, AFGSC nuclear forces represent two-thirds of the Nation's nuclear triad and provide the ultimate guarantee of national sovereignty. Furthermore, our forces continue to provide overwhelming conventional power to joint commanders around the world. As a core element of our national defense, we must continue to fully resource our strategic capabilities.

WEAPONS STORAGE AREA

2. Senator VITTER. Major General Harencak and General Wilson, in February 2011, then Air Force Chief of Staff General Norton A. Schwartz, USAF, told Congress that the Air Force could not afford to recertify a second weapons storage area (WSA) to house the Nation's air-launched cruise missiles despite a September 2008 Nuclear Weapons Management concluding that "the closure of the WSA at one of the bomber bases was a significant mistake with a negative operational impact," and that the closure left our B–52 bomber force vulnerable to attack. Last year, this committee added language encouraging the Secretary of the Air Force to reexamine

plans, including requirements and costs, for reconstituting a second nuclear WSA for nuclear-armed air-launched cruise missiles. This direction noted the potential to consolidate the old WSA's existing security perimeter and the installation of modern detection and denial systems which could reduce security personnel requirements and result in significant cost savings from original estimates. What is your opinion regarding the amount of risk the Nation is assuming by only having one WSA for the entire inventory of these weapons?

General HARENCAK. Air Force WSAs currently meet U.S. Strategic Command operational requirements and provide for the safe, secure, and effective storage of our nuclear weapons. As part of a comprehensive WSA recapitalization initiative, AFGSC and the Air Force Nuclear Weapons Center (AFNWC) are currently assessing infrastructure conditions at all five operational AFGSC bases—F.E. Warren Air Force Base (AFB), Minot AFB, Malmstrom AFB, Whiteman AFB, and Barksdale AFB—in order to develop an investment strategy.

Prior to the finalization of the WSA investment strategy, the Air Force must validate requirements and assess the costs of sustaining existing facilities relative to the costs of new construction. Our goal is to have a finalized and approved implementation plan that could support projects beginning in fiscal year 2016. In February 2014, the Air Force provided a report to the defense committees on this matter pursuant to the National Defense Authorization Act (NDAA) for Fiscal Year 2014.

General WILSON. The air launch cruise missile capability is a critically important piece of the Nation's nuclear triad, and certainly having one of anything presents risks. A single location simplifies enemy action and adds mission vulnerability during inclement weather, natural disaster, major accident, and periodic maintenance scenarios. All of our WSAs are aged, the oldest being 52 years with the average just over 38 years. We have an investment plan to recapitalize our WSAs at our bomber and missile wings over a 15+ year period, and we are working to bring that forward in the fiscal year 2016 program.

3. Senator VITTER. General Wilson, have you examined new technology when it comes to a WSA recertification and ways to harness such technology to reduce the number of security personnel, which I am to believe is the largest incurred cost to operate a WSA?

General WILSON. The command has been deeply involved in the planning of the new WSAs. The new WSAs are being designed to maximize security capabilities and take advantage of key technologies. In coordination with our partners, we will ensure the facility is in compliance with all DOD nuclear security standards, and is manned with the right-sized security force.

DOE PARTNERING

4. Senator VITTER. General Harencak, regarding the Quadrennial Defense Review (QDR), there are a number of references to the United States maintaining a safe, secure, and effective nuclear force. The QDR also states that DOD will collaborate with the Department of Energy (DOE) when it comes to nuclear weapons and supporting infrastructure. DOE brings a tremendous amount of capability to the table when it comes to the design of our nuclear infrastructure. Has the Air Force ever collaborated with DOE on the design of a modern, more cost-effective WSA, using technology to reduce the security personnel requirement?

General WILSON. The Air Force continues to benefit from its multi-decade strong partnership with DOE on nuclear weapons-related programs. Recently, we have relied on DOE's technical expertise to support the design of modern, more cost-effective WSAs. Additionally, we are leveraging best-practices and lessons-learned from other mission partners—the U.S. Navy for instance—in order to optimize the investments we have planned in our nuclear WSAs.

Personnel and technology are but two elements of a multi-dimensional security construct the Air Force relies on to protect nuclear weapons. While future WSA designs will incorporate advanced technology, technology itself does not necessarily reduce the requirement for security forces. The Air Force remains open to exploring innovative, cost-effective solutions that enhance the safety, security, and reliability of our WSAs.

5. Senator VITTER. General Harencak, could DOE help you solve the recertification issue for a second WSA?

General HARENCAK. The Air Force and DOE work together frequently on solutions within the Nuclear Enterprise, however, the AFNWC is responsible for the design

and certification of Air Force nuclear WSAs. DOE does not conduct facility certifications. The AFNWC oversees all Air Force nuclear facility certifications in accordance with DOE and DOD guidelines, and works closely with DOE to support facility projects and certifications.

The question of certifying a second WSA for air launched cruise missiles is under consideration as part of a broader Air Force WSA investment initiative. In February 2014, the Air Force provided a report to the defense committees on this matter pursuant to the NDAA for Fiscal Year 2014.

THREATS ABROAD

6. Senator VITTER. Ms. Bunn, the recently released QDR states, "our nuclear deterrent is the ultimate protection against a nuclear attack on the United States and through extended deterrence, it also serves to reassure our distant allies of their security against regional aggression" and that in a new round of negotiations with Russia, "the United States would be prepared to reduce ceilings on deployed strategic warheads by as much as one-third below New START levels." Today, Russian troops are on the march in Crimea, with no clear idea of their ultimate intentions. Ukraine and our NATO allies are dealing with Russian regional aggression today. Considering these threats to our allies and Russia's clear advantage in tactical nuclear weapons, is this an appropriate time to negotiate a further, significant reduction in our nuclear inventory?

Ms. BUNN. The QDR, reiterating the findings of the Nuclear Posture Review follow-on analysis, and the President's nuclear employment guidance from June 2013, reflect the administration's determination that we can ensure the security of the United States and its allies and partners, and maintain a strong and credible strategic deterrent, while reducing our deployed strategic nuclear weapons by up to one-third. Administration officials have since been clear that any future reductions would not be unilateral, but part of further negotiated cuts with Russia. We will not enter into any agreement with Russia that is not in the national security interests of the United States. However, Russia, by its words and deeds, has demonstrated no interest in negotiating further reductions.

7. Senator VITTER. Ms. Bunn, in your opinion, is Russia the type of partner we can trust to work with?

Ms. BUNN. In light of recent events in Crimea, the administration continues to review its policy toward the Russian Federation. However, we continue to work with Russia under the framework of a number of agreements that remain in force, some bilateral and some multilateral. We honor our commitments under these agreements, and we expect Russia to hold to its obligations as well.

8. Senator VITTER. Ms. Bunn, the QDR followed up on a June 19, 2013, speech by President Obama, stating that in further negotiations with Russia, "the United States would be prepared to reduce ceilings on deployed strategic warheads by as much as one-third below New START levels." Given recent issues with Russia, do you believe this is a wise decision?

Ms. BUNN. In the course of developing the current nuclear employment guidance, the administration determined that we can ensure the security of the United States and its allies and partners, and maintain a strong and credible strategic deterrent, while reducing our deployed strategic nuclear weapons by up to one-third. The foundation of this posture is protecting the national security interests of the United States. Regarding further reductions, administration officials have since been clear that such reductions would not be unilateral, but be made after further negotiated cuts with Russia. However, Russia has so far shown no interest in negotiating further reductions, nor is the current climate conducive to such negotiations.

DEPARTMENT OF DEFENSE AUTHORIZATION OF APPROPRIATIONS FOR FISCAL YEAR 2015 AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, MARCH 12, 2014

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

MILITARY SPACE PROGRAMS

The subcommittee met, pursuant to notice, at 3:07 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, and Sessions.

OPENING STATEMENT OF SENATOR MARK UDALL, CHAIRMAN

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

I want to thank our witnesses for your patience. I know Senator Sessions will be here shortly. I would like to deliver my opening statement, and then when Senator Sessions arrives, I know he will have some remarks as well.

This afternoon, we will receive testimony regarding the Department of Defense (DOD) military space programs for fiscal year 2015.

As I said, I want to thank all of you for taking your valuable time to be here today.

On February 11, Director of National Intelligence (DNI), James R. Clapper, testified to the full committee that "threats to U.S. space services will increase during 2014 and beyond, as potential adversaries pursue disruptive and destructive counter-space capabilities. Chinese and Russian military leaders understand the unique information advantages afforded by space systems and are developing capabilities to disrupt the United States' use of space in a conflict."

I do not have to tell the witnesses that Director Clapper's statement illustrates how our policy is just now beginning to catch up with the threat and that our operational plans are just now starting to synchronize with the policy and material requirements flowing from the operational plans. Given these rapidly changing

threats to our space-based assets and the need to examine these issues at the ground floor, this hearing is timely.

General Shelton, good to see you again. I want to just say your command, as I know you know, is squarely in the middle of this vortex of events. I hope to hear more from you in this unclassified forum regarding what we are doing to protect space assets from these threats, not only now, but over the next 15 years. I know that we are discussing plans to move away from larger satellites and toward smaller hosted payloads. But it is my understanding that we know little about the cost and benefit in comparison to existing satellites where we have perfected the engineering and are now at a point where we can procure them at a fixed price, allowing for incremental improvements.

General Mann, congratulations on becoming the commanding officer of the Space and Missile Defense Command (SMDC). Your operations are located both in Colorado and Alabama which, of course, makes your command all the more relevant to Senator Sessions and myself. I understand your command is in charge of Kwajalein Atoll, which is one of the most important ground assets we have, not only for space tracking, but for missile testing. I am interested in hearing more about your long-term plans for Kwajalein and how your command supports U.S. Strategic Command (STRATCOM) for space situational awareness. Unlike military sites in my State of Colorado, Kwajalein Atoll does not have an elected Member of Congress to advocate for them and their needs. I hope to make this subcommittee their advocate.

Mr. Loverro, you were with us last year. Welcome back. It is your job to develop the necessary policies to support DOD's space operations. I hope to hear how these policies are changing in light of the threat we face, combined with the fiscal constraints we are under for the foreseeable future. I would also like to know how you are working with STRATCOM to turn those policies into effective operational plans.

Dr. Zangardi, you are a veteran in appearing before this subcommittee. Welcome back. The Navy is fielding the Mobile User Objective Satellite (MUOS) system which will allow cell phone-like satellite service worldwide to DOD personnel. It is my understanding that the Navy recently had a setback with satellite number 3 and has had to switch it with another satellite. I would like to know the status of the system and how the Navy is developing its ground system to support the MUOS constellation.

Finally, we saved the best for last, Ms. Chaplain. You are our Government Accountability Office (GAO) expert on DOD space systems. Your reports are the bedrock for helping our subcommittee perform its oversight duties. I would like to hear about your recent findings on new entrants to the DOD launch market and your recent work on the Family of Advanced Beyond-Line-of-Sight Terminals, including its cost overruns, and restructuring the acquisition program to only support command post terminals.

I would also like to note I have some real concerns that the Air Force has decided to spend hundreds of millions of dollars over the Future Years Defense Program on developing an all-new helicopter at the same time they are accepting higher costs and increased risks for overhead architecture. They could save a huge amount of

money by purchasing existing aircraft and investing the savings in improved space situational awareness (SSA) and smarter acquisition practices that would bring down the cost per copy of essential satellite programs like Global Positioning Satellite (GPS)–3.

Now, my remarks here say I am going to turn to Senator Sessions for his opening statement and then move to the witnesses, but I think we could start without Senator Sessions, and when he arrives, we will make some time for him.

I would like to end the hearing, if at all possible, at 4:30 p.m. We will shoot for that. We have five witnesses. I think we could make that a possibility.

Senator Sessions is arriving, so let me just finish saying I think I am going to ask my colleagues if 7-minute rounds are acceptable. If Senator Sessions would like to make an opening statement, I would like to recognize him now.

STATEMENT OF SENATOR JEFF SESSIONS

Senator SESSIONS. Thank you. We thank all of you for being here and look forward to working with you as part of this subcommittee. We have a lot of important issues before us, and we depend on you and your integrity and good judgment to help us make the right decisions.

General Mann, it is good to see you. We are proud of your new command, and good luck.

General Shelton, this will be your last hearing, maybe? We appreciate your service too and all you have done.

We are looking at the budgets for DOD. I believe that Secretary Hagel will be forced to make some tough decisions. I think all of the things that he has listed in his reductions will not occur. I do not think, under the Budget Control Act, they will have to be cut that much, which is good news. But we need to determine pretty soon what will end up having to be reduced and how we will handle that. As the ranking member on the Senate Budget Committee, Mr. Chairman, it is just a very tough time for us, but I believe if we are smart, we will be able to work through this without having these programs that we have invested so much in for so long be damaged.

Thank you all.

I will submit my full statement for the record.

[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 David Mann, the Commander of the Army Space and Missile Defense Command in Huntsville. This is General Mann's first hearing before this subcommittee and I look forward to working with him on the many important issues facing Army Space and Missile Defense Command. This will also likely be General Shelton's last hearing before this subcommittee and I would like to congratulate him on his distinguished career and thank him for his service. We have many witnesses, so in the interest of time, I will keep my opening remarks brief.

The purpose of today's hearing is to discuss the fiscal year 2015 military space budget. The impacts of sequestration on the defense budget are far reaching, yet the President's budget makes no serious attempt at addressing the debt-related issues that got us here in the first place. This budget demonstrates a failure in presidential leadership that undermines our national security. In the case of today's hearing, this lack of presidential leadership jeopardizes the strategic advantages we

have enjoyed in space for much of the last 6 decades. Our hearing today is an opportunity to hear from our witnesses how they plan to limit that risk.

The acquisition of critical space capabilities has become a zero-sum-game where program delays and cost overruns will lead to cancellations. No longer can we tolerate the multi-billion dollar cost overruns of the past 2 decades. No longer can we afford program risk, which this budget clearly demonstrates through its lack of new on-orbit capabilities and limited research and development efforts. Adversaries like China and Russia are rapidly positioning themselves to overtake American dominance in the space domain and I am concerned what falling behind could mean for our national security.

Over the last year considerable advances in space denial capabilities have been demonstrated by China. According to an unclassified November 2013 U.S.-China Economic and Security Review Commission report, recent Chinese attempts to disguise what data suggests to be a new high-altitude anti-satellite capability is a cause for serious concern. I am troubled by these developments and look forward to understanding your strategy for countering and deterring China's offensive space efforts. I also look forward to better understanding whether such developments are leading the administration to rethink its own counter space strategy, which I have criticized in the past as being deficient. Increased Space Situational Awareness and unproven and potentially costly new distributed architectures alone will not provide the level of deterrence necessary to reverse these troubling trends.

In closing, I would like to congratulate the Air Force for the significant cost savings it was able to achieve for the Evolved Expendable Launch Vehicle program. It is quite rare these days to see good acquisition news and I was pleasantly surprised to learn that the Air Force has achieved some $4.4 billion in total program savings since the fiscal year 2012 budget. I urge the Air Force to continue to take all steps necessary to continue to reduce costs in both launch and space vehicle acquisitions and to reinvest those savings in the development of our future space capabilities.

Mr. Chairman, I thank you for holding this hearing and look forward to working with you to address the many challenges we are going to face this budget cycle.

Senator UDALL. Thank you, Senator Sessions.

I want to start with Mr. Loverro and work across the panel. I think if you all could keep your remarks from 3 to 5 minutes, any additional comments you have, of course, we can include in the record. That will give us time for a robust round of questions and interaction with the members of the subcommittee. Mr. Loverro?

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

Mr. LOVERRO. Yes, sir.

Chairman Udall, Ranking Member Sessions, members of the subcommittee, I am pleased to join General Shelton, Lieutenant General Mann, Dr. Zangardi, and Ms. Chaplain to testify on DOD space programs and policies. I first testified in front of Congress on these topics about 1 year ago and I welcome the opportunity to continue that discussion today.

As I stated last year, space remains and will continue to remain vital to our national security. It underpins DOD capabilities worldwide at every level of engagement, from humanitarian assistance to the highest levels of combat. It enables U.S. operations to be executed with precision on a global basis with reduced resources, fewer deployed troops, lower casualties, and decreased collateral damage. Space empowers both our forces and those of our allies to win faster and to bring more of our warfighters home safely. It is a key to U.S. power projection, providing a strong deterrent to our potential adversaries and a source of confidence to our allies.

But the evolving strategic environment increasingly challenges U.S. space advantages. Space is no longer the sole province of world powers. It is a frontier that is now open to all. In the last several decades, space has become more competitive, congested,

and contested. Those terms, the so-called three Cs, have been used extensively, and I believe it serves us well to put them in perspective.

On the first C, as an American, I welcome the competitive aspect of today's space environment. I am highly confident that with the right policies, the United States is well-positioned to remain ahead in that environment. The changes you authorized 2 years ago on export control reform and the changes the National Aeronautics and Space Administration (NASA) and DOD have embraced on commercial launch are just two of the many right steps we are taking. I am not worried about the competitive nature of space.

On the second C, congestion, I am not quite so welcoming, but I am optimistic. Congestion and debris in space is a real issue and it threatens to put our use of space at risk. But the policies and programs of the United States, programs like the Air Force's Space Fence, are aimed at reducing that risk. Likewise, the work we and the Department of State are doing internationally and at the United Nations to set rules of the road for outer space, as well as the SSA sharing work that STRATCOM is leading, are aimed at bringing a similar focus on this issue to the community of space-faring nations. I am somewhat confident that we are on the right course to deal with congestion.

But what worries me the most is the last C, the contested nature of space, which we now face. Over the last 15 years, other nations have watched us closely and have recognized that if they are to challenge the United States, they must challenge us in space, and they are endeavoring to do so. The United States has successfully addressed such challenges before in air, sea, and land domains, and now we must likewise respond in space. We do so against a backdrop of a decreasing budget that challenges both the ability and the speed with which we can act, but in no way diminishes the importance of successfully sustaining the crucial advantages that space provides.

Our strategic approach for these issues remains consistent with what we outlined in the 2011 National Security Space Strategy and reaffirmed in DOD Space Policy in 2012. In the written testimony I have submitted to the subcommittee, I have outlined the five key elements of this strategic approach: promoting the responsible, peaceful, and safe use of space; enhancing the resilience of DOD space architectures; partnering with like-minded international organizations and commercial firms; deterring aggression; and defeating attacks and preparing to operate in a degraded environment. My testimony also describes specific steps we are taking to implement our approach in each of these areas.

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

[The prepared statement of Mr. Loverro follows:]

PREPARED STATEMENT BY MR. DOUGLAS L. LOVERRO

INTRODUCTION

Chairman Udall, Ranking Member Sessions, and members of the subcommittee, I am pleased to join General Shelton, Lieutenant General Mann, Dr. Zangardi, and Ms. Chaplain to testify on Department of Defense (DOD) space programs and policies. I first testified in front of Congress on these topics 1 year ago, and I welcome the opportunity to continue that discussion today.

As I stated last year, space remains vital to our national security. It underpins DOD capabilities worldwide at every level of engagement, from humanitarian assistance to the highest levels of combat. It enables U.S. operations to be executed with precision on a global basis with reduced resources, fewer deployed troops, lower casualties, and decreased collateral damage. Space empowers both our forces, and those of our allies, to win faster and to bring more of our warfighters home safely. It is a key to U.S. power projection, providing a strong deterrent to our potential adversaries and a source of confidence to our friends.

But the evolving strategic environment increasingly challenges U.S. space advantages. Space is no longer the sole province of world powers—it is a frontier that is now open to all. In the last several decades, space has become more competitive, congested, and contested. I am confident that with the right policies, the United States is well-positioned to remain ahead in the competitive environment. I am equally confident that we are on course to deal with congestion. But what worries me the most is the contested environment we now face. Over the last 15 years, our adversaries have watched us closely and have recognized that if they are to challenge the United States, they must challenge us in space.

The United States has successfully addressed such challenges before in air, sea, and land domains, and now we must likewise respond in space. We do so against the backdrop of a decreasing budget that challenges both the ability and speed with which we can act, but that in no way diminishes the importance of successfully sustaining our crucial advantages in space.

Our strategic approach remains consistent with what we outlined in the 2011 National Security Space Strategy and reaffirmed in DOD Directive 3100.10, the DOD Space Policy, released in late 2012. In my testimony today, I will outline the five key elements of this strategic approach and describe specific steps we are taking to implement our approach.

PROMOTING THE RESPONSIBLE, PEACEFUL, AND SAFE USE OF SPACE

As still the world's leading space power, the United States is uniquely positioned to define and promote the responsible, peaceful, and safe use of space. We need to do this to ensure that we can continue to reap the military benefits that space provides and, more importantly, the civil, scientific, and economic opportunities it presents. Space is woven into the fabric of modern economies and the United States, beyond all others, has led the way in using that to our national advantage. We are taking steps to make sure that access to and use of space is not threatened by irresponsible actions. DOD is working closely with the Department of State to establish an International Code of Conduct and other "rules of the road" for the safe and sustainable use of space. Those rules include common sense standards for debris limitation, launch notification, on-orbit monitoring, and collision avoidance. The United States already follows these practices and, by encouraging their adoption by others, could help ensure that space remains sustainable for the future.

I know there are some who question the wisdom of these multilateral activities. They are worried that in establishing international norms of behavior we would limit our response options. Let me assure you, we do not intend to allow that to happen. We have worked side-by-side with the Joint Staff, combatant commands, Military Services, Defense agencies, and Intelligence Community to make sure that any agreement we develop enhances security and does not threaten current or future U.S. capabilities.

I am not so naíve as to believe that a simple set of rules will solve all of the major issues we face—they will not; nor would I expect that they will inhibit those who would try to threaten our use of space. But common sense rules that can be embraced by a majority of space-faring nations will help stem the rise of uncontrollable debris, add demonstratively to spaceflight safety, and clearly differentiate those who use space responsibly from those who do not.

Our efforts here go beyond mere words—they are backed by actions. As I have discussed before, a key aspect of improving spaceflight safety, and assuring we can monitor the space environment more closely, is our space situational awareness (SSA) capabilities. We have been working on this for some time, and I am happy to report that we have made some real progress over the last year. That progress comes in two forms—new sensors and information sharing agreements.

On the sensor front, we have remained on a constant path for the last several years to reposition sensors where they can do the most good and to invest in new sensors where needed. Last year we reported that we had entered into an agreement with Australia to relocate and repurpose a launch tracking radar, the C-Band radar, from Antigua to western Australia to aid in our ability to monitor activities at low altitude in the southern hemisphere. That work is now underway. We com-

plemented that effort with a second agreement signed with Australia this past November to relocate the Defense Advanced Research Projects Agency-developed Space Surveillance Telescope to western Australia to give us an unmatched ability to track deep space objects in that critical region of the world. Additionally, after years of focused effort, and a sequestration-imposed 6-month delay, we will soon award the contract for the first Space Fence site. The Space Fence will provide an unprecedented ability to track an order-of-magnitude greater number of objects in low earth orbit, supporting long-term spaceflight safety.

The Department has also made great strides in more transparently sharing SSA information with other space operators. Over the past year, U.S. Strategic Command (STRATCOM) has continued to pursue SSA sharing agreements with commercial companies and foreign governments, consistent with existing legislative authority. This year, STRATCOM signed 5 agreements with other governments—Australia, Japan, Italy, Canada, and France—and increased to 41 our agreements with commercial satellite operators. Many more agreements are in varying stages of negotiation. We are committed to providing SSA services to enhance spaceflight safety for all.

While the purpose of these agreements is to allow us to share more advanced space flight safety products with other space-faring nations, they really serve to lay the groundwork for the next stage of effort—two-way data sharing. The space environment is too big and too complex for a single nation to bear the entire cost of monitoring it. Cost-effective SSA requires cooperation among space actors. The increasingly congested space environment means that an unparalleled level of information sharing is needed to promote safe and responsible operations in space and to reduce the likelihood of mishaps, misperceptions, and mistrust. We are currently engaged in detailed technical discussions with several nations that have space situational awareness capabilities to explore opportunities for two-way information exchange. This type of sharing will increase SSA information available to the United States while limiting unnecessary duplication of SSA capabilities. In short, we save money and improve safety for us and our allies.

IMPROVING DOD SPACE CAPABILITIES

Improved SSA is but one facet of the next pillar of our strategy—improving our own space capabilities. This element boils down to a single refrain—make DOD space systems and architectures more resilient. Yes, we need to continue to improve how space systems operate, the services they provide, and the capabilities they create; yes, we need to make space systems less expensive; but above all others, we have to focus on making those capabilities more resilient. The most capable and cost-effective space capability in the world is of little use if it is not there when the warfighter needs it. If we are to overcome the challenges posed by others, resilience is job one.

We have been talking about resilience for some time, but often I am unsure if we have clearly defined what we mean. In fact, I am sure we have confused several audiences. Before I describe specific investments in resilient space architectures, allow me to explain the concept.

Resilience, in fact, is not an end in and of itself; rather we seek to assure the mission benefit that our capabilities provide—omnipresent positioning from the Global Positioning System (GPS), global surveillance from overhead intelligence, surveillance, and reconnaissance (ISR), and worldwide information availability from Satellite Communications (SATCOM). As we see it, that assurance can be achieved through a combination of: (1) strengthened or resilient space architectures; (2) the ability to replenish lost or degraded capabilities; and (3) defensive operations to provide warning of and interruption to an adversary's attack. Making architectures more resilient is a combination of adequate protection, increased proliferation, service diversity, appropriate distribution, well-reasoned disaggregation, and operational ambiguity—all to create a service that can stand up to an adversary's attack. These are the same force structure ideas we use in every other field of warfighting to help our systems survive in a hostile environment.

With these concepts in hand, we have begun to consider resilience in a variety of architectural and programmatic discussions. For the first time ever, for example, our protected SATCOM analysis of alternatives is focusing on resilience. The same will be true when we look at overhead persistent infrared monitoring later this year. From an investment standpoint, we have identified extremely cost-effective enhancements in automated anti-jamming for our Wideband Global SATCOM system (WGS) to increase protection in a jammed environment. We are committed to assuring that GPS can face the rigors of a hostile battlefield environment by continuing our investment in our military (or "M-code") user equipment program. The Depart-

ment continues to use Space Modernization Initiative (SMI) investments to improve affordability and capability of our current Space Based Infrared System and Advanced Extremely-High Frequency architectures. SMI funds are also being used to invest in evolutionary follow-ons to those architectures that disaggregate strategic and tactical elements and look at ways to distribute and proliferate the resulting pieces. Every aspect of these decisions is driven by our focus on improving space system resilience.

PARTNERING WITH LIKE-MINDED NATIONS, INTERNATIONAL ORGANIZATIONS, AND COMMERCIAL FIRMS

Resilience, however, will not be achieved through U.S. investment alone. The reality of the budget is such that we cannot just hope to "buy our way out" of these challenges. They are too complex, and they are too long term. Instead we have taken a more expansive approach: joining with other like-minded space-faring nations and commercial partners to create a coalition approach to space, just as we have done in other warfighting domains.

Space is no longer limited to just a few nations. It is a major force structure component for each of our allies, and that is force structure we can all share. Whether we are talking about the dozens of radar and electro-optical imaging satellites that the United States and our allies already have on orbit, the rapidly multiplying navigation constellations whose satellites will soon number over 100, or the ever-growing array of weather and SATCOM capabilities at the world's disposal, we have begun to recognize that the United States neither can, nor does it need to, go it alone in space. This is a fundamental shift in how we approach this problem. Just as in other fields of combat where we combine with allied land, sea, and air forces, so too can we combine our space forces with equally effective results and for very little increased investment.

For example, by 2020 we anticipate that at least six nations or regional intergovernmental organizations will have fielded independent space navigation systems—our GPS network, the European Union's Galileo, Japan's Quasi Zenith Satellite System, the Indian Regional Navigation Space System, China's Compass system, and Russia's Global Navigation Satellite System. Those constellations will include nearly 140 satellites, with a dizzying number of new signals and services. While it may be possible for an adversary to deny GPS signals through jamming, physical antisatellite attacks, or a cyber-attack on a ground control network, it is much more difficult to eliminate multiple services at the same time. Assuring U.S. warfighters have access to the bulk of these systems is a very powerful way to make sure no warfighter will ever have to face battle without the incredible benefit of space-enabled positioning, navigation, and timing (PNT). To that end, we have begun negotiations with like-minded PNT owner/operators to ensure the United States has that access. We must likewise ensure our equipment is capable of receiving these different signals—just as is already happening in commercial applications.

The same is true for other space services and is already bearing fruit in our plan for future space weather capabilities. We closely examined what we could get from others—international partners, U.S. civil agencies, the commercial sector, and even non-space services—and we defined a new, minimal, DOD owned- and operated-system that is an order-of-magnitude less expensive than the previously planned system it replaces. Together this "system of systems" meets U.S. warfighting needs in a way that stymies an adversary's ability to threaten the resulting whole. A combination of diversity, distribution, disaggregation, and proliferation can increase resilience while reducing needed investment.

This approach is particularly well-suited to areas in which the commercial world plays a major role, such as remote sensing. In this area, we are aligning several of our policy elements to take advantage of and hasten the diversity- and proliferation-driven resilience I have been discussing. Building on over a decade of experience with traditional commercial providers, we are reexamining commercial remote sensing licensing policy, while leveraging new authorities to relax export controls for systems that are widely available commercially. Our aim is to posture U.S. industry—both traditional commercial providers and entrepreneurial start-ups—to compete successfully in a burgeoning global marketplace.

DETERRING AGGRESSION

The fourth strategic element is to prevent and deter aggression against our space systems. In fact, all of the policy elements I have covered thus far—promoting responsible use, improving our own capabilities, and partnering with allies and commercial space providers—are also aimed squarely at this fourth strategy element. Those efforts are complemented by a focus on SSA to provide timely and accurate

indications and warning prior to an attack and attribution during and after an attack, with a focus on command and control systems that support our ability to respond appropriately.

Let me discuss two efforts aimed at those objectives. First is our Joint Space Operations Center Mission Systems. That program delivered its first operational increment early last year, and we are on track to complete increment two in fiscal year 2017. That will be followed by additional increments that support characterizing attacks and coordinating operational responses.

The second is the Geosynchronous Space Situational Awareness Program recently announced by General Shelton. This previously classified program will deliver two satellites later this year for launch into near geosynchronous orbit (GEO). From that unique vantage point they will survey objects in the GEO belt and allow us both to track known objects and debris and to monitor potential threats that may be aimed at this critically important region. In short, threats can no longer hide in deep space. Our decision to declassify this program was simple. We need to monitor what happens 22,000 miles above the Earth, and we want to make sure that everyone knows we can do so. We believe that such efforts add immeasurably to both the safety of space flight and the stability that derives from the ability to attribute actions—to the benefit of all space-faring nations and all who rely on space-based services.

Taken together, all of these elements combine to enhance stability and deterrence—seeking to reduce the likelihood of attack, to provide the necessary indications and warning to take evasive actions prior to an attack, to deny benefits to the adversary if such attacks are undertaken, to attribute the source of the attack, and to make it impractical for an adversary to isolate the United States from the community of space-faring nations that will be affected.

DEFEATING ATTACKS AND PREPARING TO OPERATE IN A DEGRADED ENVIRONMENT

Even with all these efforts in place, however, attacks may occur. Our last strategic element is to assure we can defeat attacks and prepare to withstand them should they occur. Much of our effort in this area is coordinated through our Space Security Defense Program (SSDP). SSDP was established last year as an outgrowth of the Space Protection Program initiated in 2008 by Air Force Space Command and the National Reconnaissance Office. SSDP is developing methods to protect and defend our space systems by finding ways to counter the ever growing list of threats they will face.

Several of the initiatives I have already mentioned today, such as the WGS automatic anti-jamming capability, are derived from work of SSDP. We have requested increased funding for SSDP this year to allow them to examine non-material solutions, such as changes to tactics and procedures, that can be implemented today. While our long-term intent is to move to more resilient and more defendable space architectures, we have over a decade before those systems will even begin to deploy, and we need to protect ourselves and our on-orbit systems now.

OTHER MATTERS

Let me conclude by moving from our overall strategy to address specific matters in which I know there is continuing interest. First, last year your colleagues in the House Armed Services Committee challenged me to explain why the United States was leasing communication links from a Chinese provider to support U.S. Africa Command (AFRICOM). I agreed that while the initial lease was driven by operational need, it was not an appropriate long-term solution. I pledged that we would address the issue as quickly as possible. I am happy to report that we have. Working with us, AFRICOM has made significant progress over the last year in moving DOD SATCOM leases from the Chinese Apstar system to other commercial satellite providers in the region. We have already transitioned over 75 percent of the Apstar bandwidth to other satellites, and our intent is to be completely transitioned by May of this year.

Second, we are developing a better strategy for making long-term commitments to commercial SATCOM providers to reduce cost, increase capability, and add resilience. Later this year, Air Force Space Command will purchase a commercial transponder, one that is already in space, for use by AFRICOM. This is not a lease—instead it is government ownership of an on-orbit asset that will be managed and operated by the commercial provider at a small fraction of the cost that it would take to lease this capability on an annual basis. Not only will this transponder help to accelerate the move off of Apstar, it will provide needed experience with this new method of acquiring commercial SATCOM, potentially ushering in a revolutionary way to do so worldwide.

Third, we recently welcomed the President's new National Space Transportation Policy, released November 21, 2013. This policy will help ensure the United States stays on the cutting edge by maintaining space transportation capabilities that are innovative, reliable, efficient, competitive, and perhaps most importantly, affordable. This policy supports DOD's ongoing efforts to provide stability to the industrial base that currently provides launch vehicles to the national security community by mandating that all programmatic decisions are made in a manner that considers the health of the U.S. space transportation industrial base. The policy also calls for a level playing field for competition that can spur innovation, improve capabilities, and reduce costs, without increasing risk. The President's budget request already bears evidence that this strategy is working: the Evolved Expendable Launch Vehicle request has been reduced significantly. Those benefits will become even greater in the future as we fully qualify new entrant launch providers, an effort that is already well underway.

Fourth, we continue to make progress in building coalition space operations. Led by STRATCOM, the Department is working with close allies on cooperation, not only in the systems we fly, but in the operations we perform. This initiative paves the way for far closer operational collaboration with allies than we have ever had, with the aim of eventually broadening participation to include additional spacefaring countries.

Finally, just as the United States develops its space capabilities and leverages them to support military operations, so too do other countries. We are increasingly seeing rival nations begin to integrate space into their own operations in the same way as the United States and our allies have done for years. This is not unexpected. But it does mean that the benefits we ourselves derive from space will begin to be available to those that we may someday have to face in combat. We recognize that this is the reality of the future and we are beginning to prepare to face a more capable adversary. We appreciate the increased interest from Congress in this area and look forward to working with you over the coming years to assure our strategies and plans in this area are thoroughly deliberated.

CONCLUSION

Mr. Chairman, thank you for the opportunity to provide these updates on the Department's space policies and programs. My colleagues and I look 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 very much.

Dr. 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, Senator Donnelly, Senator King, thank you for the privilege today to speak before you and with this distinguished panel.

I am happy to announce that the MUOS program continues to make positive strides in achieving overall program goals. On the heels of our first successful launch of Space Vehicle (SV)–1, in February 2012, SV–2 launched from Cape Canaveral, FL, on July 19, 2013. Its legacy payload—that is, the ultra-high frequency (UHF) payload—is available now for early operational use. Our three remaining satellites are on schedule to be launched in January 2015, August 2015, and sometime in 2016.

The most significant challenge for the program over last year has been delays with satellite number 3. During last year's thermal vacuum testing, satellite 3's legacy payload experienced an uncommanded shutdown. The program office initiated a thorough investigation and identified the root cause as insufficient solder volume during the production of the output multiplexer (OMUX).

The program office initiated corrective actions and has since determined that this deficiency is isolated to satellite 3 only. Satellites 4 and 5 are not impacted. Since satellites 3 through 5 are under a fixed price incentive fee contract, the U.S. Government will not incur any additional expenses due to the delay.

In order to minimize the schedule delay of approximately 6 months, the Navy has decided to move satellite 4 up into the third launch slot in January 2015.

The MUOS program continues to meet objectives for ground sites in Geraldton, Australia; Wahaiawa, HI; and Northwest, VA. These sites have completed hardware installation and final acceptance testing and have been officially handed over to Fleet Cyber Command. The fourth site at Niscemi, Sicily, recently cleared a major hurdle. I would like to thank the State Department for their efforts in working with the Italian Government to bring resolution to the installation of the three large antenna dishes.

Terminal development continues as the Army lead on the Manpack radio is in the final phases of development to support the upcoming MUOS multiservice operational test and evaluation (MOT&E). Army fielding of the MUOS-capable Manpack radios is scheduled to begin in fiscal year 2015 and continue through fiscal year 2027.

Additionally, the Navy is developing the MUOS capability for the Digital Modular Radio to support shipboard operations.

While these two radios are our primary focus, several U.S. terminal vendors have contacted us to gain access to the MUOS testing laboratories. Three vendors have been scheduled to utilize the laboratories beginning in March and others will be scheduled in the near future as their terminals are ready for testing. These additional terminals are expected to greatly increase the number of MUOS terminals over the next several years.

Over the past 18 months, the program has conducted numerous phases of testing and is in the final risk reduction testing before conducting the MOT&E later this year. MOT&E is the final test that will certify the system operational, testing the full end-to-end capability of the terminals, ground stations, and satellites utilizing real-world scenarios in order to achieve initial operational capability (IOC). The Navy is extremely proud of our MUOS program and we look forward to seeing the program become operational.

Senators, 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 underlie the Navy's ability to operate forward and meet increasing anti-access/area denial (A2/AD) demands with a shifting focus towards the Pacific. The Navy continues to be highly dependent upon space-based systems for beyond line of sight communications; missile warning, intelligence, surveillance and reconnaissance, and environmental remote sensing to provide battlespace awareness in support of joint warfighting and global maritime operations; and positioning, navigation and timing information for critical command and control, battlespace and global navigation, and information system timing. The Air-Sea Battle Concept, whereby joint air and naval forces retain freedom of action through tight coordination of operations in and across multiple domains, highlights the particular importance and criticality of the

space domain. With the emergence and proliferation of anti-satellite and counter-space weapons, the United States can no longer assume that the space domain will remain uncontested. Our service must remain nimble and agile as we deal with these new space threats.

In the face of rapidly emerging threats in space, the Navy must continue to pursue new investment strategies and widely diverse capabilities to provide resilient access to space and space services to ensure mission success. As adversaries become more proficient in their use of space capabilities, they will continue to develop 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 critical the Navy continue to leverage space capabilities while improving the resilience of future space architectures to meet information demands in an increasingly contested electromagnetic environment. The Navy must also identify alternative sources and capabilities and work with the other Services to develop and refine the necessary tactics, techniques, procedures, and operational plans to help preserve Navy fleet information dominance in degraded or denied areas.

The Navy's Information Dominance strategy fully integrates the Navy's information functions, capabilities, and resources to optimize decisionmaking and maximize warfighting effects. Navy leaders increasingly rely on critical satellite communications (SATCOM) paths; positioning, navigation, and timing (PNT) signals; environmental monitoring (EM) data; missile warning (MW); and intelligence, surveillance, and reconnaissance (ISR) reporting to satisfy the three pillars of Information Dominance: assured command and control (C2), battlespace awareness, and integrated fires. Maintaining access to, and proficiency in, operations utilizing all of these space capabilities enables decisiveness, responsiveness, and agility—critical attributes for a forward-deployed force operating in an anti-access/area denial environment.

MOBILE USER OBJECTIVE SYSTEM (MUOS)

The capabilities, flexibility, and robustness of our Navy and Joint forces across the board require improved access to reliable worldwide communications to successfully execute their missions. The Navy's MUOS, with its advanced technology wideband code division multiple access (WCDMA) payload, is the key enabler that will support worldwide multi-Service users in the Ultra High Frequency (UHF) band for many years to come. MUOS will provide increased communications capabilities to smaller terminal users that require greater mobility, higher data rates, and improved operational availability. As today's legacy UHF satellite constellation continues to age, MUOS, with its legacy payload, provides the bridge to allow our forces time to transition to the newer and more capable WCDMA terminals.

The MUOS program continues to make significant strides in achieving the overall program goals. In February 2012, the first satellite was launched and within 8 months its legacy payload was made operational in order to replace a failing UFO–5 satellite, providing seamless transition without any degradation in service. The second MUOS satellite launched from Cape Canaveral, FL on July 19, 2013, and its legacy payload is now available for early operational use in the event of an unexpected failure of an on-orbit legacy satellite. The remaining three satellites are under a fixed price incentive fee contract and will launch in January 2015, August 2015, and a date to be determined in 2016.

Production of satellites #4 and #5 has gone very well, however there have been challenges with satellite #3. During last year's thermal vacuum testing, satellite #3's legacy payload experienced an uncommanded shutdown. The subsequent investigation using photographic inspection, contractor logs and technician interviews identified the root cause as insufficient solder volume during the production of the Output Multiplexer (OMUX). The program office has initiated corrective actions and through extensive investigation has determined that this deficiency is isolated to satellite #3 only. It does not affect any of the other satellites.

In order to minimize impact on the launch schedule, the third satellite will be repaired and launched in a later launch slot, and the fourth production satellite is on track to take its place on the launch schedule in January 2015. That is a 6 month slip from the original schedule. Because of an effective contract structure, the government will not expend any additional funds to bring the third satellite up to standards. Additionally, thanks to flexible program management and the ability to launch satellite number four earlier than planned, the warfighters who depend on satellite communications will see no change in service.

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 completed hardware installation and final acceptance testing, and have

been officially handed over to Fleet Cyber Command. The fourth site at Niscemi, Sicily, has had several setbacks over the past year as Italian protesters have caused significant delays; however, the program recently cleared a major hurdle with the installation of the three large antenna dishes at the Niscemi site. The U.S. and the central Italian Governments have worked together closely and Navy officials have increased cooperation with the local Sicilian authorities to maintain unfettered access to the site. Italian Government studies were released in 2013, reassuring the local population that all RF levels at the site are within safe and normal operating levels. Two previous studies were conducted by the U.S. Navy with acceptable results by both American and Italian health standards. The Navy resumed work late last summer at the site, and the current projection is to finish work by the end of this year.

The final segment needed to achieve full MUOS capability is the fielding of the MUOS-capable terminals. The MUOS waveform software was completed in 2012, 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 has been used to complete the initial phase of the MUOS End-to-End (E2E) testing is the AN/PRC–155 Manpack Radio. The U.S. Army PEO C3T Tactical Radio Program has developed this terminal by adding the MUOS capability to this new radio. Army fielding of MUOS capable Manpack radios is scheduled to begin in fiscal year 2015 and continues through fiscal year 2027.

Additionally, the Navy is currently adding the MUOS capability to its Digital Modular Radio (DMR) to support shipboard operations. Upgrade kits will be fielded in fiscal year 2016 to existing UHF SATCOM DMRs and older systems will begin full DMR installations in fiscal year 2017 with 196 radios fielded by 2020. The Navy has been contacted by several MUOS terminal vendors to gain access to the MUOS testing labs. Three vendors have been scheduled to utilize the Navy testing labs beginning in March and others will be scheduled in the near future as their terminals are ready for testing. These additional terminals are expected to greatly increase the numbers of MUOS terminals over the next several of years.

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), Joint Tactical Networking Center (Army) and the Defense Information Systems Agency. Significant progress has been made since the Navy was assigned overall responsibility by USD(AT&L) in May 2012 to deliver the MUOS End-to-End capability. The first phase of events designed to reduce risk associated with seams between each of the program offices has been completed. WCDMA voice and data calls were successfully transmitted by a Manpack Radio through the MUOS–1 satellite, routed through the MUOS ground system using a single ground site, and received by a second Manpack Radio. The second phase of risk reduction events is in progress and involves 2 MUOS satellites, 2 ground stations, and at least 15 Manpack Radios. The next major event for the MUOS program is the completion of the Multiservice Operational Test and Evaluation (MOT&E) which will occur later this year. The MOT&E is the final test that will certify the system operational, testing the full E2E capability of the terminals, ground stations and satellites utilizing multiple operational scenarios. Once the system is certified the program will achieve Initial Operational Capability (IOC) followed by Full Operational Capability (FOC) after all five satellites have been launched and tested.

Additional developmental testing was sponsored by the prime contractor in 2013. Initial indications are that MUOS may provide some coverage for narrowband SATCOM in the Arctic. A recent test successfully communicated over MUOS to an aircraft flying at 23,000 feet at 89.5 North latitude. Further testing will be required to determine if and to what degree surface ships could employ MUOS to communicate in ice free waters in that region. Routine surface and subsurface operations in the region cannot be supported as there is insufficient coverage. The USAF EPS is required to support joint Arctic operations. MUOS is not capable of supporting joint Arctic operations, and it does not provide a protected SATCOM capability. Protected SATCOM is essential to these operations.

NAVY MULTIBAND TERMINAL

The increasing threat to access Space is a growing Navy concern. A2/AD threatens satellite communications systems that enable critical warfighter commander assured C2 functions. The Advanced Extremely High Frequency (AEHF) Satellite communications program acquired and deployed by the USAF provides a means to protect satellite communications. The Navy Multiband Terminal (NMT) Program will allow the Navy to leverage the AEHF satellite communications program to mitigate this

risk. NMT provides secure, protected, and survivable high capacity mission bandwidth access for all warfare areas in an A2/AD environment. NMT variants are being installed on surface ships, submarines, and shore sites, including ground sites for the Enhanced Polar System program. Each order for a production lot of NMTs requires a 15-month lead time for the first unit of delivery. The remaining units can be delivered over a 12-month window. Once a unit is delivered to the Navy, it undergoes an additional period of Government testing of up to 2 months prior to being delivered to its ultimate installation platform. This timeline means that an NMT unit may be bought up to 29 months prior to installation, giving an inaccurate perception of being early to need. Further program cuts could lead to breaks in production, which will negate learning curve efficiencies and increase production costs, while delaying delivery of this much needed capability for the warfighter. Given these points, if current budget funding levels remain stable, program FOC will occur in 2022.

POSITIONING, NAVIGATION, AND TIMING

Precise time and time interval (PTTI) is absolutely critical to the effective employment of a myriad of Department of Defense (DOD) systems. Coordinated Universal Time as referenced to the U.S. Naval Observatory (UTC–USNO) is the DOD standard and the primary PTTI reference for the Global Positioning System (GPS). The Navy remains at the forefront of timekeeping technology with the USNO Master Clock, an ensemble system of independent atomic clocks. Four Navy Rubidium Fountain (NRF) atomic clocks achieved FOC at USNO Washington, DC in August 2013. These additions to USNO's timing suite improve UTC–USNO to better than one nanosecond per day as required for GPS III. The DOD Alternate Master Clock facility in Colorado Springs, CO received its second of two planned NRF clocks in early February. IOC was delayed to September 2014 and September 2015, respectively, due to furloughs and funding cuts.

The Navy initiated a Critical Time Dissemination (CTD) program in 2013 to ensure PTTI remains available to DOD users in contested environments. This program will provide critical upgrades to timing stations to overcome dependence on GPS-only solutions and ensure correct PTTI delivery to the warfighter. These efforts are being resourced and executed in concert with DOD Chief Information Officer (CIO) priorities and the department's long term strategy for Assured PNT. CTD funding supports four lines of effort: development of a radio-frequency interface, a timing reference upgrade, timing system integration, and development of an optical interface. The $3 million cut to CTD research and development in the fiscal year 2014 budget due to 'excess growth' will retard program goals at least 1 year to fiscal year 2019.

The Military-Code (M-Code) GPS signal is a new encrypted signal for military users designed for resiliency. The USAF led development of M-Code GPS User Equipment is critically important to the warfighter in order to capitalize on the advantage gained by precise PNT while enhancing its ability in a denied and degraded environment. Hand-held requirements are vital to the USMC, however current development has been deferred to increment 2, and delaying USMC access to M-code beyond fiscal year 2022. Protecting the funding for its development is important to ensure that the ground segment keeps pace with on orbit capabilities and provide future access to space-based PNT for ground forces utilizing hand-held devices.

ENVIRONMENTAL MONITORING

Environmental monitoring is a vital capability that the Navy relies on for its short- and long-term forecasts, as well as climate monitoring programs. Satellite data is the primary method for collecting these large volume data sources that are used to feed the Navy's, as well as other Federal and International numerical models. As the DOD budget has decreased over the past several years, the Navy has relied on other Federal agencies and international governments to provide the necessary data. The DOD is not the only organization feeling the budget crisis. Smaller budgets are a reality for space organizations around the world and thus there is the potential of being left without the necessary resources to ensure operations can be conducted safely and efficiently. In order to develop mitigation plans, the Navy has been participating with the Air Force in a study to review the operational requirements for Space-based Environmental Monitoring. This study has shown that space-based solutions are required; especially to support Ocean Surface Vector Wind and Tropical Cyclone Intensity. The study is due to report out by the end of April but the Navy is hopeful that the documented requirements will be met with the necessary resources to support this vital service need.

INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (ISR)

The Nation's recent focus on the western Pacific and the Arctic has increased the need for better access to space-based ISR systems. The WESTPAC and Arctic key maritime operating areas of interest are located in remote regions of the Earth, cover very large expanses of water, and offer limited access from land-based and airborne sensors. Space-based sensors are not restricted in these areas. In fact they are well-suited to support the wide variety of missions the U.S. Navy is called upon to support, from both a strategic and defensive perspective, for the Nation as well as our International Partners.

Significant progress has been made since last year's testimony in defining maritime collection needs for future national and commercial ISR systems. Over the last year the Director of National Intelligence has completed work on a series of capability documents for our next generation national systems. These documents outline required sensor collection capabilities as well as system architecture design specifications. The U.S. Navy has been actively engaged in ensuring the Nation's maritime collection needs are properly defined so the sensors, when fielded, will be able to provide the required collections to support these missions well into the 2030 timeframe and beyond. The Navy is also working with the National Geo-Spatial Intelligence Agency to determine what role commercial satellite systems can play in meeting our collection needs. Commercial sensors offer unique collection capabilities for the maritime domain that in some cases exceed national systems capabilities, cost less than their national counterparts, and provide information at the unclassified level which ease data flow within DOD as well as with our allies and coalition forces. Although national security concerns do preclude use of commercial sensors for some collection operations, they can play a significant role in filling collection gaps.

NANO SATELLITES

With the increasingly contested nature of space and the promulgation of International counterspace capabilities, the pressure has been turned up for more resilient, cost-effective access to space and capability on orbit. In response, the Navy is participating in nano satellite initiatives designed to provide low cost and quick response capability for emerging space requirements. One such effort is the Vector Joint Capability Technology Demonstration, which launched two, foot-long "CubeSats" in November 2013 to demonstrate advanced communications capabilities. Both satellites were part of the Operationally Responsive Space (ORS)-3 mission which launched from Wallops Island, VA on a MINOTAUR IV space vehicle. The satellites will be demonstrated and their military utility assessed by our mission partners through the spring of 2014. The multi-mission satellite is designed with an open payload interface that allows third party capabilities to be integrated quickly. Three companies are now developing prototype naval payloads for the multi-mission satellite using our Small Business Innovative Research program. While not as capable as larger satellites, nano satellites can be launched in relatively short timelines in order to address a quickly evolving operational need.

CONCLUSION

The Navy continues to be reliant upon space for SATCOM, PNT, EM, MW and ISR information in order to enable decisionmaking in increasingly contested and denied environments. Growing global uncertainty and emerging and expanding adversary capabilities will continue to require the Navy to become more resilient and efficient in the use of available assets in order to maintain the level of effectiveness that the Nation expects. This will require a revalidation of fleet information requirements and promotion of resilient measures to ensure that threats to space access and services 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, Dr. Zangardi.

General Shelton?

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

General SHELTON. Mr. Chairman, Senator Sessions, Senator Donnelly, Senator King, it is an honor to appear before you once

again as the Commander of Air Force Space Command. It is also a privilege to appear with these distinguished witnesses on the panel here.

As you noted in your opening statement, our Nation's advantage in space is no longer a given. The ever-evolving space environment is increasingly contested as potential adversary capabilities grow in both number and sophistication. Providing budget stability and flexibility in this very dynamic strategic environment is necessary to maintain and bolster the viability of our Nation's space capabilities. Given this new normal for space, I believe we are at a strategic crossroads. It is a reality that requires us to address how we protect our space systems, challenge traditional acquisition practices, and consider alternative architectures that are more resilient and more affordable.

I thank you for your support, and I look forward to working with Congress to keep you abreast of our efforts to provide resilient, capable, and affordable space capabilities for the joint force and for the Nation. Thank you.

[The prepared statement of General Shelton follows:]

PREPARED STATEMENT BY GEN. WILLIAM L. SHELTON, USAF

INTRODUCTION

Chairman Udall, Senator Sessions, and distinguished members of the subcommittee, it is an honor to appear before you once again as the Commander of Air Force Space Command (AFSPC). As the Air Force space and cyberspace lead, I am responsible for organizing, training, and equipping more than 40,000 military and civilian employees to provide Air Force space and cyberspace capabilities for the combatant commands and for the Nation. My team works hard to deliver these capabilities around the world, every hour, every day.

Space and cyberspace capabilities are foundational to the Joint Force Commander's ability to deter aggression and to execute global operations across the entire range of military operations, from humanitarian and disaster relief through major combat operations. Our military satellites and computer networks are technological marvels, providing mission-critical global access, persistence, and awareness. These systems not only provide essential, game-changing capabilities for our joint forces, they are increasingly vital assets for the global community and world economy.

Specifically in space, our sustained mission success integrating these capabilities into our military operations has encouraged potential adversaries to further develop counterspace technologies and attempt to exploit our systems and information. Therefore, I believe we are at a strategic crossroad in space. With the threats to our space systems increasing and defense budget uncertainty, the status quo is no longer a viable option. This "new normal" in space requires us to address protection of mission-critical systems, challenge traditional acquisition practices, and analyze new operational constructs.

The grand challenge before us is to assure essential space services will be available at the time and place of our choosing, while simultaneously lowering the cost of executing these missions. Finally, the budget situation of the last year certainly reminded us that our ability to provide these services now and into the future is fragile.

MANDATE FOR CHANGE: FUTURE SPACE CAPABILITIES AT A STRATEGIC CROSSROAD

The space environment has fundamentally changed since our fledgling efforts in the late 1950s and early 1960s. Our space systems were designed to operate in a relatively benign environment, and the detente between the United States and the Soviet Union kept the peace—even in space. There were few space-faring nations, and even fewer with indigenous launch capability. Today, there are more than 170 nations with some form of financial interest in a variety of satellites, and 11 nations that can independently launch satellites into space. The rapid expansion in space traffic over the past 50+ years occurred largely without conflict, but that era is coming to an end.

The joint force dependence on space assets yields a corresponding vulnerability we know others seek to exploit. Counterspace developments by potential adversaries are varied and include everything from jamming to kinetic kill anti-satellite weapons. Global Positioning System (GPS) jammers are widely available, complicating our employment of GPS navigation and timing signals in weapons and platforms. Satellite communications jammers are also available, which may challenge over-the-horizon communications when needed most. Also, some nations have developed and successfully demonstrated anti-satellite weapon capabilities which could threaten our satellites in times of conflict. Unfortunately, all projections indicate these threatening capabilities will become more robust and proliferated, and they will be operational on a shorter than predicted timeline.

In addition to adversarial counterspace programs, the growing debris problem is also a concern to spacecraft operators in all space sectors: military, civil and commercial. While we are routinely tracking some 23,000 objects at the Joint Space Operations Center (JSpOC), our sensors are unable to detect and reliably track objects smaller than 10 centimeters. Our models project more than 500,000 man-made objects greater in size than one centimeter in orbit today—many of these small objects represent a potentially catastrophic risk to fragile-by-design spacecraft.

We are also addressing the President's direction to support the National Broadband Plan by finding balance between assured access, spectrum sharing and reallocation/repurposing. Use of radio spectrum for ground-space communications must be protected from both a regulatory perspective and from targeted adversary action.

With the rapidly expanding adversary threats to our spacecraft, the growing debris population and decreasing budgets, we must adapt our satellite constellation architectures to become more resilient, while simultaneously making them more affordable. Just as combat aircraft necessarily evolved with the threat, we can no longer expect satellites built for a permissive environment to operate effectively in an increasingly contested space domain.

Due to the cost of launching satellites, our design philosophy has been to maximize the functionality on a given satellite, which translates to increased weight, size and corresponding cost. As a result, we build just enough satellites, just in time, to sustain our constellations. This philosophy worked well over the years, but in the new normal of space, we are vulnerable to the cheap shot or to premature failure. For example, loss of a single satellite in our missile warning or our protected communications constellations would potentially leave large gaps in a vital capability. We must consider different architecture options that will provide adequate and resilient capability at an affordable cost. Our die is cast through the mid-2020s with the outstanding satellites we are buying and successfully placing on orbit to support national security objectives and joint operations. Because of lengthy acquisition timelines, to affect these architectures in the post-2025 timeframe, we need to complete ongoing studies soon to determine the most efficient approach for the future.

CONFRONTING BUDGET CHALLENGES

Based on available funding, we made difficult decisions in the Command to survive fiscal year 2013. The Budget Control Act of 2011 resulted in significant fiscal year 2013 cuts to the Operations and Maintenance (O&M) budget at Air Force Space Command, which in turn compelled irreversible changes and significant risk to space operations going into fiscal year 2014. The welcome relief and flexibility provided by the fiscal year 2014 Appropriations Act is sustained in the fiscal year 2015 President's budget—our space operations budget requires this level of support to maintain our current operational posture and manage risk in changing operating conditions.

Impact of Sequestration

Despite our cost reduction efforts, last year's sequestration cuts required drastic actions at AFSPC. We cut $304.8 million from our O&M budget for fiscal year 2014 alone to comply with the Budget Control Act. Achieving that magnitude of reductions required continued civilian workforce pay freezes, a 25 percent reduction of contractor services within my headquarters (on top of a 50 percent reduction the year before), inactivation of some operational capabilities, and most notably $100 million of additional risk in Weapon System Sustainment funding. This means that in fiscal year 2015, vital sustainment activities are delayed or deferred, which could translate into system outages of increased duration or severity. Additionally, AFSPC uses a significant portion of our O&M budget to fund mission-essential contractor operators for our space and cyberspace missions—there is no flexibility here. Our search for savings over the last several years of declining budgets virtually elimi-

nated any margin in O&M; therefore, the cuts began to erode these contracts which are essential to perform and sustain our mission.

While the Bipartisan Budget Act of 2013 alleviates a portion of the cuts we were facing in fiscal year 2014 and fiscal year 2015, we remain concerned that continued sequestration-induced budget cuts in fiscal year 2016 and beyond, as well as overall funding instability, could undermine our space capability for years to come.

CHALLENGING LEGACY SPACE ARCHITECTURES AND TRADITIONAL ACQUISITION PRACTICES

This past year, we continued success in our acquisition programs to provide greater mission assurance and cost savings. As we transition from development to production, we have captured success through lean processing, smart testing and appropriate oversight and reporting. The Space and Missile Systems Center (SMC) made tremendous strides implementing "should-cost" initiatives that resulted in real program savings of more than $1.4 billion across the Future Years Defense Program. The result of these actions can be seen in streamlined assembly, testing and delivery of a number of programs to include Advanced Extremely High Frequency (AEHF), Space-Based Infrared System (SBIRS), Wideband Global Satellite Communications (WGS) and GPS III.

Space Modernization Initiative (SMI)

In 2011, AFSPC adopted the Efficient Space Procurement (ESP) concept to reduce procurement risk and lower overall cost by transitioning from buying satellites one-at-a-time to buying satellites in blocks using fixed price contracts. This approach allowed us to take advantage of economic order quantities and the efficiencies inherent in a stable production line. We then used a portion of these savings to invest back into mission areas under SMI. The overall SMI strategy is to invest in program efforts that create increased trade space for future decisions. Study contracts under SMI are helping us better plan for a challenging future by exploring affordable technology alternatives and architectures in missile warning, communications, global positioning, navigation and timing mission areas.

SMI-funded studies position AFSPC to take advantage of opportunities such as greater commercial satellite availability, a competitive medium launch market and faster commercial production cycles. SMI also postures the Air Force to rapidly address emerging kinetic and non-kinetic threats. These investments are critical to our ability to define future options to increase resiliency in this dynamic operational space environment.

Resilient Architectures

As we work toward increased resiliency and affordability, we are examining a range of options, one of which is disaggregation. Disaggregation concepts call for the dispersion of space-based missions, functions or sensors across multiple systems or platforms. By separating payloads on different satellites we will complicate a potential adversary's targeting calculus, decrease size and system complexity, and enable use of smaller boosters—with the goal of simultaneously driving down cost.

In addition, we are evaluating constructs to host payloads on other platforms where feasible, and take better advantage of available commercial services. The trailblazing Commercial Hosted Infrared Payload program, a government infrared payload on a commercial satellite, was a technical success by any measure, and we learned significant lessons on the overall hosted payload concept.

Over the past several months, we've met with more than 65 space companies to seek their ideas on alternative architectures. From those meetings, we collected many concepts that will inform our Analyses of Alternatives (AoA) for the future of protected military satellite communications and overhead persistent infrared systems. In addition, the Missile Defense Agency (MDA) is supporting our AoA studies with threat definition, technical evaluations and cost analysis support. AFSPC and MDA are collaborating on future space sensor architecture studies and sensor performance assessments across a broad set of joint mission areas. Finally, federally Funded Research and Development Centers, as well as others, will complete studies this year on disaggregation and its secondary impacts on the launch industry and space architectures.

Better Buying Power

As previously mentioned, our use of the ESP approach and the Department of Defense's (DOD) Better Buying Power concepts resulted in significant positive results. SMC, under the sterling leadership of Lieutenant General Ellen Pawlikowski, awarded a block buy contract for the AEHF space vehicles 5 and 6, obtaining $1.625 billion in savings from the original independent cost estimate. Also, we anticipate

the award of a contract for two more SBIRS satellites later this year, taking advantage of lessons learned on AEHF 5 and 6. Despite parts obsolescence challenges that required initial nonrecurring engineering and advance procurement efforts, we will realize significant savings using a firm, fixed-price contract.

SPACE CAPABILITIES FOR THE JOINT WARFIGHTER

Space Situational Awareness (SSA)

SSA underpins everything we do in space. Gaining and maintaining awareness in space requires data from global sensors and the integration and exploitation of that data to support operational command and control (C2). The JSpOC Mission System (JMS) is integral to improving SSA and C2. JMS Increment 1 was approved for full deployment and operationally accepted last year. This increment delivered the net-centric framework and the initial capability advances toward better operator understanding and monitoring of the space environment. JMS Increment 2 will build on that foundation by fielding groundbreaking capabilities to include greatly improved capability to detect and characterize orbital hazards and adversary threats. Increment 2 will also enable the JSpOC to transition from the legacy Space Defense Operations Center system to expanded computational capacity and improved automation, thereby improving our ability to handle space events and allowing us to retire increasingly difficult to sustain hardware. Furthermore, it will allow integration of data from our network of space surveillance sensors, previously unavailable intelligence community data, and data from other commercial, allied and governmental sensors. The JMS program clearly represents game-changing capability for the Nation's space situational awareness.

Enhancements to the Space Surveillance Network are necessary to close sensing gaps and take full advantage of the JMS high performance computing environment. International cooperative efforts are part of that effort. As an example, in November 2013, Secretary Hagel and Australian Defense Minister Johnston signed a Memorandum of Understanding finalizing arrangements to move the Defense Advanced Research Projects Agency's Space Surveillance Telescope from its original site in New Mexico to a site in Western Australia. The high capacity and extremely accurate capabilities of this telescope will significantly enhance SSA in deep space. The telescope will be relocated and operational in 2016 to monitor geosynchronous orbits over the Pacific region. Similarly, we have reached an agreement to place a C-Band Radar in Australia to help with southern hemisphere SSA coverage.

Another big step forward is the new S-Band Radar, commonly known as the Space Fence. We will build this critical SSA sensor on Kwajalein Atoll, and remotely operate from Huntsville, AL. This radar will track much smaller objects and cover almost all orbital inclinations with a capacity to track many thousands of objects daily. Budget uncertainty contributed to a 1 year delay, but the contract should be awarded this spring, with an initial operational capability date in fiscal year 2019.

Our ground-based radars provide outstanding deep space tracking and space object identification capabilities, but they are not well-suited to search operations. Our ground-based optical systems are outstanding deep space search and tracking assets, but they can only perform their mission at night, and they must have clear skies to conduct imaging operations.

Based on the success of a sensor flown on a missile defense experimental satellite, in 2010 we developed and launched the Space-Based Space Surveillance (SBSS) satellite, with a 7-year design life, into low-earth orbit to augment both search and tracking of man-made objects. The follow-on program is being developed; however, it will not be launched until 2021 based on available funding. The result is a potential 4-year gap in this crucial space-based coverage, which will limit our ability to maintain timely custody of threats to our satellites in geosynchronous orbits. We have extended our network to include allied contributions to mitigate the potential loss of data. For example, the Canadian Sapphire satellite, launched in 2013, is a contributing sensor to our space surveillance efforts, but unfortunately, this satellite has a 5-year design life and is expected to be decommissioned about the same time as SBSS. We are working hard to extend the life of SBSS and other potential contributors to mitigate this potential coverage gap.

A future contributor to extend and enhance coverage is the Geosynchronous Space Situational Awareness Program (GSSAP). This system will collect SSA data allowing for more accurate tracking and characterization of man-made orbiting objects in a near-geosynchronous orbit. Data from GSSAP will contribute to timely and accurate orbital predictions, enhance our knowledge of the geosynchronous environment and further enable space flight safety to include satellite collision avoidance. GSSAP is expected to launch in 2014.

Assured Access to Space

It is essential that we sustain a reliable capability to launch national security satellites into space. To that end, we continued our unprecedented string of successful launches in 2013. Alongside our industry partner, United Launch Alliance, we executed an all-time high of 11 launches of the Evolved Expendable Launch Vehicle (EELV).

The commercial space launch industry made substantial progress last year with successful launches by Orbital Sciences and SpaceX. Our launch acquisition strategy aims to take advantage of the competition made possible by these new entrants once they are fully certified under the approved new entrant certification protocol. We have been very successful placing new satellites in orbit by placing a premium on mission assurance. As we move forward in an era of competition for launch services, we must remain focused on mission assurance to ensure national security payloads are safely and reliably delivered to space.

Our launch and range infrastructure has served the space enterprise well over the years, but the infrastructure overall is old and it requires considerable sustainment and modernization efforts. Due to the previously mentioned O&M budget shortfalls, we took action to right-size our infrastructure on both coasts and at our down-range sites. Our National Security Space Essential Range will not compromise public safety or mission assurance, but we will continue to balance sustainability and modernization to overcome obsolescence, as well as implementing better contract mechanisms to control costs.

Military Satellite Communications

2013 was a successful year for AFSPC military satellite communications as well. The Air Force launched the third AEHF satellite in September 2013, delivering increased capacity for survivable, secure, protected and jam-resistant satellite communication for strategic and tactical warfighters as well as our most senior national leadership and international partners. The Air Force also successfully launched the fifth and sixth WGS satellites within 76 days of each other. These satellites significantly increase high-capacity satellite communication to joint forces around the world.

The WGS program exemplifies the opportunities to leverage commercial satellite technologies to reduce the cost of providing space systems. However, we need to go further. At SMC, our program managers collaborated with industry to explore other possibilities. Through the use of broad area announcement solicitations, SMC awarded contracts to 17 vendors to examine concepts for secure satellite communications at a lower cost.

Position, Navigation, and Timing (PNT)

By the end of 2013, we completed production of all 12 GPS IIF satellites. The fourth GPS IIF satellite was launched in 2013, and we plan to launch three satellites in 2014, three more satellites in 2015, and the final two GPS IIF satellites in 2016.

As has been widely reported, the navigation payload delivery for GPS III is delayed beyond the contracted date. Although we don't believe this will result in any impact to our ability to provide gold standard PNT services to the world, we are concerned about the impact to the overall GPS III program. We are working remedies with the prime contractor for this delay.

We also expect the Next-Generation GPS Control Segment Block 1 to transition to operations in 2016. In November, we tested the system's ability to command GPS Blocks II and III satellites using space system simulators, including control of the major PNT signals. This demonstration is a major step forward to prepare for the GPS III era of more secure and robust GPS signals to the warfighter.

Space-Based Infrared System

The SBIRS GEO–2 satellite was launched, delivered for operational trial period and operationally accepted in 2013. To date, the data provided by both SBIRS GEO–1 and GEO–2 satellites is outstanding, providing enhanced missile warning and battlespace awareness over critical portions of the world. SBIRS GEO–3 is planned to launch in 2016.

Terrestrial Environmental Monitoring

Defense Meteorological Satellite Program (DMSP) satellite number 19 will launch in April 2014 and we expect the satellite will remain operational well into the 2020s. We are concerned about potential gaps in meteorological coverage when current DOD, civilian, partner and allied meteorological satellites reach their end-of-life in the 2015–2025 timeframe. The Space-Based Environmental Monitoring AoA was conducted to study follow-on options, such as international partnerships, hosted

payloads or a new satellite, for continued meteorological support to warfighters in the most cost-effective manner. The results from the AoA are currently being reviewed by the Joint Requirements Oversight Council.

CONCLUSION

The men and women of AFSPC remain committed to providing unsurpassed support to our warfighters and allies. Every day they bring innovation, excellence, and uncompromising focus to the Nation's space missions that are conducted 24/7 across the globe.

Our Nation's advantage in space is no longer a given. The ever-evolving space environment is increasingly contested as current and potential adversary capabilities grow in number and sophistication. Providing budget stability and flexibility in this very dynamic strategic environment is necessary to maintain and bolster the viability of all space capabilities.

I remain committed to a course of action that acknowledges and responds to uncertainty in this new normal. The status quo is not a viable alternative in response to the new normal. We are reaching out to our talented airmen, industry partners, allies, and Congress to make the changes necessary to provide required capability that is affordable and resilient.

I thank you for your support and look forward to working with Congress and this committee to keep you abreast of our efforts to provide resilient, capable and affordable space capabilities for the joint force and the Nation.

Senator UDALL. Thank you, General Shelton.

General Mann?

STATEMENT OF LTG DAVID L. MANN, USA, COMMANDER, U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/ARMY FORCES STRATEGIC COMMAND AND JOINT FUNCTIONAL COMPONENT COMMAND FOR INTEGRATED MISSILE DEFENSE

General MANN. Mr. Chairman, Ranking Member Sessions, Senator Donnelly, Senator King, thank you for your ongoing support of our soldiers and our civilians and our families.

This is my first appearance before the subcommittee, and it is an honor for me to be here to talk about the values of space to the Army, especially in light of declining budgets.

Space is essential to the Army and it is truly the ultimate high ground. The Army is the largest user of space capabilities for DOD. In order for the Army to see, shoot, move, and communicate, we need space. The advantages that space provides are critical to our success and that of our joint partners.

As the Army's proponent for space, my organization coordinates with all the members of the space enterprise in order to provide the capabilities through our three main tasks: number one, to provide trained and ready space missile defense soldiers out there, to build the future force and future capabilities for tomorrow, and also to look at emerging technologies for the day after tomorrow.

That said, it is important to make the point that our soldiers, sailors, Air Force, marines, and civilians out there are truly our asset. That is our greatest asset to getting after this capability.

This subcommittee's continued support is essential to providing the capabilities that have proven so vital to maintaining our edge on the battlefield.

I appreciate the opportunity to speak about the value of space to the Army and look forward to your questions. Thank you.

[The prepared statement of General Mann follows:]

PREPARED STATEMENT BY LTG DAVID L. MANN, 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 first appearance before the Strategic Forces Subcommittee of the Senate Armed Services Committee, a body that has been a strong supporter of the Army and the key capabilities that space affords our warfighters. Your past and future support is vital as we pursue joint efforts to provide critical space capabilities for our Nation, our fighting forces, and our allies. Thank you for your continued support.

In my current assignment, I have three distinct responsibilities. 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, as the Commander, Army Forces Strategic Command, I am the Army Service Component Commander (ASCC) to the U.S. Strategic Command (STRATCOM). I am responsible for planning, integrating, and coordinating Army space and missile defense forces and capabilities in support of STRATCOM missions. Third, as the Commander of STRATCOM's Joint Functional Component Command for Integrated Missile Defense (JFCC IMD), I am responsible for synchronizing missile defense plans, conducting ballistic missile defense operations support, and also serve as the warfighter's advocate for missile defense capabilities.

Today, I am honored to appear with these other witnesses to provide this subcommittee insight on the critical space-based capabilities that our respective commands continuously provide the warfighter.

As the Army's proponent for space, U.S. Army Space and Missile Defense Command (USASMDC)/Army Strategic Command (ARSTRAT) coordinates with the other members of the Army space enterprise, to include the Army intelligence, signal, and geospatial communities. We are 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, to the greatest extent possible, mitigated. We also collaborate with STRATCOM, its Joint Functional Component Command for Space (JFCC Space), and other members of the joint community to provide trained and ready space forces, as well as 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.

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

My focus today is to impress upon the Subcommittee the need to ensure our space capabilities are maintained, if not further enhanced, during the present environment of increasing threats and declining resources.

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 cadre of space professionals to support our Army.

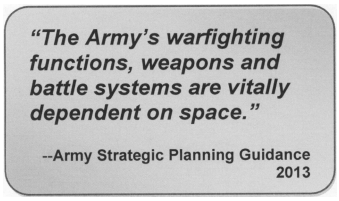
In step with the Army, our USASMDC/ARSTRAT leadership team embraces the imperatives of Sexual Harassment/Assault Response and Prevention (SHARP). As stated by the Chief of Staff of the Army, sexual harassment and sexual assault violate everything the U.S. Army stands for including our Army Values and Warrior Ethos. At USASMDC/ARSTRAT, I will continually assess the effectiveness of our SHARP efforts to ensure we are meeting the needs of our soldiers, civilians, and family members. Our workforce deserves nothing less.

RELIANCE ON SPACE-BASED CAPABILITIES

Our Army provides a globally responsive and regionally engaged force that supports the Joint Team with critical enablers and, as directed, responds to crises at home and abroad. The Army is dependent on space capabilities to execute Unified Land Operations in support of the Nation's objectives. Army space forces contribute to the Joint Force and the 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.

There are currently six Army 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.

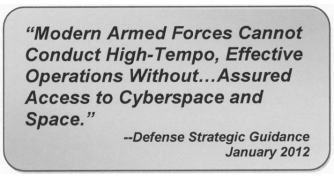


When combined with other capabilities, space systems allow Joint Forces to see the battlefield with clarity, navigate with accuracy, strike with precision, communicate with certainty, and operate with assurance. Dependence on space as a force multiplier will continue to grow for the Army of 2020 and beyond, especially in an era of tight fiscal resources, a smaller force structure, and possibly, a further reduced forward presence. The bottom line is the Army depends on space capabilities in everything we do. Retaining our global space superiority is a military imperative.

SPACE IN SUPPORT OF ARMY WARFIGHTING FUNCTIONS

There are five space force enhancement mission areas: (1) satellite communications (SATCOM); (2) position, navigation, and timing; (3) intelligence, surveillance, and reconnaissance; (4) missile warning; and (5) 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. Joint and Army forces require assured access to space capabilities and, when required, have the ability to deny our adversaries the same space-based capabilities.

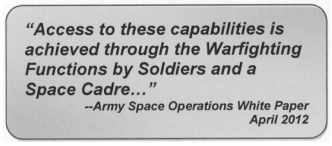
Joint interdependence is achieved through the deliberate reliance on the capabilities of one or more Service elements to maximize effectiveness while minimizing vulnerabilities. As the DOD Executive Agent for Space, the Secretary of the Air Force is responsible for leading the development, production, 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 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.



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

While the Army is the largest DOD user of space, we are also a provider of space-based 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 that are essential in all phases of operations. The Brigade, a multi-component organization comprised of Active, Army Reserve, and associated National Guard 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-deployable space support teams.

Army space professional personnel policy 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) is the focal point for all Functional Area (FA) 40 Space Operations Officers matters and executes the personnel development and life-cycle management functions on their behalf. Additionally, ASPDO develops policies, procedures, and metrics for the Army Space Cadre. The Army's Space Cadre, utilizing FA 40s as its foundation, is comprised of over 3,000 soldiers and civilians. The Space Cadre and Space Enablers consist of soldiers and civilians from multiple branches, career fields, disciplines, and functional areas.



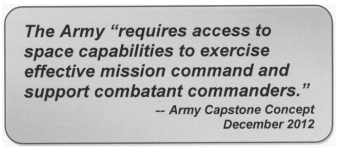
Today, there are approximately 400 multi-component FA 40s serving in joint and Army organizations across all echelons of command—tactical, operational, and strategic. These Space Operations Officers, along with members of the Army's Space Cadre, directly influence the execution of strategic operations in support of operational and tactical level ground maneuver forces. Their principal duties include planning, developing, acquiring, and integrating space force capabilities. Over recent years, the maturity of the career field and the capabilities these officers provide to the Army and its joint partners has led to an increased demand for FA 40 personnel. As the Army continues to reduce its overall end strength, FA 40 billets have fared well in the support of our corps and divisions. We have actually realized a slight increase in billets due to the requirements of the Special Forces community. During the past year, USASMDC/ARSTRAT space professionals have supported over a dozen major exercises, several mission rehearsal exercises for units deploying in support of Operation Enduring Freedom, and 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 corps and divisions, other Services, Joint Task Forces, and multinational forces. The teams, which maintain a continuous 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. During 2013, USASMDC/ARSTRAT deployed four Army Space Support Teams and Com-

mercial Imagery Teams to U.S. Central Command's area of operations. Since this era of persistent conflict began, we have deployed teams on 86 occasions. These teams bring tailored products and capabilities that meet critical theater commander needs.



Satellite Communications:

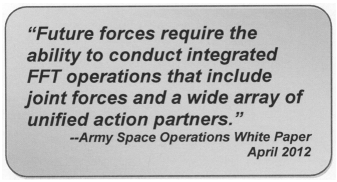
Our mission in satellite communications (SATCOM) is to ensure reliable and resilient access to tactical warfighter networks and the DOD Information Network primarily through the successful execution of satellite payload operations and the management of regional satellite communication centers. USASMDC/ARSTRAT conducts payload and transmission control for all DOD-owned wideband SATCOM bandwidth, including communications carried over the Defense Satellite Communications System (DSCS) and Wideband Global SATCOM System (WGS) constellations.

Additionally, we serve as the Consolidated SATCOM System Expert (C–SSE) for the DOD narrowband and wideband SATCOM constellations, which include 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. During 2013, our Wideband C–SSE experts conducted detailed testing on the recently activated WGS–5 and WGS–6 satellites that are now providing increased Wideband SATCOM resources to combatant commanders. In 2013, we supported the early activation of the MUOS–1 legacy payload and will soon directly support the testing and activation of enhanced capabilities on the MUOS–2. The Army also has a significant role and assigned responsibilities in DOD's expanding use of military satellite communications through a number of growing programs and initiatives, and is the operational lead for multiple international partnerships.

USASMDC/ARSTRAT also mans and operates the Wideband Satellite Communications Operations Centers (WSOCs) and the Regional Satellite Communications Support Centers (RSSCs). The satellite communications control 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. Support to the joint community, agencies, and our allies continue to grow exponentially as use of military SATCOM increases. SATCOM is the Army's top space priority. We are actively transforming our concept of operations and upgrading our capabilities to defend vital mission command links and provide assured access to SATCOM. For example, we recently replaced aging antennas and terminal equipment at the Wahiawa, Hawaii WSOC. The new WSOC at Fort Meade, Maryland will be completed this year, and we broke ground for the construction of a new WSOC facility in Germany. Modernization and equipment replacement are required so that the centers remain compatible with the fleet of new and expanding WGS assets being deployed by the Air Force.

Friendly Force Tracking:

Friendly force tracking systems support situational awareness enroute to and throughout areas of operation. Joint and Army forces require precise position, navigation, and timing information to enable confident, decisive maneuver by both ground and air assets. The DOD's Friendly Force Tracking Mission Management Center, operated by USASMDC/ARSTRAT from Peterson Air Force Base, CO, receives more than 1 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.



Ballistic Missile Early Warning:

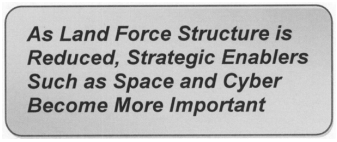
Early warning is a key component of indications and warning for missile defense. Army forces need assured, accurate, and timely missile warning launch location, in-flight position, and predicted impact area data. The 1st Space Brigade's Joint Tactical Ground Stations (JTAGS) Detachments, operated by Army personnel, monitor adversary missile launch activity and other events of interest and then share this 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 provides geospatial intelligence in direct support of the combatant commands as an operational element of the Army's National-To-Theater Program and as a member of the National System for Geospatial Intelligence. The Army's space and intelligence experts exploit 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. During 2013, our GEOINT professionals created over 17,000 geospatial intelligence reports which provided essential support to the geographical and functional combatant commands. Late last year, our GEOINT Team was presented the 2013 Military Achievement Award by the U.S. Geospatial Intelligence Foundation for its work in developing a process to speed the exploitation of large volumes of hyper-spectral imagery data from DOD's experimental Tactical Satellite-3 platforms.

Operations Reach-back Support and Services:

Our Operations Center, located in Colorado Springs, CO, continues to provide daily reach-back support for our space experts deployed throughout the operational force and enables the Army 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.



Strategic Space Surveillance:

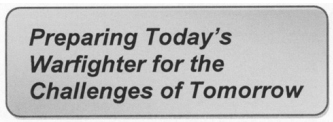
The Army also operates facilities and assets that are of utmost importance to protecting the Nation's use of space. The Ronald Reagan Ballistic Missile Test Site (RTS), located on the U.S. Army Garrison-Kwajalein Atoll in the Marshall Islands, is a national asset that provides unique radars and sensors 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 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 of 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 joint and Army 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. Assured 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 ensure the Army is prepared to conduct operations in a space-degraded environment.

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 joint, Army, and coalition requirements. This regimented approach helps ensure limited resources are applied where warfighter operational utility is most effectively served. This approach enhances our pursuit and development of necessary capabilities across Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF) domains to address 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 space related DOTMLPF alternatives and solutions.



In 2011, the Secretary and Chief of Staff of the Army approved the Army's Strategic Space 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.

The essence of our space strategy and the guiding vision of the Army space enterprise are to ensure Army forces conducting Unified Land Operations have access to resilient and relevant space-enabled capabilities. 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; and
- To employ cross-domain solutions to create a resilient architecture to address threats and vulnerabilities, and assure access to critical capabilities needed to sustain land force operations.

The initial implementation tasks of this strategy are complete. This past November, the Army completed a Space Capabilities Based Assessment to identify critical space gaps and potential solutions. These solutions are currently being evaluated and prioritized to ensure the most critical and affordable solutions are pursued. The Army also implemented a Space Training Strategy last year. This strategy seeks to improve the Army's understanding and utilization of space capabilities, to improve operations in contested operational environments, and to create an integrated and seamless continuum of career-long space education and training.

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 who 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 of capabilities that 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.

Space-Based Products—Providing Greater Capabilities to Future Warfighters

In conjunction with both DOD and non-DOD agencies, we continue to advance three responsive space Joint Capability Technology Demonstration (JCTD) Program efforts that have the potential to provide enhanced space capabilities to ground commanders and warfighters. A summarized update of these three initiatives follows.

SMDC Nanosatellite Program-3 (SNaP–3):

Future constellations of relatively low cost nanosatellites 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 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.

Kestrel Eye Visible Imagery Nanosatellite:

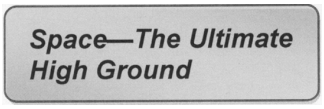
Kestrel Eye is an endeavor to manufacture and fly three electro-optical near-nanosatellite-class imagery satellites that can be more responsive in support to ground warfighters. Weighing about 30 pounds and capable of producing 1.5 meter resolution imagery, data from each Kestrel Eye satellite will be 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. The intent of this program is to demonstrate a small, tactical space-based imagery nanosatellite that could be employed in large numbers to provide a cost effective, persistent capability for 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 2015.

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

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 materials to provide an affordable launch for small weight payloads to low earth orbit with a goal of 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. NASA is providing reimbursable support for development of the SWORDS launch vehicle.

CONCLUSION

The Army is the largest user of space and space-based capabilities. USASMDC/ARSTRAT is actively engaged in organizing, manning, equipping, and training space forces for the Army. We also work with other organizations to continue to develop and enhance technology to provide our warfighters with 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. In adapting to the budget realities, space capabilities will become even more critical to enabling adaptive Army and Joint Forces.



While continued technological advances are critical, the most critical space asset we possess are the dedicated soldiers, sailors, airmen, marines, and civilians who develop, field, and operate space technology and deliver its capabilities to the warfighter. 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!

Senator UDALL. Thank you, General Mann.

Ms. Chaplain?

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

Ms. CHAPLAIN. Chairman Udall, Ranking Member Sessions, Senators Donnelly and King, thank you for inviting me to participate in today's hearing on DOD's space programs.

The GAO has been tracking space acquisitions, past problems, and reforms. Most of DOD's space programs have overcome significant problems and are now in the production phase. DOD has continued its focus on implementing acquisition management and oversight improvements. There are still technical and manufacturing programs affecting key programs such as MUOS and GPS–3, but the portfolio as a whole has not seen problems on the scale it saw last decade.

The challenges that face DOD now, in fact, are different than the ones faced just 5 or 6 years ago when most programs were in the development phase.

First, faced with budget constraints, DOD has been seeking ways to reduce costs and achieve savings as it negotiates contracts for more satellites and launch vehicles. For launch vehicles, it is also working to introduce competition and lower costs.

Second, faced with growing security threats and the need to increase resilience, DOD has been reconsidering its approach to acquisition. For instance, instead of building a satellite that meets many mission needs and serves a multitude of users, DOD is considering whether it should disperse missions, functions, and sensors across multiple systems, platforms, or domain. This approach is known as disaggregation.

We recently reported on DOD's efforts to introduce competition into the Evolved Expendable Launch Vehicle (EELV) program, and today we are reporting our preliminary findings related to disaggregation. On the EELV program, we reported that DOD has taken significant steps to gain insight into contract costs with its current provider, United Launch Alliance (ULA). This effort has resulted in significant savings. We also reported that DOD could take a range of approaches to introduce competition with the 14 cores coming up, and we specifically laid out the benefits and challenges with 2 approaches, having the EELV competitors compete for

launches under a commercial approach or having them compete similar to the way DOD now contracts with ULA.

In short, both approaches can foster competition. The first could further reduce prices, but it could also result in less insight into costs and reduce DOD's flexibility in scheduling launches. The second would maintain the flexibility and insight, but could add costs. For new entrants, for instance, it could require them to develop and install new business systems to fulfill government data requirements. We do not recommend an approach that should be taken. It is really DOD's decision and it is not GAO's role to make such a recommendation.

On the second question of disaggregation, we are reporting today that while our prior work shows these concepts can potentially reduce costs and development time, DOD does not yet have the knowledge it needs to make a transition to disaggregation on a wide scale. While DOD has conducted some studies that have assessed alternative approaches to the current programs of record, some within DOD do not consider these studies to be conclusive because they were either not conducted with sufficient analytical rigor or did not consider the capabilities, risks, and trades in a holistic manner.

More analysis about disaggregation is important because this approach can have far-reaching effects and because there are challenges to its implementation. For several missions, this analysis is in progress and we will be continuing to evaluate DOD's progress this summer for this subcommittee.

This concludes my opening remarks. I am happy to answer any questions you have.

[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. DOD spends billions of dollars each year to develop, produce, and launch space systems. These systems provide the government with critical intelligence information, communication methods, and navigation information, which are vital to many military and other government programs. Because these systems can be highly complex, they require large investments of both money and time to develop, produce, and launch. Given the expensive nature of space systems in today's constrained government budget environment, it is essential that DOD manage the acquisition of these systems carefully and continue to address problems that have plagued space systems acquisitions in the past decade.

In the past, DOD has seen program after program experience significant cost increases coupled with schedule delays. However, in recent years these problems have largely been overcome for the programs currently in production, and additional satellites of the same design are now being launched. With the worst of their acquisition problems behind them, DOD is beginning to look at potential new directions for the national security space community, including options for meeting program requirements through the disaggregation[1] of large space missions into multiple smaller satellites as a means to increase satellite resiliency and reduce acquisition costs and development time.[2] In addition, DOD has been introducing significant

[1] The Air Force defines space disaggregation as "[t]he dispersion of space-based missions, functions or sensors across multiple systems spanning one or more orbital plane, platform, host or domain." Programs may consider disaggregation in the future because it allows for options within a system's architecture to drive down cost, increase resiliency and distribute capability. Air Force Space Command, Resiliency and Disaggregated Space Architectures, White Paper (Aug. 21, 2013).

[2] DOD Space Policy defines resilience as the ability of an architecture to support the functions necessary for mission success with higher probability, shorter periods of reduced capability, and across a wider range of scenarios, conditions, and threats, in spite of hostile action or adverse

changes to the way it acquires space launch services, by transitioning to a new acquisition approach with a longer-term commitment, and by taking steps to introduce competition to its Evolved Expendable Launch Vehicle program, a major change from the last 8 years of that program. These potential changes may provide benefits to DOD, but there are challenges to their implementation.

My testimony today will focus on: (1) the current status and cost of major DOD space systems acquisitions; (2) recent actions taken to further improve space systems acquisitions; and (3) potential impacts of the direction DOD is taking on upcoming changes to the acquisition of DOD space systems. This testimony is based on Government Accountability Office (GAO) reports issued over the past 5 years on space programs and weapon system acquisition best practices, and on DOD reports. In addition, it is based on ongoing work conducted to address a mandate in the Senate Report accompanying the National Defense Authorization Act for Fiscal Year 2014 for GAO to review the potential benefits and limitations of disaggregating future space systems.[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. 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 2013 through 2018. More information on our scope and methodology is available in our related GAO products. The work that supports this statement was performed in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. DOD provided technical comments which were incorporated as appropriate.

BACKGROUND

Over the last decade, DOD has been managing many challenging space systems acquisitions. A longstanding problem for the department is that program costs have tended to increase significantly from original cost estimates. In recent years, DOD has overcome many of the problems that had been hampering program development, and has begun to launch many of these satellites. However, the large cost growth of these systems continues to affect the department. Figure 1 compares the original cost estimates with current cost estimates for some of the department's major space acquisition programs.

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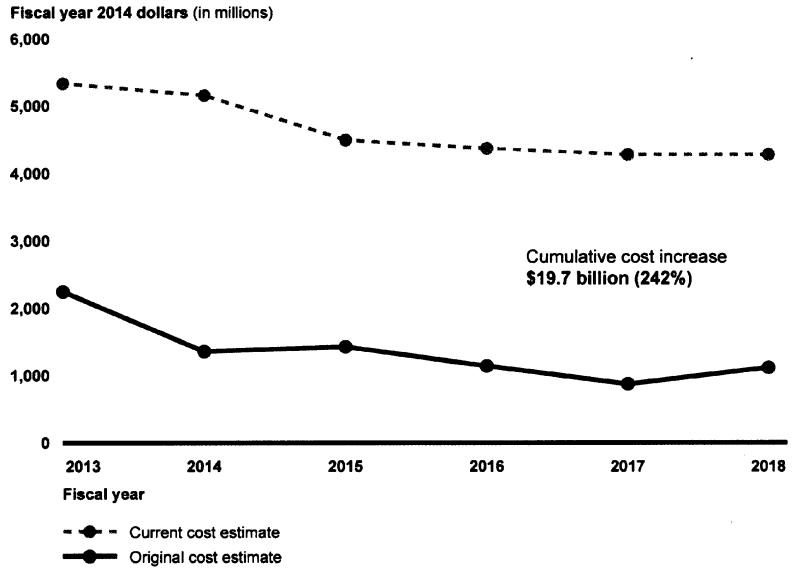
conditions. The policy further states that resilience may leverage cross-domain or alternative government, commercial, or international capabilities. See Department of Defense Directive 3100.10, Space Policy (Oct. 18, 2012). However, Office of the Secretary of Defense and Air Force officials we spoke with stated DOD is in the process of refining the definition of resilience and determining a methodology for measuring it.

[3] S. Rep. No. 113–44, at 165 (2013). The Senate Report mandated GAO to assess the potential benefits and drawbacks of disaggregating key military space systems and examine whether disaggregation and payload hosting (an arrangement where DOD instruments are placed on commercial or other agency satellites) offers benefits to cost and survivability of a constellation (a group of similar satellites synchronized to orbit the Earth in an optimal way).

Figure 1: Comparison of Original Cost Estimates and Current Cost Estimates for Selected Major Space Acquisition Programs for Fiscal Years 2013 through 2018.



Source: GAO analysis of DOD Selected Acquisition Report cost data.

Note: Includes Advanced Extremely High Frequency (AEHF), Evolved Expendable Launch Vehicle (EELV), Global Broadcast System (GBS), Global Positioning System (GPS) II and III, Mobile User Objective System (MUOS), GPS Operational Control System (GPS OCX), Space Based Infrared System (SBIRS), and Wideband Global SATCOM (WGS). This chart does not include planned new space acquisition efforts—such as Joint Space Operations Center Mission System (JMS), Space Based Space Surveillance Follow-on (SBSS), the Defense Weather Satellite Follow-on (WSF), or Space Fence—for which total cost data were unavailable.

The gap between the estimates in figure 1 represents money that the department was not planning to spend on these programs, and did not have available to invest in other efforts. The gap in estimates is fairly stable between fiscal years 2014–2018, a result of the fact that most programs are mature and in a steady production phase. This figure does not include programs that are still in the early stages of planning and development.

In past reports, we have identified a number of causes of acquisition problems. For example, in past years, DOD has tended to start more weapon programs than is affordable, creating a competition for funding that focuses on advocacy at the expense of realism and sound management. DOD has also tended to start its space programs before it has the assurance that the capabilities it is pursuing can be achieved within available resources and time constraints. There is no way to accurately estimate how long it would take to design, develop, and build a satellite system when key technologies planned for that system are still in relatively early stages of discovery and invention. Finally, programs have historically attempted to satisfy all requirements in a single step, regardless of the design challenges or the maturity of the technologies necessary to achieve the full capability. DOD's preference to make larger, complex satellites that perform a multitude of missions has stretched technology challenges beyond current capabilities in some cases.

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 example, we reported in the past that, among other actions, DOD created a new office within the Under Secretary of Defense for Acquisition, Technology and Logistics to focus attention on oversight for space programs and it eliminated offices considered to perform duplicative oversight functions. We have also reported in the past that the Air Force took actions to strengthen cost estimating and to reinstitute stricter standards for quality.[4]

THE CURRENT STATUS AND COST OF SPACE SYSTEMS ACQUISITIONS

Most of DOD's major satellite programs are in mature phases of acquisition, and some of the significant problems of past years, such as cost and schedule growth, are not currently as prevalent. Table 1 describes the status of the space programs we have been tracking in detail.

Table 1: Status and Cost of Selected Space Systems Acquisitions

Advanced Extremely High Frequency (AEHF) (satellite communications)	Original total program cost: $6.7 billion Current total program cost: $14.6 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 occurred in September 2013. 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: $4.4 billion Quantity: 8 Schedule: The program recently experienced a 21-month delay due to a satellite anomaly, and the first satellite is now expected to be ready for launch in January 2016. GPS III is to replenish a constellation of multiple generations of GPS satellites that provide global position, navigation and timing capability to both military and civil users worldwide.

[4] GAO, Space Acquisitions: DOD Is Overcoming Longstanding Problems, but Faces Challenges to Ensuring Its Investments Are Optimized. GAO–13–508T. (Washington, DC: April 24, 2013) and Space Acquisitions: DOD Faces Challenges in Fully Realizing Benefits of Satellite Acquisition Improvements. GAO–12–563T. (Washington, DC: March 21, 2012).

Mobile User Objective System (MUOS) (satellite communications)	Original total program cost: $7.1 billion Current total program cost: $7.4 billion Quantity: 6 Schedule: MUOS has launched two satellites. The third scheduled launch has been delayed 6 months to January 2015, as described in more detail below. 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) (missile warning, infrared intelligence, surveillance, and reconnaissance)	Original total program cost: $4.8 billion Current total program cost: $18.9 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. The third satellite is expected for delivery in late 2015. The program plans to fully meet operational requirements in 2019 once it has established the full on-orbit constellation of highly elliptical orbit sensors, four geostationary orbit satellites, completion of its first two software blocks, and delivery of its mobile ground assets. The production contract for the fifth and sixth satellites is expected to be awarded in early 2014. 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 is to 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.
Next Generation Operation Control System (GPS OCX) (command and control system for GPS III satellites)	Original total program cost: $3.5 billion Current total program cost: $3.5 billion Original quantity: 1 Current quantity: 1 Schedule: The first GPS OCX deliverable is scheduled to be complete in November 2014. The second deliverable, which is to provide command and control for GPS III satellites, is scheduled to be complete in October 2016, 9 months after the first GPS III satellite is available for launch. GPS OCX is to replace the current ground control system for current and new GPS III satellites.
Wideband Global SATCOM (WGS) (satellite communications)	Original program cost: $1.3 billion Current total program cost: $4.2 billion Original quantity: 3 Current quantity: 10 (two funded by international partners) Schedule: The first satellite was launched in October 2007, over 3 years later than estimated at program start. Currently, six satellites are on orbit. The seventh and eight satellites are in full production and scheduled for launch in 2016 and 2017. WGS provides 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 information.

Note: Dollar figures are reported in fiscal year 2014 dollars.

While many programs have overcome past problems, some of the major space programs have encountered significant challenges in the last year and some delays in development and production. For example:

- The Air Force's Space Fence program office is developing a large ground-based radar that is expected to improve on the performance of and replace the Air Force Space Surveillance System, which became operational in 1961 and was recently shut down. The Space Fence radar will emit radio frequencies upward to space, from ground-based radar sites, to detect and track more and smaller Earth-orbiting objects than is currently possible, and provide valuable space situational awareness data to military and civilian users. The Air Force had originally planned to award a contract for Space Fence systems development in July 2012, but due to internal program reviews and budget re-prioritizations, this date has been delayed to May 2014. In addition, the number of radar sites planned has been reduced

from two to one, though DOD plans to have an option under the system development contract to build a second site if needed.

- In April 2013, DOD proposed canceling the Missile Defense Agency's Precision Tracking Space System (PTSS) because of concerns with the program's high-risk acquisition strategy and long-term affordability. PTSS was intended to be a satellite system equipped with infrared sensors that would track ballistic missiles through their emitted heat. The planned satellite system would consist of a constellation of nine satellites in orbit around the Earth's equator. We reported in July 2013 that the decision to propose canceling the PTSS program was based on an evaluation of the acquisition, technical, and operational risks of the PTSS program. Specifically, DOD's evaluation assessed the PTSS cost, schedule, technical design, and acquisition strategy to identify whether risks could challenge the program's ability to acquire, field, and sustain the system within planned cost and schedule constraints. The evaluation also determined that the PTSS program had significant technical, programmatic, and affordability risks. The program officially ceased operations in October 2013.
- The Air Force has nearly completed its analysis of alternatives to determine the direction for space based environmental monitoring, which will be a follow-on program for the Defense Meteorological Satellite Program (DMSP). Through this analysis, the Air Force analyzed various options that included, but were not limited to, a traditional procurement of a weather satellite similar to the existing DMSP satellites, or a disaggregated approach using small satellites and hosted payload opportunities. According to the Air Force, the study was completed in the fall of 2013 and is awaiting final approval.
- The MUOS program plans to launch a third satellite in January 2015, which represents a delay of 6 months due to a production issue on the third satellite. Specifically, the third satellite failed system- and subsequent unit-level testing after rework last year and the program determined the root cause to be a manufacturing deficiency on a component critical for the operation of the satellite's ultra-high-frequency legacy communications payload. The program is replacing the component. According to the MUOS program office, the program is on track to meet the launch schedule of subsequent satellites, which is important because most of the communications satellites that MUOS is replacing are past their design lives. Synchronizing deliveries of MUOS satellites with compatible Army Handheld, Manpack, Small Form Fit (HMS) terminals remains a challenge. Currently over 90 percent of the first satellite's on-orbit capabilities are being underutilized because of terminal program delays. Consequently, military forces are relying on legacy communication terminals and are not able to take advantage of the superior capabilities offered by the MUOS satellites. Operational testing and initial fielding of MUOS-capable HMS terminals is planned for fiscal year 2014, with a production decision expected in September 2015.

RECENT ACTIONS DOD BELIEVES WILL IMPROVE SPACE SYSTEM ACQUISITION PROCESSES, AND CONTINUING BARRIERS TO PROGRAM OVERSIGHT AND MANAGEMENT

We have reported in the past that DOD and Congress are taking steps to reform and improve the defense acquisition system, and in the past year additional actions have been taken towards these goals.[5]

DOD Continues to Take Actions it Believes Will Improve Acquisition Oversight

In November 2013, DOD published an update to its instruction 5000.02, which provides acquisition guidance for DOD programs.[6] With this update, DOD hoped to create an acquisition policy environment that will achieve greater efficiency and productivity in defense spending. Air Force officials noted that, for satellite programs, there are two major changes that they believe will improve the acquisition process. First, the instruction was changed to formally allow satellite programs to combine two major program milestones, B and C, which mark the beginning of the development and production phases, respectively.[7] According to the Air Force, satellite pro-

[5] GAO–13–508T. GAO–12–563T.

[6] Interim Department of Defense Instruction 5000.02, Operation of the Defense Acquisition System para. 5.d.(10)(b) (Nov. 25, 2013).

[7] In defense acquisitions, milestone B provides authorization for a program to enter into the system development phase, and commits the required investment resources to the program. Milestone C is the point at which a program enters the production and deployment phase.

grams have typically seen a great deal of overlap in the development and production phases, mainly because they are buying small quantities of items. They are often not able to produce a prototype to be fully tested because of the high costs of each article, so the first satellite in a production is often used both for testing and operations. Air Force officials believe that this change to the acquisition guidance will allow for streamlining of satellite development and production processes, and provide more efficient oversight without sacrificing program requirements. GAO has not assessed the potential effects of this change. In the past, we have reported that committing a program to production without a substantive development phase may increase program cost and schedule risks, and we plan to look at the impacts of this change as it begins to be implemented.

A second change made this year, according to Air Force officials, is the requirement that DOD programs, including space programs, undergo independent development testing. While development testing for DOD programs is not new to this policy revision, now the testing organization will be an independent organization outside the program office. For space programs, this organization will be under the Program Executive Officer for Space, and will report their findings directly to that office, providing what the Air Force believes will be an independent voice on a program's development status. The Air Force is confident that these changes will provide benefits to program oversight, although because these are recent changes, we have not yet assessed their potential for process improvements.

In addition, DOD is adopting new practices to reduce fragmentation of its satellite ground control systems, which adds oversight to a major development decision. Last year we reported that DOD's satellite ground control systems were potentially fragmented, and that standalone systems were being developed for new satellite programs without a formal analysis of whether or not the satellite control needs could be met with existing systems.[8] In the National Defense Authorization Act for Fiscal Year 2014, Congress placed more oversight onto this process by requiring a cost-benefit analysis for all new or follow-on satellite systems using a dedicated ground control system instead of a shared ground control system.[9] This new requirement should improve oversight into these systems' development, and may reduce some unnecessary duplication of satellite control systems. According to Air Force officials, the first program to go through this process was the Enhanced Polar System, and all future satellite programs will include this cost-benefit analysis in their ground system planning. In addition, the act directed DOD to develop a DOD-wide long-term plan for satellite ground control systems.[10]

Additionally, the Defense Space Council continues with its architecture reviews in key space mission areas. According to Air Force officials, the Council is the principal DOD forum for discussing space issues, and brings together senior-level leaders to discuss these issues. These architecture reviews are to inform DOD's programming, budgeting, and prioritization for the space mission area. The Council has five reviews underway or completed in areas such as overhead persistent infrared, satellite communications, space situational awareness, and national security space launches. They are also initiating a study of how DOD can assess the resilience of its space systems. DOD also recently held a forum on resiliency that included participation from senior leaders from several groups within DOD and the Intelligence Community to create a work plan towards resolution of critical gaps in resiliency.

Many of the reforms that are being initiated may not be fully proven for some years, because they apply mainly to programs in early acquisition stages, and most DOD space systems are currently either in the production phase or late in the development phase. We have not assessed the impact of actions taken this year, but we have observed that the totality of improvements made in recent years has contributed to better foundations for program execution.

DOD Continues to Face Barriers to Program Oversight and Management

While DOD has taken steps to address acquisition problems of the past, significant issues above the program level will still present challenges to even the best run programs. One key oversight issue is fragmented leadership of the space community. We have reported in the past 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.[11] Past

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

[9] Pub. L. No. 113–66, § 822(a) (2013) (codified as amended at 10 U.S.C. § 2366b(a)).

[10] Pub. L. No. 113–66, § 822(b) (2013).

[11] GAO, 2012 Annual Report: Opportunities to Reduce Duplication, Overlap and Fragmentation, Achieve Savings, and Enhance Revenue, GAO–12–342SP (Washington, DC: Feb. 28, 2012);

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 and those to acquire imagery and environmental satellites, are integral to the execution of multiple agencies' missions. This fragmentation is problematic because the lack of coordination has led to delays in fielding systems, and also because no one person or organization is held accountable for balancing government-wide 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. Though changes to organizations and the creation of the Defense Space Council have helped to improve oversight, our work continues to find that DOD would benefit from increased coordination and a single authority overseeing these programs.

A program management challenge that GAO has identified, which stems from a lack of oversight, is that DOD has not optimally aligned the development of its satellites with associated components, including ground control system and user terminal acquisitions. Satellites require ground control systems to receive and process information from the satellites, and user terminals to deliver that satellite's information to users. All three elements are important for utilizing space-based data, but development of satellites often outpaces the ground control systems and the user terminals. Delays in these ground control systems and user terminals lead to underutilized on-orbit satellite resources, and thus delays in getting the new capabilities to the warfighters or other end-users. In addition, there are limits to satellites' operational life spans once launched. When satellites are launched before their associated ground and user segments are ready, they use up time in their operational lives without their capabilities being utilized. Synchronization of space system components will be an important issue for DOD in considering disaggregating space architectures, as the potential for larger numbers and novel configurations of satellites and ground systems will likely require the components to be synchronized to allow them to work together in the most effective way possible. As mentioned earlier, DOD is taking steps in response to improvements mandated by Congress. But it will likely be difficult to better synchronize delivery of satellite components without more focused leadership at a level above the acquisitions' program offices. For example, budget authority for user terminals, ground systems, and satellites is spread throughout the military Services, and no one is in charge of synchronizing all of the system components, making it difficult to optimally line up programs' deliveries.

DOD IS CONSIDERING AND ADOPTING SIGNIFICANT CHANGES TO SPACE SYSTEMS ACQUISITIONS

Fiscal pressures, past development problems, and concerns about the resiliency of satellites have spurred DOD to consider significant changes in the way it acquires and launches national security satellites.

Potential Changes to Acquiring New DOD Space Systems

Significant fiscal constraints, coupled with growing threats to DOD space systems—including adversary attacks such as anti-satellite weapons and communications jamming, and environmental hazards such as orbital debris—have called into question whether the complex and expensive satellites DOD is fielding and operating are affordable and will meet future needs. For example, a single launch failure, on-orbit anomaly, or adversary attack on a large multi-mission satellite could result in the loss of billions of dollars of investment and a significant loss of capability. Additionally, some satellites, which have taken more than a decade to develop, contain technologies that are already considered obsolete by the time they are launched.[12]

To address these challenges, DOD is considering alternative approaches to provide space-based capabilities, particularly for missile warning, protected satellite communications, and environmental monitoring. According to DOD, the primary considerations for studying these approaches and making decisions on the best way forward relate to finding the right balance of affordability, resiliency, and capability. These decisions, to be made over the next 2 to 3 years, have the potential for making sweeping changes to DOD's space architectures of the future. For example, DOD could decide to build more disaggregated architectures, including dispersing sensors onto separate platforms; using multiple domains, including space, air, and ground,

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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).

[12] GAO, Briefing on Commercial and Department of Defense Space System Requirements and Acquisition Practices, GAO–10–135R (Washington, DC: Jan. 14, 2010).

to provide full mission capabilities; hosting payloads on other government or commercial spacecraft; or some combination of these.

Our past work has indicated that some of the approaches being considered have the potential to reduce acquisition cost and time on a single program. For instance, we have found that DOD's initial preference to make fewer large and complex satellites that perform a multitude of missions has stretched technology challenges beyond existing capabilities, and in some cases vastly increased the complexities of related software.single program. For instance, we have found that DOD's initial preference to make fewer large and complex satellites that perform a multitude of missions has stretched technology challenges beyond existing capabilities, and in some cases vastly increased the complexities of related software.[13] In addition, developing extensive new designs and custom-made spacecraft and payloads to meet the needs of multiple users limits DOD's ability to provide capabilities sooner and contributes to higher costs.[14] Last year, we reported that one potential new approach, hosted payload arrangements in which government instruments are placed on commercial satellites, may provide opportunities for government agencies to save money, especailly in terms of launch and operation costs, and gain access to space.[15]

As new approaches, such as disaggregation, are considered, the existing management environment could pose barriers to success, including fragmented leadership for space programs, the culture of the DOD space community, fragmentation in satellite control stations, and disconnects between the delivery of satellites and their corresponding user terminals. For instance, disaggregation may well require substantial changes to acquisition processes and requirements setting. But without a central authority to implement these changes, there is likely to be resistance to adopting new ways of doing business, particularly since responsibilities for space acquisitions stretch across the military services and other government agencies. Moreover, under a disaggregated approach, DOD may need to effectively network and integrate a larger collection of satellites—some of which may even belong to commercial providers. We have reported that ground systems generally only receive and process data from the satellites for which they were developed. They generally do not control and operate more than one type of satellite or share their data with other ground systems. To date, however, DOD has had difficulty adopting modern practices and technologies for controlling satellites as well as difficulty in coordinating the delivery of satellites with the user terminals that must be installed on thousands of ships, planes, and ground-based assets. These are conditions that are difficult to change without strong leadership to break down organizational stovepipes and to introduce technologies or techniques that could enable DOD to better integrate and fuse data from a wider, potentially more disparate, collection of satellites.

In light of suggestions that disaggregation could potentially reduce cost and increase survivability, the Senate Committee on Armed Services mandated that we assess the potential benefits and limitations of disaggregating key military space systems, including potential impacts on total costs.[16] To date, we have found that the potential effects of disaggregation are conceptual and not yet quantified. DOD has taken initial steps to assess alternative approaches, but it does not yet have the knowledge it needs to quantify benefits and limitations and determine a course of action. DOD officials we spoke with acknowledge the department has not yet established sufficient knowledge on which to base a decision. While DOD has conducted some studies that assessed alternative approaches to the current programs of record, some within the department do not consider these studies to be conclusive because they were either not conducted with sufficient analytical rigor or did not consider the capabilities, risks, and trades in a holistic manner. For example, according to the Office of the Secretary of Defense's Office of Cost Assessment and Program Evaluation, a recent Air Force study that assessed future satellite communications architectures contained insufficient data to support the conclusion that one architectural approach was more resilient than others, and the cost estimates it contained did not consider important factors, such as ground control and terminal costs, in calculating the implications of changing architectures.

To build consensus in the department, and to conduct a more rigorous analysis of options, DOD is currently in the process of conducting additional studies that will consider future architectures. Included in these studies are Analyses of Alternatives

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[13] GAO, Space Acquisitions: DOD Needs to Take More Action to Address Unrealistic Initial Cost Estimates of Space Systems, GAO–07–96 (Washington, DC: Nov. 17, 2006).

[14] GAO–10–135R.

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

[16] S. Rep. No. 113–44, at 165 (2013).

for future missile warning, protected satellite communications, and space based environmental monitoring capabilities.[17] Among the range of alternatives these analyses are considering are approaches that keep the current system, evolve the current system, and disaggregate the current system into more numerous, but small and less complex, satellites. DOD has nearly finished the space-based environmental monitoring study and expects to finish the other two in either this fiscal year or next.

Moreover, as DOD continues to build knowledge about different acquisition approaches, it will be essential to develop an understanding of key factors for decisions on future approaches that could impact the costs, schedules, and performance of providing mission capabilities. Some considerations for moving to a new or evolved architecture may include the following:

- Common definitions of key terms, such as resiliency and disaggregation, across all stakeholders, and a common measurement of these terms in order to compare architectural alternatives.
- The true costs of moving to a new architecture, including transition costs for funding overlapping operations and compatibility between new and legacy systems and non-recurring engineering costs for new-start programs, among others.
- Potential technical and logistical challenges. For example, with hosted payloads, our past work has found that ensuring compatibility between sensors and host satellites may be difficult because of variable interfaces on different companies' satellites.[18] In addition, scheduling and funding hosted payload arrangements may be difficult because the timeline for developing sensors may be much longer than that of commercial satellites.
- Impacts to supporting capabilities, such as ground control and operations and launch availability, and longstanding challenges we have identified regarding how these have been managed.[19]
- Readiness of the acquisition workforce and industrial base to support a new architecture.

Given that DOD is in the early stages of assessing alternatives, our ongoing work is continuing to identify potential benefits and limitations of disaggregation and examine the extent to which these issues are being factored into DOD's ongoing studies. We look forward to reporting on the results of this analysis this summer.

Recent and Upcoming Changes to the Evolved Expendable Launch Vehicle Program

DOD has made some changes to the way it buys launch services from its sole-source provider, and plans to allow other companies to compete with that provider for launch services in the near future. DOD's Evolved Expendable Launch Vehicle (EELV) program is the primary provider of launch vehicles for U.S. military and intelligence satellites. Since 2006, the United Launch Alliance (ULA) has been the sole-source launch provider for this program, with a record of 50 successful consecutive government missions. From 2006 through 2013, DOD had two types of contracts with ULA through which ULA provided launch services for national security space launches.[20] DOD utilized this dual-contract structure to achieve flexibility in launch schedules and to avoid additional costs associated with frequent launch delays.

In the last few years, though the dual contract structure met DOD's needs for unprecedented mission success and flexible launch capability, predicted costs continued to rise for launch services. In response to these cost predictions, DOD revised its

[17] An Analysis of Alternatives (AOA) is a review in the DOD acquisition process that compares the operational effectiveness, suitability, and lifecycle cost of solutions to satisfy documented capability needs. Factors considered in the AOA include effectiveness, cost, schedule, concepts of operations, and overall risk of each alternative. A GAO report in 2009 found in many cases the AOAs did not effectively consider a broad range of alternatives and that DOD sponsors sometimes identify a preferred solution before an AOA is conducted. GAO, Defense Acquisitions: Many Analyses of Alternatives Have Not Provided a Robust Assessment of Weapon System Options, GAO–09–665 (Washington, DC: Sept. 24, 2009). These AOAs are to investigate follow-on programs for SBIRS, AEHF, and the Defense Meteorological Satellite Program. In addition to missile warning, SBIRS supports missile defense, battlespace awareness, and technical intelligence missions.

[18] GAO–13–279SP.

[19] GAO–13–315. GAO, Evolved Expendable Launch Vehicle: DOD Needs to Ensure New Acquisition Strategy Is Based on Sufficient Information. GAO–11–641. (Washington, DC: September 15, 2011) and Space Acquisitions: Uncertainties in the Evolved Expendable Launch Vehicle Program Pose Management and Oversight Challenges. GAO–08–1039. (Washington, DC: September 26, 2008).

[20] Under this two-contract structure, DOD bought launch capability on one series of contracts, and launch hardware on another series of contracts. Launch capability included things like overhead on launch pads, engineering support, and labor to conduct launches.

acquisition strategy to allow for a "block buy" of launch vehicles, where DOD would commit to multiple years of launch purchases from ULA, with the goal of stabilizing production and decreasing prices. In addition, and partially in response to GAO recommendations, DOD gathered large amounts of information on ULA's cost drivers to allow DOD to negotiate significantly lower prices under the contracting structure.[21] In December 2013, DOD signed a contract modification with ULA to purchase 35 launch vehicle booster cores over a 5-year period, 2013–2017, and the associated capability to launch them. According to the Air Force, this contracting strategy saved $4.4 billion over the predicted program cost in the fiscal year 2012 budget. We recently reported on some of the changes included in this new contract from the prior contracts.[22]

In addition to this change in the way DOD buys launch vehicles, DOD is also in the process of introducing a method for other launch services companies to compete with ULA for EELV launches. Since 2006, when ULA began as a joint venture between then-competitors Boeing and Lockheed Martin, the EELV program has been managed as a sole source procurement, because there were no other domestic launch companies that could meet the program's requirements. With the recent development of new domestic launch vehicles that can meet at least some EELV mission requirements, DOD plans to make available for competition up to 14 launches in fiscal years 2015–2017. Any launch company that has been certified by DOD to launch national security space payloads will be able to compete with ULA to launch these missions. DOD is currently finalizing their plan for this competition, including what requirements will be placed on the contractors and how they will compare proposals from the contractors.

Based on our discussions with DOD officials, they plan to use a best value approach for this competition, in which price is not the only consideration. DOD will likely consider several factors when comparing proposals for launch services for the 14 booster core competition between ULA and new entrants, including price, mission risk, and satellite vehicle integration risks. DOD could require competitive proposals to be structured in several ways. If DOD requires proposals to contain both fixed-price and cost reimbursement features for launch services and capability, respectively, similar to the way it currently contracts with ULA, there could be benefits to DOD and ULA, but potential burdens to new entrants. For example, DOD is familiar with this approach and has experience negotiating under these terms, and ULA is familiar with DOD's requirements given ULA's role as the EELV's sole launch provider. But use of a cost type contract may negate efficient contractor business practices and cost savings due to government data requirements under this type of approach, and it may give ULA a price advantage because DOD already funds launch capability for ULA. Alternatively, if DOD implements a fixed-price commercial approach to launch proposals with fewer data reporting requirements, DOD could lose insight into contractor cost or pricing, but may receive lower prices from new entrants due to these fewer data reporting requirements. DOD could also require a combination of elements from each of these approaches, or develop new contract requirements for this competition. We examined some of the benefits and challenges of the first two approaches, either of which can facilitate competitive launch contract awards, in a recent report.[23] DOD expects to issue a draft request for proposal for the first of the competitive missions, where the method for evaluating and comparing proposals will be explained, in the spring of 2014.

The planned competition for launch services may have helped DOD negotiate the lower prices it achieved in its December 2013 contract modification, and DOD could see further savings if a robust domestic launch market materializes. DOD noted in its 2014 President's Budget submission for EELV that after the current contract with ULA has ended, it plans to have a full and open competition for national security space launches. Cost savings on launches, as long as they do not come with a reduction in mission successes, would greatly benefit DOD, and allow the department to put funding previously needed for launches into programs in the development phases to ensure they are adequately resourced.

In conclusion, DOD has made significant progress in solving past space systems acquisition problems, and is seeing systems begin to launch after years of development struggles. However, systemic problems remain that need to be addressed as DOD considers changes to the way it acquires new systems. This is particularly important if DOD decides to pursue new approaches that could require changes in longstanding processes, practices, and organizational structures. Even if DOD de-

[21] GAO–11–641.

[22] GAO, The Air Force's Evolved Expendable Launch Vehicle Competitive Procurement, GAO–14–377R (Washington, DC: March 4, 2014).

[23] GAO–14–377R.

cides not to pursue new approaches, these problems must still be tackled. In addition, challenging budget situations will continue to require tradeoffs and prioritization decisions across programs, though limited funds may also provide the impetus for rethinking architectures. We look forward to working with Congress and DOD in identifying the most effective and efficient ways to sustain and develop space capabilities in this challenging environment.

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 ACKNOWLEDGEMENTS

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Senator UDALL. Thank you, Ms. Chaplain.

We will do 7-minute rounds. I will start.

General Shelton, I want to turn to you. Much has been said about the disaggregation of satellite sensors to smaller satellites or hosted payloads, but no studies have been done to prove that it increases survivability and lowers cost. What is your point of view on that set of questions?

General SHELTON. Senator, as Cristina just said, we are in the middle of these studies right now. In fact, she mentioned this as well. The way we have gone about procuring satellites, particularly advanced extremely high frequency (AEHF) and space-based infrared system (SBIRS) and GPS, we have bought blocks of satellites, in some cases two, in some cases more, but we have bought in blocks and saved considerable money by doing that. Some of that money we have plowed back into what we call strategic modernization initiative funds, and those funds support both technology improvement, as well as studying these disaggregation concepts, alternative architectures for the future.

What we are trying to do here is get ahead of the threat or at least stay up with the threat so that we are much more resilient, much more survivable in our architectures in critically important space capability for the future.

I would agree that we are not quite there yet. We have not gotten to definitive answers, but we are certainly in the middle of some very important studies on what those answers would be.

Senator UDALL. If there is one thing that you are known for, it is advocacy of SSA, and I want to thank you on behalf of the subcommittee for the great service you have done the Nation in that regard.

Do you believe we need an overall coordinated architecture for this effort rather than this accumulation of sensors that we now have?

General SHELTON. Yes, sir. We do have an overall architecture, and it is orbital regime by orbital regime. So what we need in low earth orbit, what gaps we have in capabilities, what we need in geosynchronous orbit, what gaps we have in those capabilities—we are filling those gaps. We are in the process of providing new sensors that would, indeed, fill those gaps with things like the Space Fence which will go out on Kwajalein, with things like the space-

based space surveillance satellite, which will come probably in the 2018–2019 timeframe. We are looking at moving the space surveillance telescope that is now in New Mexico down to Australia to provide us better coverage of deep space in the southern hemisphere.

There is a range of things that we are doing in terms of sensor technology, but in addition to that, we are putting a new system out at the Joint Space Operations Center (JSpOC) called Joint Space Operations Center Mission System (JMS). That will fuse all this data and provide us much better capability to be predictive in our SSA, much less reactive because right now we do forensic analysis, frankly, of what happened. We want to get to the place where we are predicting what is going to happen and then we can take steps to avoid the consequences of those actions.

Senator UDALL. Let me ask a final question of you that gets at the heart of this important discussion we are having. Do you believe deterrence concepts work with space assets?

General SHELTON. Senator, that is a very difficult question because traditional deterrence theory involves two things. It is either denying benefits to an adversary or imposing costs on an adversary. But much of that deterrence is based on being able to see what capabilities the adversary has. We do not make public in most cases some of the capabilities that we have, so there is no transparency there, so there is no deterrence. There is very little capability to really verify what we might consider as deterrence or treaty obligations or anything of that nature. Typically, what we have looked at for strategic deterrence in many cases does not apply because you just do not have the same situation, and as you reach into the cyber domain, it gets even worse.

Senator UDALL. That is a whole other conversation, is it not?

General SHELTON. Yes, sir.

Senator UDALL. Thank you for those insights.

General Mann, maybe I could turn to you. As I mentioned, one of the primary assets you maintain is the one on Kwajalein. Its location makes it very important for SSA.

Could you please explain to the subcommittee how the Army budgets for SSA and what improvements might be made in the budget process?

General MANN. Thank you, Senator, for that question.

Currently, the way we work the budgeting process is, we receive from STRATCOM the needs, the requirements each year in terms of products, whether it is imagery, and we use that to help form the Program Objective Memorandum (POM) that the Army puts forth. So we have an arrangement where we work very closely with STRATCOM, with the Air Force, to make sure that we fully understand what the requirement is and then we POM accordingly.

Now, something that might come in out of cycle or an additional request is something that we would have to take back to the Army and it would have to be prioritized and funded if it met that threshold.

Currently, that is the process, working very closely with STRATCOM based upon what their requirements are every year.

Second, your second question, Senator. I think not so much from the budgeting process—I think really what I have to do is I have

to make sure that I truly articulate the importance of SSA to the leaders that make the decisions. Obviously, there are multiple claimants for limited resources. From a budgeting standpoint, my challenge, my objective, is to make sure that I clearly articulate the importance and the priority that these requests should receive. Quite frankly, I think it is reflective in how the Army's senior leadership view space, missile defense, and cyber. It is at the top of the priority list. So I am pretty confident we are going to get the support we need.

Senator UDALL. Dr. Zangardi, let me try and fit in one last question. I know you will give a succinct answer.

You talked about MUOS. It is designed to replace an aging UHF system the Navy operates which, as I have implied, is near its end of life. Do you expect the event with satellite number 3 to affect our capacity to replace the aging system? If so, how?

Dr. ZANGARDI. No, sir, I do not. We experienced a 6-month delay moving to number 4 and pushing it back to a January launch of 2015. With the capacity we currently have up on orbit, between UHF, ultra-high frequency follow-on (UFO), MUOS, SV–1, and SV–2—we have two UHF packages there—hosted payloads and leased satellite capability, we exceed the Joint Staff requirement by 41 percent for channels where access is provided to the warfighter. So we are pretty confident that that will have no impact on the operational warfighter.

Senator UDALL. Thank you for that.

Senator Sessions.

Senator SESSIONS. Thank you.

General Shelton, the November 2013 U.S.-China Economic and Security Review Commission raises concerns about China's efforts to militarize space and develop an anti-satellite (ASAT) weapon capability. They say this in the unclassified report: Although Beijing claims the launch was part of a high-altitude scientific experiment, available data suggests it was intended to test at least the launch vehicle component of a new high-altitude ASAT capability. If the launch is part of China's ASAT program, Beijing's attempt to disguise it as a scientific experiment would demonstrate a lack of transparency about its objectives and activities in space. Furthermore, such a test would signal China's intent to develop an ASAT capability to target satellites in an altitude range that includes U.S. GPS, and many U.S. military intelligence satellites.

Is that accurate, to your knowledge? Do you agree with that assessment? Is it a concern to us?

General SHELTON. Senator, at this level, all I can say is we are concerned about all orbits now. We are concerned about low earth orbit because we saw the 2007 Chinese ASAT test, which was a success. We are concerned about work that we have seen since then that includes all the way up to geosynchronous orbit. Some of our most precious assets fly in geosynchronous orbit.

Senator SESSIONS. Are there actions we could take to deter our potential adversaries from taking such action? What do we consider it to be? Is it the equivalent of shooting down a military plane or attacking a ship? How do we respond to any potential attack on our satellite capability? Should we not make that clear now?

General SHELTON. Yes, sir. Those are policy questions that we are addressing right now. Maybe Mr. Loverro wants to say more about that. But I will tell you from the technology point of view, we are addressing that very issue.

Senator SESSIONS. Mr. Loverro, what do you think about that? Sometimes ambiguity encourages aggression, as many people stress. Should we have a clear position with regard to the consequences of aggression against a satellite of the United States?

Mr. LOVERRO. Yes, Senator. Actually, our national policy makes it clear that we view U.S. space assets as our sovereign assets and that attack on them is equivalent to attack on any sovereign assets. We have stated in our National Space Policy that we intend to go ahead and defend those assets in times and places of our choosing because we do view those as critical to U.S. national security.

Senator SESSIONS. I think it is important to make sure we understand. I am not sure you have stated absolutely clearly what would happen. But to the extent to which we make it very clear that you do not get to knock our satellites out and nothing will happen, I think it is very important. Thank you for sharing that, and I am glad you are working on it. We will probably inquire about it further as we go along.

General Mann, in November 2011, your team tested the Advanced Hypersonic Weapons (AHW) system. It demonstrated the best results to date for the development of a future prompt global strike capability. I understand there will be another test in August of this year. Can you provide the subcommittee a quick update on the progress that is managed by your command?

General MANN. Yes, thank you, Senator. Again, I am pretty proud of our team, those men and women at Huntsville with Sandia Labs, working with those folks. It is the only successful test to date of the AHW system.

Right now we are on track. As you mentioned, we have a test scheduled for August of this year. Then based upon the results that come from that test, then we will go ahead and again work closely with the Office of the Secretary of Defense (OSD) as to what they would like us to do, what the next steps are. I know that they are working with the Navy also on possible utilization of this capability.

Senator SESSIONS. I think there is a competitive environment for production of this, as I understand it. But tell us how you feel like your team is doing, to what extent it is an in-house operation, and how the costs are shaping up.

General MANN. Senator, right now we are on target with the costs. I do not see any kind of an overrun at this moment. Everything is predicated on what happens after the test. We have the monies allocated to support the test. We do not envision any kind of overruns. But really, I think once we see the results of the test and whether or not it met all the parameters and all the objectives, that I think will be illuminating for the OSD folks to really take a look at where they want to go with this, how much further they want to go. Do they want to look at a naval application for that? But in terms of the budget, we are on budget. We are not over

budget and we are on target right now to execute. No show-stoppers at this point.

Senator SESSIONS. You feel like there is nothing scientifically blocking you from success and reaching the goal at this point?

General MANN. Not at this point, Senator.

Senator SESSIONS. General Shelton, briefly. The full committee has delved into the concerns about cyber warfare and any vulnerabilities our systems might have, particularly our space and missile systems, to cyber attacks that could neutralize their capabilities even for a period of time. It might be a critical period of time.

Do you have any thoughts about that? I know you are concerned. Maybe some of the other panelists would offer an opinion.

General SHELTON. Yes, sir. We are going system-by-system looking at our cyber vulnerabilities, and we have a large information assurance program that gets into those vulnerabilities and patches them and tries to prevent access. In many cases, these are closed systems. That does not mean there are not vulnerabilities, but they are closed systems not accessible through the Internet. So it would take insider, special access, those kinds of things to get to these closed networks. But nevertheless, we are addressing all those touch points, if you will, and closing off those vulnerabilities as best we can.

Senator SESSIONS. Any other members want to comment on that?

We had legislation that required that to be done, a review to be done and a report to be done on this. What we found was the full committee staff recommended, and the subcommittee has fundamentally adopted it, that all our vulnerable systems—not just space and missile—be examined for these possible weaknesses. I think it is very important. Thank you for your work.

Senator UDALL. Thank you, Senator Sessions.

Senator Donnelly.

Senator DONNELLY. Thank you, Mr. Chairman.

Mr. Loverro, I do not know if you would be the guy to answer this one, but we currently rely on National Oceanic and Atmospheric Administration (NOAA) weather satellites. They are getting older, and I am concerned about their impact on military operations as they get older, if they are becoming less capable. I was wondering if there is a master plan to upgrade the weather satellite program and whether, as you look at it, you have the funding streams to get it done.

Mr. LOVERRO. Yes, Senator. Again, this is probably one of those questions that can be shared between myself and General Shelton. Let me start and perhaps let him finish.

Within DOD, I was a party to an extensive review of DOD weather needs, analyzing not just the NOAA systems but commercial and international systems as well, and what kind of specific needs did DOD need to bring to bear to assure that its capabilities were protected. Air Force Space Command took a very aggressive approach on that, brought forward a program and issues budget that I probably should turn to General Shelton to go ahead and talk about.

General SHELTON. Yes, sir. Following that analysis of alternatives that Mr. Loverro is talking about, we have gone forward

with a weather system follow-on program we call it, which will end up being a small satellite which has unique DOD requirements satisfied. Like he said, we will count on NOAA, international and commercial partners to provide the rest of the data that is needed to round out the weather picture.

We are in the process right now of launching a defense meteorological satellite program. Satellite number 19 will launch within the next couple of months from Vandenberg Air Force Base. We will put up a new satellite. What happens after that is under review, but we are confident we are in a good place, sir.

Senator DONNELLY. General Mann, the hypersonic missile program is really quite a task. You are doing amazing work on it. What I was also wondering is, as other nations are working on this, as we know they are, do we have groups working on how to counter their efforts in this area or how to protect our Nation from their efforts I guess would be a better way to put it?

General MANN. Let me say that we are aware of the technologies that are being looked at. I would like to take that for the record. I really do not know of specific programs that we are putting into place to combat that threat, but we are aware. In the case of Russia, I know that Russia is heavily involved in looking at this kind of capability. But really, let me take that for the record to get you the exact programs, if they are out there.

[The information referred to follows:]

Just as the Department of Defense (DOD) continues to mature and field capabilities to counter the growing ballistic missile defense threat, we also are working to address the emerging threat posed by a hypersonic glide body delivery platform. DOD continues to evaluate defensive capabilities to address the emerging hypersonic technology threat. Additionally, as is the case with many of our technologies, DOD is attuned to and working diligently to identify and neutralize adversarial actions to garner hypersonic technology. Upon request, further details could be provided via a classified session or paper.

Senator DONNELLY. General Shelton, as we look at the ground-based interceptor systems and such, we are looking at some sites for further development to protect us from North Korea and Iran. Do you see that as a necessary step as we move forward?

General SHELTON. Senator, I really do not work missile defense, to tell you the truth, other than to provide radar support to missile defense interceptors. That may be something General Mann could answer better than me.

General MANN. Yes, Senator. Thank you.

Obviously, putting a third site out there on the east coast will provide increased capacity, not so much capability, but increased capacity. You will take your assets and spread them out so that you do not have them just at Greeley or at Vandenberg Air Force Base. It also will give you a little bit more decision space or battle space, as it is known, in order to make a decision regarding a threat emanating from Iran.

But I will have to tell you that I think that the greatest priority, the most important thing that we need to really focus on, is long-range discrimination because I think it is fair to say that we will never have enough interceptors to really address all the threat vehicles that are out there. So I think it is more important that we are as efficient and as effective with the interceptors that we currently have. That is the reason why making sure that we are pro-

viding the interceptor with the best track data, the discrimination to be able to really identify the target within a complex, that is what I would really highly recommend.

Senator DONNELLY. This would be to whoever would like to take it. If China is conducting test targeting objects, for instance, up to 12,000 miles away from the Earth's surface, could this affect our GPS capabilities, our GPS satellites?

General SHELTON. Yes, sir.

Senator DONNELLY. In a significant way?

General SHELTON. Yes, sir.

Senator DONNELLY. Would their efforts, if they do this, indicate a significant improvement in China's space weapon capabilities as well?

General SHELTON. No question. Yes, sir.

Senator DONNELLY. This would be for Dr. Zangardi, and that is, in relation to relying more heavily on networks and computer components to utilize our military and space systems than we ever have before, what confidence do you have in our ability to detect counterfeit parts, similar parts that create a danger of their own, obviously? Number one, it is important to protect our Nation. Number two, Naval Warfare Crane out of Indiana does a lot of this work. It is something that is very concerning to me to make sure that we get this right.

Dr. ZANGARDI. Yes, sir. It is very concerning to us also. We spend time with the Naval Warfare Center at Crane. That does not fall within my portfolio. I mainly work with Space and Naval Warfare Systems Command (SPAWAR) out of San Diego and their technical acquisition expertise in this area.

We take it very seriously. Specifically as related to MUOS, we have put in place actions in the program to review what we are taking in, what we are procuring. In a broader IT sense, the IT portfolio within the acquisition of the Navy falls under me. We take very seriously this threat and we are putting in place actions to begin to ensure that we are not buying parts that would not be good for us to have.

Senator DONNELLY. What is your determination—I will ask this very quickly as I am out of time—as to the rate of counterfeit parts, what you are seeing? Do you see an increase, decrease, or what is your best estimate at the present time?

Dr. ZANGARDI. Sir, I am hesitant to give an estimate. I would like to take that question for the record and provide you an answer at a later time.

Senator DONNELLY. That would be fine.

[The information referred to follows:]

Lockheed Martin Space Systems Company (LMSSC) has experienced a total of eight known counterfeit parts incidents since 2008, none on the MUOS program. The trend is declining with the last incident occurring in October 2012. The breakdown is:

2008	2009	2010	2011	2012	2013
2	2	3	0	1	0

The program procures screened and controlled parts and also follows a robust counterfeit parts prevention process. The strategy centers on purchasing parts from authorized sources, Original Component Manufacturer or their franchised distribu-

tors. Requirements are flowed to subcontractors to further ensure that procurements they make also conform to LMSSC policy.

Senator DONNELLY. Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator Donnelly.

Senator King?

Senator KING. Thank you, Mr. Chairman.

General Mann, I just want to emphasize—I think you said something very important that what we really need to be talking about on this missile defense is long-range discrimination and sensors. Does the President's budget take that into account? Are there initiatives, programs?

General MANN. Thank you, Senator.

Yes, there are programs, and in fact, as a result of the bipartisan budget agreement that took place, I am pretty sure that the Missile Defense Agency (MDA) received some additional funding. That is one of the things in their portfolio that they are looking at. How robustly it is funded I really cannot say, but I do know that MDA is looking at that as a technology that they are going to pursue.

Senator KING. Thank you.

General Shelton, I want to engage in a hypothetical. This hearing is about the importance of the military aspects of space. Tell us what would happen if all of our space assets were wiped out in a 5-minute period. What would that mean to our ground and naval forces if we were in a conflict situation?

General SHELTON. I would tell you, Senator, that we are so dependent on space these days. We plug into it like a utility. It is always there. Nobody worries about it. You do not even know sometimes that you are touching space. So it would be almost a reversion back to almost industrial-based warfare, industrial age warfare. We would not be able to communicate as well. We could not navigate as well. We would not operate with the precision. We would not have the coordination. It would be a while recovering our coordinated, integrated aspects of warfare. We operate as an integrated joint team now. Much of that is provided by space capability. So recovering that without space would be very difficult, if not impossible.

Senator KING. Given the importance and given that vulnerability, does it not make strategic sense—I know there is a discussion. I think the term is "disaggregation"—to spread these capabilities over smaller satellites, different satellites, commercial satellites so that we do not have a Pearl Harbor of space where a few major facilities are knocked out and then we are in trouble? Just strategically, is it not better to have a diverse structure?

General SHELTON. Senator, this is exactly what started taking us down this path. As we started thinking through—I will call it the cheap shot. Let us postulate an AEHF satellite on orbit. Four of them represent the entire constellation. Take one of those out, and you have opened up a big gap in our ability to communicate over protected resources. That would be very difficult for the National Command Authority. It would be very difficult for our deployed troops. So, yes, dispersing our capability, having a much more failure resilient and attack resilient architecture, that is exactly what our study efforts are aimed at and trying to provide that capability for the future.

Senator KING. Do we have options, including military capabilities, on civilian satellites, and vice versa, for that matter?

General SHELTON. We are exploring those concepts right now. We have had a very successful test of a commercially-hosted infrared payload. It was an infrared sensor hosted on a commercial satellite, a very successful program. It showed us a lot about what was possible of hosting payloads on commercial satellites, lots of lessons learned, and we are continuing to pursue those concepts for the future.

Senator KING. In Maine, we are having a lot of success putting cellular towers in church steeples. If that is not dual use, I do not know what is. [Laughter.]

General SHELTON. Yes, sir.

Senator KING. Ms. Chaplain, what about the possibilities of greater competition in terms of launch capability? We have the unified launch system—is it Lockheed and Boeing. But are there other companies? Is this an area where there can be some competition and therefore greater economies for the Government?

Ms. CHAPLAIN. I think we finally arrived at the point where there are other companies that can begin to contend for space launches. They have not been certified yet and it might take a little while before they are certified. But SpaceX is going through that process, for example, and it hopes to be certified by the end of the year. There is at least one more company that might be in the mix there.

DOD has set aside a number of launches, 14, that they could compete for, but they will compete with ULA too. Competition is on the horizon and it is a matter of just figuring out how best to do it in a way that you can measure the competitors in a similar way.

Senator KING. Let me ask a basic question. Who owns the rockets and how do we pay for it? Does the Government or does the military contract with ULA, for example, and say we will pay you $10 million to get this satellite into orbit, or do we buy a rocket from them and then we launch it? Who has title to this?

Ms. CHAPLAIN. It is a combination of things, but we buy it as a service. The rocket itself and the launch is bought as a service, and then separately we have a contract with ULA that is not a fixed price contract. It is a cost-plus contract, and it pays for all the things that go behind launching those rockets. There is a lot of capability and skill sets behind those launches that need to be maintained.

Senator KING. If this is something that is done on a fairly regular basis and has been for some years, why are we doing cost-plus and not fixed price?

Ms. CHAPLAIN. It has been the Government's choice to follow the cost-plus approach mainly to have maximum flexibility, maximum convenience. They want ULA to be ready to launch these rockets whenever the Government wants them to launch. If you move to an approach where you are more dependent on the supplier and you are not paying for this extra premium of capability, you could have delays. You might be in a situation where the supplier cannot readily accommodate you. If you have several suppliers, that might be okay. You could go back and forth and see who could meet that,

but when you have one supplier, the Government, in the situation it was in, chose to have this kind of convenience and flexibility and it chose the approach it did to accommodate that.

Senator KING. I would appreciate your keeping the subcommittee updated on the progress of competition in this area of launch just so we can be aware of what is available when and what the timetable is.

Ms. CHAPLAIN. We are happy to do that.

Senator KING. I appreciate it.

One more quick question, Mr. Chairman, if I can take another minute.

General Shelton, there is a recent Congressional Research Service report that says we have an orbital debris problem. How serious is that and is there any way to deal with it?

General SHELTON. Senator, just some numbers. We routinely track about 23,000 objects on orbit right now. About 1,000 of those are active payloads. The rest of those are defunct satellites, pieces of debris, defunct spent stages, those sorts of things.

Our models tell us that between 1 centimeter in size and 10 centimeters in size, which is the practical limit of what we can track—so those 23,000, by the way, is just what we can track, but between 1 and 10 centimeters, we think there are 500,000 objects on orbit. So, yes, this is a very serious problem, and I have seen nothing yet that will be technically viable for active debris removal.

Senator KING. So it is just something we have to cope with, but it seems to me you could lose a very valuable satellite to a very cheap piece of space junk.

General SHELTON. We actually already have. There is a commercial satellite that was hit by an old Russian satellite and caused catastrophic loss for the company, Iridium.

We need better capability to track, which is what the Space Fence is all about. We need all space-faring nations to not generate more debris because our biggest fear is that if you get more and more debris on orbit, eventually you get to the place where debris begets debris. You have a cascading effect and you have polluted entire——

Senator KING. Might this not be an area rife for international cooperation? It is in everyone's interest who is in space to deal with this problem, and maybe we could have a joint venture on this cleanup problem?

General SHELTON. Yes, sir. I know Mr. Loverro has been actively involved in that internationally certainly to address the debris creation problem but also to generate norms of behavior internationally that would keep people on the straight and narrow.

Senator KING. We need returnables. We need a returnable law.

General SHELTON. Yes, sir.

Senator KING. Thank you.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator King.

Mr. Loverro, let me ask you a similar question I have asked some of the other panelists and that is the question that attaches to the disaggregation of space sensors and hosted payloads. The studies are underway. Which satellite systems do you think are best suited for this approach?

Mr. LOVERRO. Thank you, Mr. Chairman.

It is interesting. We have already created several disaggregated systems without realizing it. One of those would be the weather systems we talked about with Senator Donnelly earlier. Probably about 50 to 100 different satellites with a variety of sensors all contribute to that weather picture. I spoke—I do not know if it was in this committee last year or whether it was on the House side—that if I were an adversary trying to target the weather capability, I would not know what to shoot at because there are just too many targets.

GPS is somewhat of a disaggregated system. We call it "distributed," many satellites that if you lose one, you do not lose the capability. In fact, you could lose several and not lose it. That is not an invitation to lose any, but it certainly makes it more resilient than the example that General Shelton gave, for example, on the AEHF system where if you lose one satellite, you lose coverage for an entire hemisphere. Those kinds of systems, AEHF and SBIRS, where one system tends to cover an entire side of the Earth, are the ones really where we see the most danger.

That does not mean that we are secure in any of our space capabilities. All of our space capabilities need to respond to the threats we have seen. They were not built to go ahead and sustain themselves in an environment in which they are threatened. They were not built in an environment where they would be used in conventional warfighting and threatened by conventional means. They were built for nuclear warfighting. So all of the architectures need to be refreshed with that view in mind. Disaggregation is an important concept especially for AEHF and SBIRS. But that concept, what we call resiliency in space, applies to all of our space systems.

Senator UDALL. Assess the new entrant policy in space and then, if you will, think 10 years out for us, what concerns you would have, what might be some of the up sides.

Mr. LOVERRO. Absolutely. I think we have talked a lot about the up sides. I think Ms. Chaplain has already talked about some of the cost reductions that we have seen in the EELV ULA program. Some of those we get because we have decided to buy more launchers, but there is no question that some of those came about in the face of competition. I already spoke in my opening statement about competition being good.

I think that there is clear evidence that the competitive aspects of launch will benefit DOD. We were on that path in the early 1990s and we moved away from it because at the time we did not think there was enough launch rate to sustain competitive actions in space. The indication for the future is that is not the case. The indication is that there is enough launch need to sustain a competitive environment. The indications are that in that competitive environment, we can bring commercial launch back to the United States. SpaceX has been one of the most successful companies in attracting competitive international launch back into the United States, which is good for us all.

I think this is a very key aspect. I think what we will have to avoid and what the President's National Space Transportation Policy clearly suggests is that we want to maintain that competition for the future. We do not want to be 10 years down the road, as

you hypothesized, and decide, maybe we should go down to one supplier. We think that is the wrong way to do it. We think that to keep the environment competitive keeps it inexpensive or lower expensive. It is never going to be inexpensive, but at a lower expense. It keeps folks trying to go ahead and prove the technology on their own rather than relying on the Government to do so. We think that is a critical aspect of the future.

Senator UDALL. I think, as you were saying, we have to thread the needle here. We have under-capacity that presents one set of threats; over-capacity presents another set of threats. The U.S. Government, therefore our people, are on the hook either way, and we have to try and find that balance.

Mr. LOVERRO. Yes, sir, absolutely.

Senator UDALL. Ms. Chaplain, let me turn to you. We always look forward to having you here because you have such a great understanding of the challenges and what we need to do to keep faith with the taxpayers.

Talk about the EELV a bit. I know you mentioned the lack of transparency in the launch services contract schedule. Could you speak to that?

Ms. CHAPLAIN. So until recently, there has been a great deal of lack of transparency into costs, particularly on what is known as the EELV contract. That is the one that is the cost-plus side. But in the course of negotiating contracts recently, the Government made a tremendous effort to get insight into cost, and they did so to a great extent. What did not happen was not all the costs could be tied to a launch vehicle by the Government. So there is probably 70 percent or so where you cannot exactly tie those activities and parse them out amongst launch vehicles. But the Government does have a lot more transparency into those costs. They know what they are. They know what they are paying for a year. They know how to break it down amongst all the activities. That is great progress from where we were before. It is just a matter of, you just do not have that visibility tied by launch vehicle, and there are reasons that are good to have that. Hopefully we will get that in time.

Dr. ZANGARDI. Sir, may I add from the Navy's perspective?

Senator UDALL. Yes, please, Doctor.

Dr. ZANGARDI. From MUOS' perspective, we have seen an increase in transparency. We are happy with what we are seeing. We have also seen a decrease in cost. So we have seen an improvement. Now, granted, the data points we have are quite limited, but then again, we have seen improvement over the last couple years.

Senator UDALL. Thank you for that elaboration.

Ms. Chaplain, I have been asking many of the panelists about disaggregation of existing satellite systems, which after 10 years I think have stabilized costs and requirements. Do you believe the assessments involved purely from a schedule standpoint will timely inform the decision for using existing systems or follow-on systems?

Ms. CHAPLAIN. I do have questions about whether the assessments will be done in time to have enough input into the next set of buys that come up for programs like SBIRS. In other cases on the communication side, they probably will be able to have maximum information provided and ability to do things about that information. But I am concerned that if they take too long, time will

make its decision for it. If you do not have enough time to act on the information that you get, you are just going to have to go along and buy what you keep buying.

Senator UDALL. It is an important point.

Senator Sessions?

Senator SESSIONS. Thank you. We have seen some progress in competition, and it has saved the taxpayers some money. Mr. Loverro, you mentioned that the EELV buy was 36 over a period of years, and my understanding is that you believe it saved $4.4 billion. Competition and a longer buy were the main factors in that, in your opinion?

Mr. LOVERRO. Yes, Senator. I do not want to quote a number. It is not my business to be in the budget game specifically, but savings were significant and I believe both factors led to those savings.

Senator SESSIONS. We have seen some other savings too when we rebid the maintenance program for one of our systems. It was a billion dollar savings. Do you know what I am referring to there?

Mr. LOVERRO. You may be referring to what is called the launch infrastructure program, so-called, LISC program, launch range infrastructure program, a competitive bid that one of General Shelton's organizations, the Space and Missile Systems Center, is responsible for. Again, I think competition is looked for to drive those savings down. I would again turn to General Shelton for more details on that program.

Senator SESSIONS. General Shelton?

General SHELTON. Senator, the $4.4 billion figure that you quoted is accurate. If you look at the fiscal year 2012 President's budget as your baseline and then look at what we actually contracted for, there is $4.4 billion of difference. Now, a lot of people want to dispute that. A lot of people want to reaccount for that money. But, in fact, from an Air Force budget perspective, it is $4.4 billion of difference.

As Mr. Loverro just talked about, this combined contract that will service both the eastern range and the western range for launch services is going to save us a bundle of money. We are in the source selection process for that right now and contract start should be the 1st of October this year.

Senator SESSIONS. I think I am correct—and I will just wrap up here—to say that we were, I think, at $554 billion for budget function defense, which includes homeland security monies. That dropped down to $518 billion. Then it was projected to go to $498 billion this year. Then Ryan-Murray put back money that moved it back up to $521 billion this year. It is projected to be at $521 billion next year and $523 billion the next year. That is billions of dollars each. Basically, under the Budget Control Act we have today, it will be at flat level spending considerably below what we were a few years ago.

But it does start increasing then at the rate of $13 billion a year for the next 6 years, I believe it is. So we end up over $590 billion at the end of the 10-year budget window.

I say that I am not sure we can replicate these kinds of cost savings in the future, but a few more of those cost savings plus the fact where we are now—I am not sure we have to devastate our procurement system to stay on track even with a very constricted

budget DOD has dealt with. In fact, my analysis of the budget is DOD has the most significant reductions than any other department of our Government. If you were given more time to achieve the savings, it would be easier even then. The biggest danger was we had these cuts so fast. That is what the Ryan-Murray—I did not like the way they did it, but the result of getting more money this year so we do not have another big cut on top of the last one because there are efficiencies in productivity.

This $4 billion savings, General Shelton—you could not account for it in the first year, could you? You had to account for it each year over a period of years. Savings effected today may not actually accrue until the out-years. That is one of my particular concerns about the danger of the difficulties in the defense budget.

We will have to see where we are. Thank you for your work to bring down costs. As technology gets more common, things that 10 years ago were out of this world are more routine today and should cost a lot less. You certainly see computers and everything else drop in their cost. So maybe we can not be too pessimistic about our budget. I hope so.

Senator UDALL. Thank you for that, Senator Sessions.

I have one more question. I did not have a chance to check with Senator Sessions, but if he does not have any other questions, I will ask my question and we will end the hearing.

But I would add to what Senator Sessions said. The Murray-Ryan budget possibilities and opportunities are there as long as we do not fall back into sequestration 2 years hence.

Senator SESSIONS. Let us talk about that. Everybody needs to get this straight. With sequestration and the way current law expects spending to be, DOD will spend $521 billion this year, $521 billion next year, $523 billion the next year, and then go to $536 billion, $549 billion, and it goes up $13 billion each year thereafter. So there is really no more cuts. It is just flat spending for 3 years, which is not easy to deal with. There is a feeling that I keep picking up among my colleagues that we are facing additional cuts as a result of the sequester. The sequester was what hit us this year. That is what got us, and it was dangerous.

I do not know whether you have sufficient money to meet the defense needs of the country or not. But if we keep finding these kinds of savings, we might surprise ourselves and we can maintain a sufficient defense of America at a more reasonable cost. I hope so.

Senator UDALL. Me as well. Thank you for that, Senator Sessions.

General Mann, the last question is yours for the day. The Air Force may fire communication satellites, but SMDC is the primary scheduler of bandwidth for DOD communications via the wide band global satellite and the defense satellite communications systems. Over the next 5 years, what do you see as the Army's biggest issue and what do you recommend to help alleviate it?

General MANN. Senator, thank you for that question.

I think we talked a little bit about this in terms of maintaining persistent and protected communications, I think it is going to be our biggest challenge over the next couple of years. So whether that is hardening the things that we have in space on orbit or our

ground stations and also looking at our tactics, techniques, and procedures, how we operate those things, those are the areas, I think, that we really need to focus on to make sure that we address a threat that is only going to evolve and increase in intensity over the next couple of years.

Senator UDALL. We on the committee look forward to working with you on that important mission.

I want to thank the panelists again for spending time with us, for being succinct, for being to the point.

We will leave the record open for another 3 or 4 days. We may extend some additional questions to all of you. Thanks again for your time.

This hearing is adjourned.

[Whereupon, at 4:18 p.m., the subcommittee adjourned.]

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR DAVID VITTER

JOINT MISSION SYSTEM PROGRAM

1. Senator VITTER. General Shelton, the Joint Mission System (JMS) is responsible for Space Situational Awareness (SSA) and command and control (C2) of space forces. The JMS program office inserted some important commercial SSA capabilities into the JMS program. The committee previously included report language stating that this capability requires timely migration from fragile legacy components. In addition, there are some very concerning emerging threats in the space environment which are highly classified. In an effort to meet growing demands, the national security community has utilized similar commercial SSA capabilities elsewhere. In your testimony, you state that this new normal in space requires us to address protection of mission-critical systems, challenge traditional acquisition practices, and analyze new operational constructs. Given your statement about the growth of these space threats and other known current utilization of similar commercial SSA technology by similar important intelligence programs, would it be possible to accelerate the integration of commercial SSA capabilities into the JMS program?

General SHELTON. The JMS acquisition approach allows for the agile adoption of capability with accelerated delivery to the warfighter. The JMS Program Office has already awarded contracts to two commercial companies (a.i. solutions and Analytical Graphics Inc.) to provide commercial SSA capabilities.

During fiscal year 2015 and fiscal year 2016, the JMS program will be primarily focused on the integration of commercial products from these two companies. The pace of the effort is limited by funding and by the time required for security and other modifications of the commercial software to run in JMS.

2. Senator VITTER. General Shelton, would integration of established SSA capabilities into the JMS program help the Air Force detect, analyze, and characterize these threats faster?

General SHELTON. The integration of established SSA capabilities does assist the Air Force in detecting, analyzing, and characterizing threats faster. Some of these capabilities have already been incorporated into the JMS program and are being used in operations today. During the course of fiscal year 2015 and fiscal year 2016, additional capabilities will be integrated into the JMS baseline. These capabilities include commercially developed SSA tools we believe will be extremely valuable in meeting current and emerging threats.

3. Senator VITTER. General Shelton, what can Congress do to assist in this process to help provide what the warfighters need?

General SHELTON. As a still evolving system, JMS presents several opportunities to exploit new SSA tools and alternative architectures to build an adaptive and resilient capability to attain appropriate SSA and C2 of space forces in a dynamic strategic environment. JMS enhancements will field advanced capabilities to improve the detection and characterization of emerging threats and orbital hazards and integrate previously unavailable data sources and sensors. However, the great-

est challenge in attaining this gamechanging capability has been fiscal, rather than technical.

Funding stability will enable the warfighter to further enhance and maintain a robust national space capability to address progressively more challenging and numerous adversary threats. For example, an improved JMS will have the capacity to monitor and respond to full electro-magnetic spectrum interference, decreased threat identification and warning response times, and the ability to forecast and predict future SSA events with sophisticated modeling and simulation. Together, these new capabilities will present the joint force with a more resilient, capable, and affordable space capability.

4. Senator VITTER. General Shelton, in addition to your testimony today, we also heard from General Mann, where he stressed to the subcommittee the need to ensure our Nation's space capabilities are maintained and further enhanced. In that effort to better understand these needs, I am requesting a briefing from you or someone on your staff in the near future on how the Air Force is striving to connect both established and emerging processes, as well as on space threats from adversaries as highlighted by recent statements made by General Shelton and Admiral Haney during testimony before this full committee. Will you work to ensure this briefing happens?

General SHELTON. Yes. I will ensure a briefing is scheduled with you on how the Air Force plans to organize, train, and equip in order to provide essential, gamechanging space and cyberspace capabilities for our joint forces to combat current and emerging space threats.

DEPARTMENT OF DEFENSE AUTHORIZATION OF APPROPRIATIONS FOR FISCAL YEAR 2015 AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, APRIL 2, 2014

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 2:33 p.m. in room SR–222, Russell Senate Office Building, Senator Mark Udall (chairman of the subcommittee) presiding.

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

OPENING STATEMENT OF SENATOR MARK UDALL, CHAIRMAN

Senator UDALL. The subcommittee will come to order. The Strategic Forces Subcommittee meets today to consider the ballistic missile defense programs and policies supporting the President's budget request. We have five expert witnesses joining us today to help us review these important and complex issues.

Ms. M. Elaine Bunn is the Deputy Assistant Secretary of Defense for Nuclear and Missile Defense Policy. She's testified before the subcommittee on nuclear policy, and she's here today as the Department of Defense's (DOD) expert on missile defense policy issues.

The Honorable Michael J. Gilmore is the Director of Operational Test and Evaluation within DOD. He provides DOD and Congress with independent assessments of the adequacy and results of our missile defense testing and also plays a critical role in reviewing and approving the semi-annual integrated master test plan for missile defense.

Vice Admiral James D. Syring, USN, is the Director of the Missile Defense Agency (MDA), which researches, designs, develops, tests, and fields our Ballistic Missile Defense System (BMDS) and supports its operation and improvement. He is responsible for roughly $7.5 billion in this year's budget request.

Lieutenant General David L. Mann, USA, is the Commander of the U.S. Army Space and Missile Defense Command (SMDC) and Army Forces Strategic Command. He is also the Commander of the

Joint Functional Component Command for Integrated Missile Defense. He represents the crucial warfighter perspective on missile defense issues, which we always want to keep in mind since they are the customer and the user.

Ms. Cristina T. Chaplain is the Director of Acquisition and Sourcing Management at the Government Accountability Office (GAO) and leads the GAO evaluation of our missile defense acquisition programs. Congress has benefited from her work on this topic, among many others.

We welcome you all to the subcommittee and we thank each of you for your long and dedicated service to the Nation and to our security.

Ballistic missile defense has taken on a growing importance as missile threats have grown. We all want operationally effective, cost effective, and affordable missile defenses to protect our Homeland, our forward deployed troops, our allies, and our partners. We also recognize such missile defense is both technically challenging and expensive.

Unfortunately, by imposing sequestration on DOD's budget and the rest of government, Congress has made the effort more difficult. Those constraints mandated by Congress affect our missile defense programs just like all other government programs. If we let sequestration return with full force next year, it will make things worse. I would continue to urge my colleagues on both sides to work to avoid that.

With respect to our Homeland missile defense capability, we have a system in place today that protects the entire Nation from limited missile attacks from North Korea and a potential Iranian threat. Yet, we all know that we have had problems with the kill vehicles on that system and we need to fix those problems and demonstrate the fixes through realistic testing before we buy more interceptors. That's what we call fly-before-you-buy.

Those kill vehicle problems occurred because we deployed the system before it was properly designed, engineered, and tested. In other words, in its haste to deploy the system quickly the Bush administration did not practice fly-before-you-buy. Consequently, I am pleased that the budget request includes funds to redesign the kill vehicles so that they will be more effective, robust, and reliable. This subcommittee has supported such a redesign. In order to avoid repeating any of the previous mistakes, we also need a rigorous acquisition approach with stringent engineering design and testing to be confident it will work before we deploy it.

As DOD has told us, we also need to improve our Homeland defense capabilities by investing in additional sensor and discrimination capabilities. That is their highest investment priority because it will make our current system more effective and allow us to defeat more threat missiles with our existing and planned interceptors.

Regional missile defenses are a high priority for our regional combatant commanders because they need a capability to address existing missile threats to Europe, the Middle East, and Asia, especially those from Iran and North Korea. That's why the Joint Chiefs of Staff and Secretary of Defense Robert Gates unanimously recommended the European Phased Adaptive Approach (EPAA) to

the President. It would rapidly provide the capability they needed to protect North Atlantic Treaty Organization (NATO) Europe against the growing Iranian missile threat.

Phase 1 of the EPAA was deployed in 2011 and we are on track to deploy phase 2 in Romania next year. Phase 3 is planned for deployment in Poland in 2018 at the same site we agreed with Poland back in 2008. We will be interested to hear more about the progress of EPAA and on our regional defense efforts, particularly with our allies and partners in the Middle East and Asia.

With all of that said, we look forward to your testimony on these important topics. Before we turn to you for brief oral statements, let me turn to my friend and ranking member, Senator Sessions, for any comments that he wishes to make. Senator Sessions.

Senator SESSIONS. Thank you, Mr. Chairman. I think you make some very important observations, that I share, in your remarks. Thank you for that.

In March of last year, Secretary Hagel announced steps to strengthen homeland missile defense, including the deployment of 14 more ground-based interceptors (GBI) in Alaska, which was really bringing it back up to the Bush plan after they had been reduced, and deploying a second AN/TPY2 radar in Japan to provide improved early warning, particularly from North Korean launches. This was a recognition, I think, that we face a long-range missile threat to the Homeland and that threat is increasing faster than we expected.

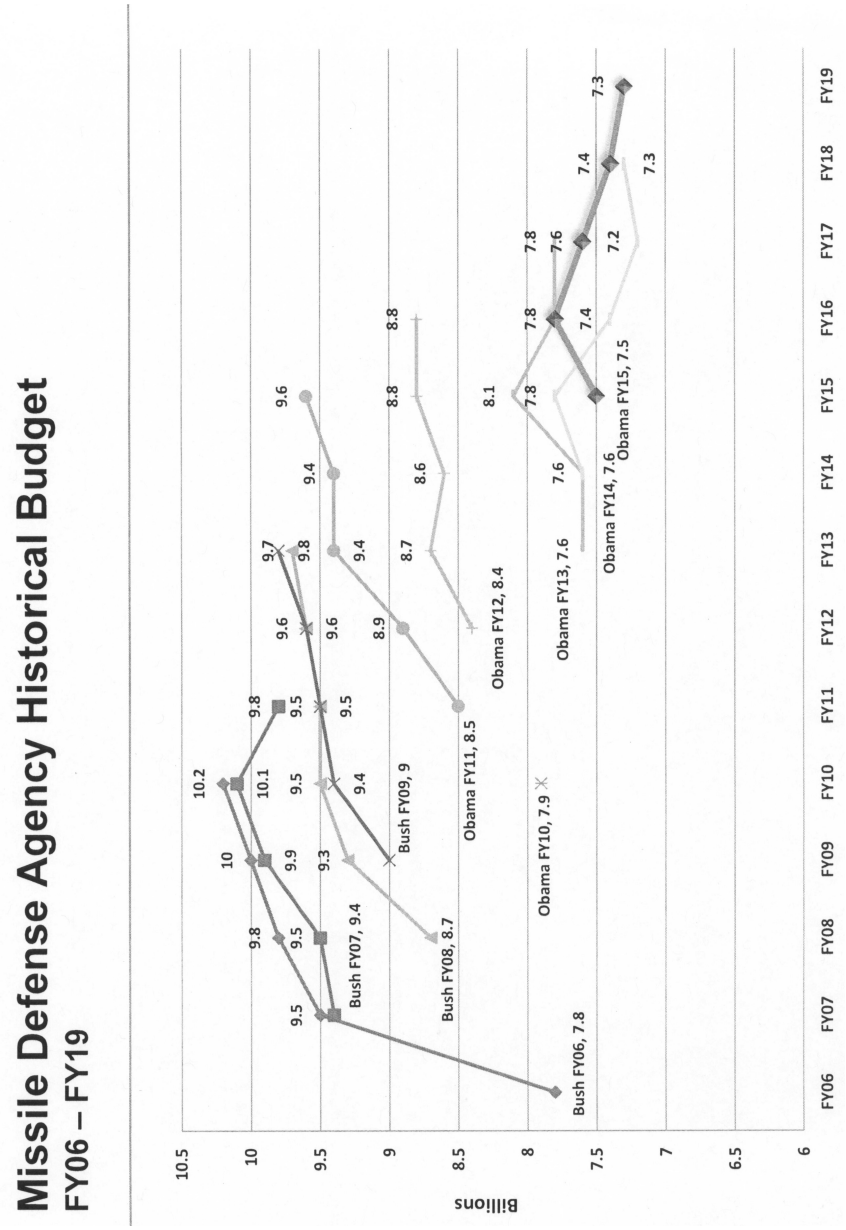
This year the budget request includes several important initiatives meant to improve the ground-based midcourse defense (GMD) system. They include: a redesigned exoatmospheric kill vehicle (EKV) for the GBI, which you made reference to; a new long-range discrimination radar to be deployed in Alaska; and software improvements for threat discrimination. Those are good steps. I believe they'll save money in the long run. If we can get our discrimination ability and our ability to discriminate against false threats, we can use fewer launches and have more effect. I commend Admiral Syring and Secretary Hagel for these steps.

Back in 2009, DOD decided to cease deployment of GBIs at 30 at Fort Greely and that has now been overcome. I recall a meeting in Senator Lieberman's office with Secretary Gates and other Senators where we discussed our concern about the decision to go to 30 from 44. While Secretary Gates assured us that the intention was to improve the GMD system at the time, funding shortfalls and the administration's emphasis on regional missile defense meant there was very little real improvement available to GMD.

Today, I think we move forward. The next 5 years, MDA intends to spend around $700 million to design a new kill vehicle and I believe this is overdue.

Speaking of funding, let me show this chart.

[The chart referred to follows:]


Missile Defense Agency Historical Budget
FY06 – FY19
Billions
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
FY06
FY07
FY08
FY09
FY10
FY11
FY12
FY13
FY14
FY15
FY16
FY17
FY18
FY19
Bush FY06, 7.8
Bush FY07, 9.4
Bush FY08, 8.7
Bush FY09, 9
Obama FY10, 7.9
Obama FY11, 8.5
Obama FY12, 8.4
Obama FY13, 7.6
Obama FY14, 7.6
Obama FY15, 7.5

Senator SESSIONS. It looks awfully crowded, but it tells us how in Washington things start eroding when we don't really understand what's happening to us. The President made a commitment at the time of the New Strategic Arms Reduction Treaty (START) that we would be involved in this, but this is how it looks.

According to our staff estimates, the President's proposed 5-year spending plan that he's submitting today for missile defense is about $6 billion less than the President's fiscal year 2012 spending plan. This is what he submitted as his spending at $8.8 billion in 2015 and 2016. Here we are for 2015 and we're at $7.8 billion, and dropping down to $7.3 billion in fiscal year 2019.

Based on that, we're talking about over the Future Years Defense Program (FYDP) about $6 billion less than we were expecting to spend. Now, if this is because you've saved money on the energy buildings at their laboratories, maybe we could survive that. Maybe it wouldn't be so devastating, because I have doubts about whether all that money, $5 billion, $10 billion buildings, was necessary. All I'm saying, Mr. Chairman, is having a credible missile defense system is so fundamentally important, and it's less than 5 percent of our total defense budget for the whole system, and we ought to be able to—actually, that's about 2 percent. $7 billion out of $500 billion is a lot less than that.

I would say that just points out where we are. That's what we're wrestling with, the kind of issue we're dealing with today. We want a good, strong missile defense system. Can we complete it with those numbers and do you have a plan that will work? It would be great if you can do it at those numbers, but I'm a bit uneasy about it.

Thank you, Mr. Chairman—I would say one more thing. The sequester does not require us to cut any more in the future. The big cuts were this year and somewhat next year. But that Ryan-Murray bill filled in the hole this year and filled in some next year, leaving us at basically, the 050 account, at $521 billion this year, $521 billion in 2015, $561 billion in 2016—no, $523 billion in 2016, $536 billion in 2017, $549 billion in 2018, $562 billion in 2019, $576 billion in 2020, and $590 billion in 2021.

We're going to have some pretty good increases, about a 2.5 percent increase, after the next 2 years, after the cuts we've already taken. You had to make big cuts this year, even with the little extra money that Ryan-Murray put into the account. But it avoided, I think, disastrous pain and some very unwise decisions you would have had to make. I'm sympathetic with the problem, but we're going to all have to tighten our belt and defend America without wasting money, because the interest on the debt is going from $233 billion this year to $880 billion 10 years from today, according to Congressional Budget Office, and that passes the whole defense budget in 4 or 5 years.

Thank you.

Senator UDALL. Thank you, Senator Sessions.

We will hear from the panel from our left to your right. We'll start with Ms. Bunn, and if you'll keep your oral statements brief, and I know you came prepared to do so, then we can open the subcommittee up to questions from you. Ms. Bunn, you're recognized.

STATEMENT OF M. ELAINE BUNN, DEPUTY ASSISTANT SECRETARY OF DEFENSE, NUCLEAR AND MISSILE DEFENSE POLICY, DEPARTMENT OF DEFENSE

Ms. BUNN. Thank you, Chairman Udall, Ranking Member Sessions, Senator Donnelly. Thank you for the opportunity to testify today. Thank you for the work you do to provide for the common defense.

That defense with regard to ballistic missiles includes the defense of our Nation, deployed forces, allies, and partners from the threat posed by ballistic missiles of many ranges—short, medium, intermediate, and long-range missiles. We need a variety of defenses for two missions: first, defending the United States against limited long-range ballistic missile attacks from countries such as North Korea and Iran, as you've said; and second, defending against regional missile threats to U.S. forces, while protecting allies and partners and enabling them to defend themselves.

For both Homeland and regional missile defense, our strategy has to take into account uncertainties, including both the uncertainty of future threat capabilities and the technical and fiscal uncertainties inherent in our own program development. The steps we've taken to strengthen our missile defense posture are focused on developing and deploying proven, cost-effective capabilities to address both existing and emerging threats.

With regard to Homeland defense, we know that North Korea has taken actions that are provocative and concerning. They've conducted three nuclear tests. They continue their efforts to bring the KN08 road-mobile intercontinental ballistic missile (ICBM) to operational capacity. While Iran has not yet deployed an ICBM, its continued efforts on space launch vehicles, along with its desire to deter the United States and our allies, provide Iran with both the means and the motivation to develop longer-range missiles, including an ICBM.

The U.S. Homeland is currently protected against potential ICBM attacks from states like North Korea and Iran. But to ensure that we stay ahead of the threat, we're taking several steps to strengthen our Homeland defense posture. Deploying 14 more interceptors in Alaska will provide additional protection against both North Korea and Iranian ICBM threats as they emerge. We are also deploying, as you mentioned, a second missile defense radar to Japan, and are requesting funding to develop a radar that when it's deployed in Alaska, will provide persistent sensor coverage and improved discrimination against capabilities from North Korea.

Finally, as you mentioned, we're initiating a redesign of the kill vehicle for the GBI. That will not only improve the reliability and performance of the interceptor, make our missile defenses better; it should also be easier to build, upgrade, and maintain than previous versions.

While the ICBM threat from the Middle East has not yet emerged, the regional ballistic missile threat from Iran as well as Syria exists today. Iran already has the largest inventory of ballistic missiles in the Middle East and is capable of striking targets throughout the region and into the eastern part of Europe. The Assad regime in Syria has several hundred short-range ballistic

missiles that can reach much of Israel and large portions of other countries, including Turkey.

North Korea also possesses regional ballistic missiles and has recently conducted a number of short-range missile launches.

Our responses are tailored to the circumstances of each region, that is Europe, the Middle East, and the Asia-Pacific region. We're continuing to implement regional missile defenses that are both phased—that is, as technology becomes available we phase them—and adaptive to the emerging threats. Our focus is on developing and fielding capabilities that are mobile, scaleable, and relocatable. We're also encouraging our allies and partners to acquire missile defenses and to strengthen operational missile defense cooperation. So it's both the stuff and the operations.

We have made progress in strengthening our regional missile defense posture in the past 2 years. We've upgraded five additional Aegis ships with missile defense capability and increased our inventory of both the Theater High Altitude Air Defense (THAAD) and Standard Missile (SM) interceptors. In Europe, we already maintain a missile defense ship presence in the eastern Mediterranean, along with the radar deployed in Turkey, and plans to deploy Aegis Ashore sites in Romania in 2015 and in Poland in 2018 are on schedule. In the Asia-Pacific region, we maintain an Aegis ship presence along with Patriot batteries deployed in Japan and South Korea. Last year we also deployed a THAAD battery to Guam in response to North Korean provocation. Of course, we also maintain a missile defense presence in the Middle East and a strong missile defense partnership with Israel, and are working with Gulf Cooperation countries as they expand their air and missile defense as well.

We have made progress over the last several years, but we cannot afford to stand still. The President's budget reflects our goal of retaining the flexibility to adjust and enhance our defenses as the threat and technologies evolve.

Thank you for having me here today. I look forward to your questions.

[The prepared statement of Ms. Bunn follows:]

PREPARED STATEMENT BY M. ELAINE BUNN

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 2015 budget request for missile defense. Ballistic missile defense (BMD) is a critical national security priority—both for the Homeland and for our ability to project power abroad, prevent and deter conflicts, and defend our deployed forces and allies.

You asked for my assessment of how the programs and fiscal year 2015 budget request for the Missile Defense Agency (MDA) reflect missile defense policy and posture. The President's budget requests $8.5 billion in fiscal year 2015 with $7.5 billion for the MDA to develop and deploy missile defense capabilities that protect the U.S. Homeland and strengthen regional missile defenses.

As reflected in the 2014 Quadrennial Defense Review , which was submitted with the budget request, our top missile defense policy priorities have not changed. The first priority is the defense of the U.S. Homeland against the threat of limited ballistic missile attack. We are committed to maintaining an advantageous position compared to the intercontinental ballistic missile (ICBM) threats from North Korea and Iran. This requires continued improvement to the ground-based midcourse defense (GMD) system, including enhanced performance of the Ground-Based Interceptor (GBI) and the deployment of new sensors.

DOD's budget request for fiscal year 2015 also 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. Our focus is on developing and fielding capabilities that are mobile and capable of being redeployed to different locations as necessary to address the threat. We are also encouraging our allies and partners to acquire missile defenses, and we are working to strengthen missile defense cooperation that can contribute to significantly increased performance than individual countries can achieve on their own.

I will begin with a discussion of ballistic missile threat and trends, 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 THREATS AND TRENDS

Ballistic missiles are becoming more survivable, reliable, and accurate at greater ranges. Regional powers are basing more missiles on mobile platforms at sea and on land. Technical and operational measures to defeat missile defenses also are increasing. China, Iran, and North Korea, for example, exercise near simultaneous salvo firings of short- and medium-range ballistic missiles from multiple locations to saturate regional missile defenses. Countries are designing missiles to launch from multiple transporters against a broad array of targets, enhancing their mobility and effectiveness on the battlefield. Shorter launch-preparation times and smaller footprints are making new systems more survivable.

Iran

Iran already has the largest inventory of ballistic missiles in the Middle East, and today can strike targets throughout the region and into Eastern Europe. In addition to its growing missile inventories, Iran is seeking to enhance lethality and effectiveness of existing systems with improvements in accuracy and warhead designs. Iran is developing an anti-ship ballistic missile which could threaten maritime activity throughout the Persian Gulf and Strait of Hormuz. While Iran has not yet deployed an ICBM, its progress on space launch vehicles—along with its desire to deter the United States and its allies—provides Tehran with the means and motivation to develop longer-range missiles, including an ICBM.

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.

Syria

While Syria does not pose a ballistic missile threat to the U.S. Homeland, the Assad regime does possess short-range ballistic missiles, and has shown a willingness to use them repeatedly against its own people. Syria has several hundred short-range ballistic missiles, all of which are mobile and can reach much of Israel and large portions of Iraq, Jordan, and Turkey from launch sites well within the country.

North Korea

North Korea's weapons and missile programs pose a serious threat to the United States and to East Asia. North Korea has conducted three nuclear tests. It also is seeking to develop longer-range ballistic missiles capable of delivering nuclear weapons to the United States, and continues efforts to bring its KN08 road mobile ICBM, which it paraded most recently in July 2013, to operational capacity. While the reliability of an untested North Korean ICBM is likely to be very low, North Korea has used its Taepo-Dong-2 launch vehicle to put a satellite in orbit, thus successfully demonstrating technologies applicable to a long-range missile.

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.

China

In the regional ballistic missile context, China is augmenting the over 1,200 conventional short-range ballistic missiles with a limited but growing number of conventionally armed, medium-range ballistic missiles that will improve China's ability to strike regional targets. China also continues to deploy growing numbers of anti-ship ballistic missiles.

HOMELAND DEFENSE

The U.S. Homeland is currently protected against potential limited ICBM attacks from states like North Korea and Iran by the GMD system. This system consists of GBIs, land-based early-warning radars, sea-based radar systems, and a sophisticated command and control architecture.

The Department of Defense is implementing steps to strengthen the U.S. Homeland missile defense posture as announced by Secretary Hagel in March of last year. The refurbishment of Missile Field 1 at Fort Greely, AK, is underway and the budget includes funding for the acquisition of GBIs to support GMD operations, testing, and spares, and emplacement of additional GBIs in Missile Field 2 as we progress toward 44 deployed interceptors by the end of 2017. Secretary Hagel also announced the deployment of a second AN/TPY–2 radar in Japan. This deployment will provide improved early warning and tracking of missiles launched from North Korea at the United States as well as its regional allies and partners. We remain on track to complete deployment of this capability by the end of the year.

The President's budget request also includes funding to initiate the redesign of the Exoatmospheric Kill Vehicle (EKV). The redesigned EKV, in essence a next-generation kill vehicle, will not only improve the reliability and performance of the GBI, but by being designed to allow for a more standardized production process, the kill vehicle should also be easier to build, upgrade, and maintain than the previous versions. This investment in the next generation kill vehicle for the GBI is especially important considering the test problems associated with the Capability Enhancement-II (CE–II) version of the kill vehicle. Although we are committed to ensuring the effectiveness of the current kill vehicle through testing; we are also pursuing a redesigned kill vehicle that will improve the reliability and effectiveness of the GMD system.

The submitted budget also includes funding for development of a Long-Range Discrimination Radar. This radar will provide persistent sensor coverage and improve discrimination capabilities against threats to the Homeland from North Korea and will provide the Sea-Based X-band radar more geographic deployment flexibility for contingency and test use.

We are also requesting funding to improve the discrimination capabilities of the existing GMD system. These investments will lead to a GMD system more capable of discriminating and destroying reentry vehicles with a high degree of confidence and will improve the efficiency and effectiveness of our Homeland missile defenses.

As directed by Congress, the Missile Defense Agency is also currently evaluating four potential locations for an additional GBI site in the continental United States. An additional missile field in the Eastern portion of the United States would increase the overall survivability of the GMD system, provide more time to conduct missile defense engagements, and would allow for the deployment of additional interceptors.

That said, the cost of building an additional missile defense site in the United States is very high. Given that the ICBM threat from Iran has not yet emerged, and due to the recent test failures associated with the current GBI kill vehicles, the highest priorities for the protection of the Homeland are in improving the reliability and effectiveness of the GBI and improving the GMD sensor architecture. The current GMD system provides coverage of the entire United States from North Korean and potential Iranian ICBMs. No decision has been made to deploy an additional missile field in the United States. If an ICBM threat were to emerge in numbers that necessitated the deployment of additional interceptors, the steps being taken now, to include conducting an environmental impact statement, will shorten the construction timelines associated with deployment of a new missile defense site.

REGIONAL MISSILE DEFENSE

The Department's budget request for fiscal year 2015 also continues to implement regional approaches that are tailored to the unique deterrence and defense requirements of Europe, the Middle East, and Asia-Pacific regions.

Europe

We are continuing to implement the European Phased Adaptive Approach (EPAA), and we are working in close collaboration with our North Atlantic Treaty Organization (NATO) allies to develop an advanced network of sensors and interceptors—on land and at sea—to protect NATO European territory and our forces and military facilities.

The United States has operated a forward-based radar in Turkey and maintained a sea-based missile defense presence in Europe since 2011. The SM–3 Block IB was deployed on Aegis BMD ships as an operational interceptor for the first time in

2013. The Block IB version of the interceptor uses an improved seeker and signal processor that allows for greater on-board discrimination and area coverage than the SM–3 IA. In October 2013, a ground-breaking ceremony was held at the land-based SM–3, or Aegis Ashore, site in Romania. The site is planned to be operational by the end of 2015.

We have also taken steps to meet the requirement for sea-based BMD capabilities by establishing a homeport for four U.S. Aegis BMD destroyers at the naval facility at Rota, Spain. These multi-mission ships will support the missile defense mission, as well as other U.S. European Command (EUCOM) and NATO maritime missions. The first of the four ships to be stationed at Rota, USS *Donald Cook*, has already deployed to Europe, and the USS *Ross* will arrive this summer. The final two ships, the USS *Carney* and USS *Porter*, will arrive in 2015.

The President's budget request also supports the Aegis Ashore site that will be deployed in Poland in the 2018 timeframe and the development of the SM–3 Block IIA interceptor that will be deployed on land and at sea. These capabilities will extend coverage to all NATO European countries.

As Secretary Hagel emphasized in his announcement in March of last year, 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.

Our NATO Allies are also making significant contributions to the European missile defense mission. Romania, Spain, and Turkey are hosting U.S. missile defense assets and provide the external security for the facilities. Beyond hosting the second Aegis Ashore site in Europe, Poland has also announced its intention to spend up to $10 billion to acquire increased air and missile defense capabilities. DOD is engaging directly with Poland to assist in the development of its missile defense requirements and is promoting U.S. systems to meet these requirements.

Several allies have modern surface combatant ships that could be equipped with a BMD sensor or interceptor capability. The United States will continue to encourage its NATO allies to do even more to cooperate and invest in missile defenses that will contribute to Alliance security.

The Netherlands has committed to spend up to 250 million Euro to upgrade the SMART–L radars on four of their frigates and it, along with Germany, has committed Patriot PAC–3 systems to NATO missile defense as demonstrated through the ongoing NATO deployment in defense of Turkey.

France is planning to provide its Spirale satellite detection system and a long-range radar for NATO territorial missile defense and has contributed the SAMP/T air and missile defense system, which became operational in 2013, to NATO BMD. Despite the U.S. decision to forgo production of the Medium Extended Air Defense System (MEADS), development will be completed in 2014. Germany and Italy are considering the system a possible future national contribution to NATO BMD.

The United States conducts exercises designed to hone our Alliance missile defense capabilities. EUCOM is engaged with NATO in the development of a biennial NATO-led BMD exercise event that serves to reinforce and expand upon other, routine BMD training evolutions that take place on a quarterly and semi-annual basis.

Many NATO Allies also participate in Nimble Titan, a series of exercises designed to understand how the missile defenses of many participant can work together in a crisis or conflict. The Nible Titan 14 campaign, which began last year with regional tabletop exercises, has 21 participant nations, and NATO participates as an alliance. The final exercise of Nimble Titan 14 is a capstone event that will take place in April involving all participants in a cross-regional wargame.

Asia-Pacific

The cornerstone of our security and diplomacy in the region has been our strong bilateral alliances, including with South Korea, Japan, and Australia. All three of these nations play an important role in our regional efforts to achieve effective missile defense.

South Korea obviously has an immediate, proximate stake in preventing missile strikes from North Korea. We have worked very closely with South Korea to ensure that our Alliance maintains the capacity to do just that. The United States deploys Patriot PAC–3 batteries in South Korea to defend U.S. and South Korean forces. In addition, South Korea is taking steps to enhance its own air and missile defense systems, which include sea- and land-based sensors and Patriot PAC–2 batteries. DOD has been consulting closely with South Korea about how it can upgrade its missile defense capabilities and we are mutually committed to sustain and strengthen protection against the North Korean missile threat.

Japan has its own layered missile defense system, which includes Aegis BMD ships with Standard Missile (SM)-3 interceptors, PAC–3 batteries, early-warning ra-

dars, and sophisticated command-and-control systems. Japan is upgrading two ATAGO-class Aegis destroyers to BMD capability with certification scheduled for fiscal year 2018 and fiscal year 2019 and has recently expressed interest in purchasing two additional Aegis BMD ships, which would increase its inventory to a total of eight BMD-capable ships. As mentioned earlier, Japan also hosts a U.S. missile defense radar and has agreed to host a second radar.

Japan is also a critical international partner for BMD development. One of our most significant cooperative efforts is the co-development of an advanced version of the SM–3 interceptor, the SM–3 Block IIA.

The United States and Australia have forged a long-standing partnership on missile defense research and development—most notably with regard to sensors. In addition, Australia is involved in a trilateral discussion on missile defense in the Pacific involving the United States, Australia, and Japan.

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 a strong defense relationship with Israel, and our cooperation on missile defense has resulted in a comprehensive missile defense architecture. 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. A similar exercise, Juniper Cobra, is scheduled to take place in May of this year.

The United States is also working with a number of Gulf Cooperation Council (GCC) countries on missile defense, including supporting the purchase of missile defense systems through the Foreign Military Sales program. The United Arab Emirates is procuring the Terminal High Altitude Area Defense system, with the first delivery expected next year. This is in addition to the UAE's earlier purchase of Patriot systems, which have been delivered. Saudi Arabia is in the process of upgrading its existing Patriot PAC–2 batteries to the PAC–3 configuration. Kuwait is also purchasing Patriot PAC–3 batteries.

U.S. Air Force Central Command maintains 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. These exchanges provide an opportunity for increased situational awareness of missile threats in the region as well as the potential for future BMD planning and operational cooperation.

As the GCC states begin to field more capable systems, the United States and its Gulf partners must work toward greater integration of those capabilities across the region. The desired end state is a regional missile defense architecture in which GCC member states participate and contribute to the extent practical, leading to a networked, layered defense of key strategic centers that strengthens deterrence and increases our collective ability to defeat a ballistic missile attack.

Russia

This administration, in keeping with previous administrations, has sought cooperation with Russia on missile defense. Genuine missile defense cooperation would be in the security interests of all parties by strengthening the defensive capabilities of the United States, NATO, and Russia. It would also help to remove missile defense as a source of tension in the bilateral relationship, and send a powerful signal to potential adversaries that ballistic missile threats will be ineffective as a tool of coercion.

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 the ballistic missile defense of NATO territory.

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. We have made a number of proposals that would have laid the groundwork for meaningful cooperation, including a proposal to establish missile defense cooperation centers in Europe, and more recently, a proposal that would provide for reciprocal transparency about our respective missile defense plans and programs. These proposals would allow for the better understanding of the purpose of our missile defenses and for predictability about our missile defense plans for the future.

Russia has not reacted positively to the U.S. proposals and has instead continued to seek legally-binding restrictions and limitations on our missile defense deployments to Europe. In the course of our bilateral dialogue, we have continuously rejected any limitations on our missile defenses. Our missile defense deployments to Europe address the regional ballistic missile threat posed by Iran and Syria, and cannot be subject to limits imposed by a third party.

Russia's intervention into the crisis in Ukraine, in violation of international law, led to the suspension of our military to military dialogue and we have not continued to engage Russia on the topic of missile defense. As Russia's violation of international law continues, we will review any future bilateral engagements on missile defense to ensure that they are in the security interests of the United States and our allies.

CONCLUSION

The ballistic missile threat—to the United States, to our allies and partners, and to our forces overseas—is evolving, and we continue to grow and adapt our Homeland and regional missile defense posture and international cooperation to address it.

We have had some very significant progress over the last several years, but this administration has emphasized from the beginning that we cannot afford to stand still. The President's budget request for fiscal year 2015 reflects DOD's goals of retaining the flexibility to adjust, and to enhance our defenses as the threat and technologies evolve. Missile defense is crucial to maintaining 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.

I want to thank you for having me here today, and I look forward to your questions.

Senator UDALL. Thank you, Secretary Bunn.

Dr. Gilmore.

STATEMENT OF HON. J. MICHAEL GILMORE, DIRECTOR, OPERATIONAL TEST AND EVALUATION, DEPARTMENT OF DEFENSE

Mr. GILMORE. Mr. Chairman, Senator Sessions, Senator Donnelly: I'll just briefly discuss what I see as the highlights of the test program over the last year. We learned a lot during the last year. We conducted the first ever operational test of elements of the BMDS, working together to demonstrate a layered defense such as might be necessary in the U.S. Central Command (CENTCOM) area of operations or elsewhere in the world.

In that test, Aegis performed an intercept of a medium-range ballistic missile. THAAD was available to perform an intercept if Aegis failed, and in fact, THAAD did fire an interceptor at the Aegis target, which then ended up intercepting a piece of the debris after Aegis successfully intercepted its target. Then THAAD had to plan its intercept in the presence of the debris from the Aegis intercept. That's an important thing to demonstrate because in the kinds of large raids that many of the scenarios that we are worried about might occur there would be multiple intercepts and the systems would have to plan intercepts in the presence of debris and other junk that was created by previous intercepts. So that was a very important test.

The integration demonstrated in that test between Aegis and THAAD was limited. The organic systems, the organic Aegis and THAAD radars, and the organic Aegis and THAAD battle management systems, were used to plan those intercepts. They did share information through the command and control system that BMDS is working on. But true integrated battle management won't be possible until further upgrades for the command and control sys-

tem, the BMDS command and control system, come on line later in this decade.

Nonetheless, it was a significant test. Many important things were learned. There were actually some surprises in the test. The intercepts were successful, but there were some surprises, and those surprises are being used to plan upgrades and changes in tactics, techniques, and procedures that our deployed forces can use as they today use these systems in CENTCOM and elsewhere.

In my view, it was a very valuable test, and as far as I can tell, the combatant commands feel the same way. They strongly supported the test and felt that they learned a lot from it.

One thing that was demonstrated by the test—originally there were four targets that were going to be used in the test. We ended up only using two because we ran out of time because of problems associated with readying the two targets that actually were used. That's a problem that Vice Admiral Syring is working with and that his predecessor was working on and that continues to be a problem of note, with no easy solutions in sight, although I know Vice Admiral Syring and MDA are working very hard to make the targets more reliable, and it will be important to achieve that.

There was the failed intercept test of the Capability Enhancement 1 kill vehicle on a GBI. We've learned a lot from that, and that's been alluded to. The Failure Review Board found several issues of concern associated with the design of the kill vehicle. I had recommended that MDA consider redesigning the kill vehicle and Vice Admiral Syring and DOD's leadership independently decided that that would be a good idea and funding, as you've noted, is provided for that. I think that's a good idea, and it's particularly important to use a rigorous systems engineering process in that redesign so that we don't end up with just patchwork fixes, but rather a more comprehensive fix to these problems that we've seen that will result in a robust kill vehicle as we go forward.

Finally, there were at least two important tests of the SM–3 1B interceptor, which provides additional capability, additional processing, and an improved seeker that will help discriminate lethal objects from things that we don't care about. When conducting ballistic missile tests, the so-called tests FTM–21 and –22, which my office is going to report on later this year, to support a full-rate production decision, those intercepts were successful and, in fact, the intercept of the second target was meant to and did, in fact, exercise the capabilities of the new seeker and the new processor in the SM–3 1B. That was successful.

Of course, that was a salvo shot. We were interested in seeing how the missiles would behave when there was one ahead of another and how the interceptors worked and the kill vehicles would work when one was looking at what the first one was doing and having to contend with the flash and other effects that are created by successful intercept as it trails the first interceptor.

Unfortunately, the second interceptor failed in flight, problems associated with the third-stage rocket motor, which is common to both the SM–3 1B and 1A. MDA and Vice Admiral Syring are conducting a Failure Review Board to understand that failure thoroughly. It could be connected to previous failures and MDA is going to look at a way ahead there.

Those are the highlights of the test program. I would also make one final note. My testimony, as it has for the past 4 or 5 years when I've testified, says that we're still several years away from validating the models associated with missile defense that we're going to need in order to do a thorough assessment of operational effectiveness and suitability for this system, because we're never going to be able to test in live tests over the full range of conditions under which it might be employed. So the models are very important.

Every year I've said, and I've said it again this year, that we're still several years away. Unfortunately, that is correct. One of the reasons, one of the primary reasons it's correct, is because of the 4½-year delay that we've had to suffer in gathering information on the performance of the ground-based missile defense system as a result of the three test failures that have occurred, and the last successful intercept using a GBI occurred in December 2008.

We have made progress on THAAD and Aegis, collecting information there and validating models. There's still more work to be done. But we're definitely lagging when it comes to the ground-based missile defense system because of the test failures and the need to recoup from those failures.

Thank you.

[The prepared statement of Mr. Gilmore follows:]

PREPARED STATEMENT BY J. MICHAEL GILMORE

Chairman Udall, Senator Sessions, distinguished members of the subcommittee, thank you for the opportunity to discuss missile defense testing and my assessment of the Ballistic Missile Defense System (BMDS).

Over the last year, Aegis Ballistic Missile Defense (BMD) and Patriot each demonstrated progress toward short-range ballistic missile threat class capability, even though Aegis BMD suffered a Standard Missile-3 (SM–3) Block IA intercept failure and an SM–3 Block IB missile failure during fiscal year 2013 flight tests. The Theater High-Altitude Air Defense (THAAD) (twice) and Aegis BMD (once) demonstrated progress toward medium-range ballistic missile threat class capability when they successfully destroyed medium-range air-launched targets during two separate tests. The Command and Control, Battle Management, and Communications (C2BMC) demonstrated the capability to control two operationally-deployed AN/TPY–2 radars in Forward-Based Mode, using operational communications architectures, personnel, and tactics, techniques, and procedures.

The Ground-Based Midcourse Defense (GMD) element experienced a third consecutive failure in its flight test program. Supported by my office and by U.S. Northern Command, the Missile Defense Agency (MDA) conducted a GMD intercept test using a Capability Enhancement-I (CE–I) Exoatmospheric Kill Vehicle (EKV) flying a more challenging and operationally realistic profile than the three previous CE–I intercept tests. The EKV failed to separate from the third stage, and could not complete the planned intercept.

Significant to a system-level characterization of the BMDS, the BMDS Operational Test Agency Team and the MDA conducted the first operational flight test of the BMDS that included Aegis BMD, THAAD, C2BMC, and an AN/TPY–2 radar operating in its Forward-Based Mode. This test, Flight Test Operational-01 (FTO–01), was planned to include a layered ballistic missile defense with the C2BMC providing information on system-level performance. The AN/TPY–2 (Forward-Based Mode) radar acquired and tracked all targets and passed track data to both Aegis BMD and THAAD via C2BMC. Although a layered defense between Aegis BMD and THAAD was demonstrated, the integration demonstrated was limited because, consistent with the test's design and the current capabilities of the BMDS and C2BMC, engagements were managed using the organic capabilities of the Aegis and THAAD systems. The test results are being used to modify and refine the tactics, techniques and procedures to be used by deployed Aegis and THAAD units, as well as to incorporate and field upgrades to those systems' suites of software.

The 2013 test program, although less robust than previous years, was adequate to support the development of the BMDS. The MDA conducted tests as scheduled in the Integrated Master Test Plan (IMTP), versions 12.2 and 13.1, approved by the MDA and DOT&E directors. However, except for Patriot Missile Segment Enhancement testing, all key flight tests scheduled in IMTP 12.2, moved to later calendar quarters in IMTP 13.1, many to fiscal year 2014 from fiscal year 2013. This includes Aegis Ashore and Aegis BMD testing. Most of these changes were due to budget issues, brought on by sequestration, other Department budget reductions, and target availability. Due primarily to problems with target readiness, the first operational test of the BMDS, FTO–01, was moved one quarter later in IMTP 13.1, and completed in that same quarter.

Last year, the MDA conducted eight flight tests and five ground tests of the BMDS and/or its elements that were the primary contributors to DOT&E's characterization of the BMDS. While the cumulative results of the testing conducted to date do not provide sufficient data to quantify BMDS system-level performance for all of the many possible instantiations of the BMDS, they are adequate to reveal specific strengths and weaknesses in system-level capability that contribute to the overall development of the BMDS.

The GMD flight test program, affected by three consecutive test failures, is under review. The MDA conducted six GMD intercept flight tests in the 8-year period from January 2006 to January 2014. The Ground-Based Interceptors (GBI) in these tests were equipped with either a Capability Enhancement-I (CE–I) Exoatmospheric Kill Vehicle (EKV) or an upgraded EKV version called the CE–II. In the first three intercept flight tests, the GBI hit its intended target; in the second three tests, the GBI did not intercept a target successfully. Following the FTG–06 failure of the GBI to hit its intended target, the MDA conducted FTG–06a as a redo of FTG–06. However, FTG–06a also resulted in a failure of the GBI to hit its intended target. While waiting for final results from the Failure Review Boards, the MDA planned FTG–07 to demonstrate CE–I EKV performance in a more challenging operational scenario than previous CE–I tests, and to increase confidence in the fielded GBIs that are equipped with CE–I EKVs. However, this also resulted in a failure of the GBI to hit its intended target.

The MDA responded to the Failure Review Board results for FTG–06 and FTG–06a by changing EKV fabrication processes, improving quality control processes during GBI fabrication, and redesigning a CE–II EKV component. In fiscal year/calendar year 2013, the MDA successfully tested a CE–II EKV incorporating the redesigned component in GMD Control Test Vehicle-01 (GM CTV–01), an interceptor-only flight test. The FTG–07 Failure Review Board determined that the root cause of the failure rested in two significant design susceptibilities with the EKV battery and electronic control power supply common to both the CE–I and CE–II EKVs. Consistent with the results of the most recent Failure Review Board, these GBI flight test results led me to recommend in my most recent Annual Report that MDA consider re-designing the EKV using rigorous systems engineering design principles to make the EKV more robust against failure. The MDA Director independently made the same recommendation to the Department's leadership, and the missile defense program submitted as part of the President's Budget allocates funds for redesigning the GBI EKV.

Since Flight Test Standard Missile-15 (FTM)-15 in April 2011, Aegis BMD has experienced one missile anomaly and three missile failures. During FTM–15, the SM–3 Block IA Third Stage Rocket Motor, or TSRM, 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 Block IA and IB missiles, was subsequently redesigned and flown successfully in FTM–18. During FTM–16 Event 2 in September 2011, a catastrophic failure of the TSRM resulted in a failure to intercept. The MDA determined the cause to be an issue with one of the firing parameters and they made the necessary software modifications to mitigate the issue and verify the fix during numerous ground firings and a later successful FTM–19 flight test. Another TSRM failure occurred during the first of two Initial Operational Test and Evaluation flight tests (FTM–21) when the second of two salvo-fired IB missiles experienced a TSRM failure following a successful intercept by the first missile. The MDA is investigating this latest failure using the Failure Review Board process. The TSRM issues just described affect both the IA and IB missiles since the TSRM is a common component to both missile variants. Finally, a Block IA missile failed to intercept during Flight Test Integrated-01. A Failure Review Board determined that the cause of this failure is unrelated to the TSRM issues.

The MDA will conduct their first engagement of an Intercontinental Ballistic Missile, with the target flying a range of greater than 5,500 kilometers, in fiscal year 2016, rather than fiscal year 2015 as planned in IMTP 13.1. The first GMD salvo

test of two interceptors fired at a single target will occur in fiscal year 2018. Finally, the MDA will conduct a multiple simultaneous engagement of two interceptors on two targets in fiscal year 2020 during an integrated system-level operational test. When I briefed you last year, the multiple simultaneous engagement was planned for fiscal year 2018. These changes will align the frequency of GMD testing back to 12-month centers. Also significant, beginning with the fiscal year 2016 test, all but one of the subsequent GMD tests will be against Intercontinental Ballistic Missile class targets.

For Aegis BMD and THAAD, sufficient data now exist to perform 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 the classified portion of my 2013 Assessment of the BMDS.

For other BMDS elements, my assessments often contain subjective content due to the limited amount of test data that are available and the resulting limited progress toward verification, validation, and accreditation (VV&A) of the required BMDS models and simulations. 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 velocities 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 the MDA are working to assure the IMTP supports BMDS modeling and simulation by providing the test data required for rigorous VV&A. The MDA was able to collect important data on Critical Engagement Conditions and Empirical Measurement Events supporting 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 5 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 well-justified set of tests. During the reporting period, the MDA continued to emphasize operational realism when planning for and conducting both ground and flight testing. 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 previous plans that I approved jointly with the MDA directors. 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), and changes in budgetary resources. The IMTP is a rigorous plan for obtaining the test information needed to assess BMDS performance quantitatively.

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 explicit provisions 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 FTG–07 and FTM–21 missile 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.

Senator UDALL. Thank you, Dr. Gilmore.

Admiral Syring.

STATEMENT OF VADM JAMES D. SYRING, USN, DIRECTOR, MISSILE DEFENSE AGENCY, DEPARTMENT OF DEFENSE

Admiral SYRING. Good afternoon, Chairman Udall, Senator Sessions, Senator King, Senator Donnelly. Out of our total request of $7.46 billion for the fiscal year 2015 missile defense program, we are requesting approximately $1.3 billion, including the Air Force early warning radar investments, for Homeland defense as we prepare to expand our GBI inventory to 44 by 2017.

My highest priority remains the successful intercept flight test of the CE–2 EKV. In January 2013 we conducted a highly successful non-intercept test of the CE–2 EKV. Its performance exceeded our

expectations and confirmed we're on the right track to return GMD to intercept flight testing. I am confident we have fixed the problem we encountered in the December 2010 test and we look forward to conducting the FTG–06B intercept test this summer.

I'm also optimistic that we have identified the root cause of the intercept failure involving our first generation EKV last July, when the CE–1 kill vehicle failed to separate from the booster's third stage. We have accounted for that issue and its probability in the upcoming flight test this summer and are working towards a correction for the entire fleet before the end of the year.

Instead of continuing to make year-to-year reliability improvements in our GBIs, in fiscal year 2015 we will begin to redesign and improve the GBI EKV. The new EKVs will be more producible, testable, reliable, and cost-effective, and eventually replace the kill vehicles used in our current GBI inventory.

We will also begin development of the long-range discriminating radar, with deployment planned in 2020. The new midcourse tracking radar will provide persistent coverage and improved discrimination capabilities against threats to the Homeland from the Pacific theater.

We will continue to improve the performance of the Aegis weapon system and request to procure 30 SM–3 Block 1B guided missiles in fiscal year 2015. We will request 4-year multi-year procurement authority next year for the SM–3 1B starting in fiscal year 2016.

In fiscal year 2015, we will also procure in our request 31 interceptors for THAAD and fund additional AN/TPY2 spares and an additional THAAD battery for the Army.

We remain on schedule to meet the presidential mandate for the deployments of phases 2 and 3 of the EPAA. With 15 flight tests planned in fiscal year 2015, we will continue to test elements of the system to demonstrate they work before we commit to fielding.

Thank you, Mr. Chairman. I look forward to the subcommittee's questions.

[The prepared statement of Admiral Syring follows:]

PREPARED STATEMENT BY VADM J.D. SYRING, USN

Good afternoon, Chairman Udall, Ranking Member Sessions, distinguished members of the subcommittee. I appreciate this opportunity to testify before you today. Our current budget request of $7.459 billion for fiscal year 2015 will continue the development of defenses for our Nation, deployed forces, allies, and international partners against increasingly capable ballistic missiles. The fiscal year 2015 missile defense program will support the warfighter and needs of the combatant commanders (COCOMs) with the development and deployment of interceptors, sensors, and the command, control, battle management and communications (C2BMC) system that makes up the integrated Ballistic Missile Defense System (BMDS). Our PB 2015 request supports needed improvements in homeland defense and continues strong support of regional defense initiatives. Our fiscal year 2015 program plans include continued investments in advanced technologies and future capabilities to keep pace with the increasingly complex threat.

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, in-

cluding intercontinental ballistic missile (ICBM)-applicable technologies and systems. As the Director for National Intelligence testified last year, "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." Iran could develop and test an ICBM capable of reaching the United States by 2015. In addition to the Taepo Dong 2 space launch vehicle/ICBM, North Korea is developing and has paraded the KN08 road-mobile ICBM and an intermediate-range ballistic missile (IRBM) capable of reaching Guam and the Aleutian Islands. 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. Demonstrating that it is capable of modifying currently deployed ballistic missile systems, Iran has flight-tested a Fateh-110 ballistic missile called the Khalij Fars by adding a seeker to improve the missile's accuracy against sea-based targets. This ballistic missile has a range of 300 km, which means it is capable of threatening maritime activity throughout the Persian Gulf and Strait of Hormuz.

SUPPORT FOR THE WARFIGHTER

Our overriding goal is to provide support to the warfighter. With this budget we will maintain our commitment to build out homeland defenses to 44 Ground Based Interceptors (GBI), pending a successful return to intercept this summer, and focus on Ground-based Midcourse Defense (GMD) system reliability and GBI performance. We will also maintain our commitment to deploy Phases 2 and 3 of the European Phased Adaptive Approach (EPAA). We are continuing efforts to improve the performance of the Aegis Weapons System and deliver Standard Missile (SM–3) Block IB guided missiles. We will also deploy a second forward-based X-band AN/TPY–2 radar in Japan, improving homeland and regional defense capabilities and increasing our global operational AN/TPY–2 radar posture, and build and improve the C2BMC infrastructure at fielded sites. We plan to procure interceptors for Terminal High Altitude Area Defense (THAAD) and, pursuant to our agreement with the Army, fund additional AN/TPY–2 spares and an additional THAAD Battery.

Last year, we conducted or participated in over 17 multi-event exercises and wargames, which are critically important to the warfighter and the intensive engineering efforts across the Agency. MDA also worked collaboratively with combatant commanders, Office of the Secretary of Defense (OSD), and the Services to complete a strategy and roadmap providing a series of near-, mid- and far-term architecture options for the BMDS that are the basis for program planning for the rest of this decade. In response to the continued fielding by U.S. adversaries of air, missile, and rocket capabilities, in May 2013 MDA assumed the responsibility of Technical Authority for Integrated Air and Missile Defense (IAMD), and as such will lead the Department's joint IAMD engineering and integration efforts, including interface definition and control as well as technical requirements allocation.

Finally, we continue to work closely with the Director, Operational Test & Evaluation (DOT&E) and with independent testers and the Services. From October 2012 to the present, we have executed 9 high profile flight tests, 13 if you include our involvement with and contributions to Israeli flight tests. The highlight was Flight Test Operational-01 (FTO–01), the historic and unparalleled operational test of our regional layered ballistic missile defenses this past September, which involved THAAD and Aegis BMD, ground- and sea-based forward deployed sensors, and C2BMC. The two targets were launched on operationally realistic trajectories towards a defended area near the Reagan Test Site in the Pacific Ocean. This was a highly successful operational test involving MDA, the Operational Test Agency, Joint Functional Component Command for Integrated Missile Defense, and U.S. Pacific Command, as well as U.S. Army soldiers from the Alpha Battery, 2nd Air Defense Artillery THAAD, U.S. Navy sailors aboard the USS *Decatur* and British sailors aboard the HMS Daring, and airmen from the 613th Air and Operations Center. Similar to the Flight Test Integrated-01 test conducted in October 2012, FTO–01 provided the warfighters confidence in the execution of their integrated air and missile defense plans and the opportunity to refine operational doctrine and tactics, techniques and procedures.

In fiscal year 2015, we have 15 flight tests in the Integrated Master Test Plan. As the BMDS matures, we are continuing to increase the complexity in our flight test program by: conducting more system-level operational tests; increasing the number of BMDS assets in those tests; increasing the numbers, types and ranges of the threat representative targets we use; conducting more simultaneous launches;

and replicating potential wartime scenarios to realistically exercise warfighting chain of command to evaluate command and control concepts of operation and tactics, techniques and procedures. We also have system-level ground tests that combine the warfighter chain of command with the developmental system and test under varying conditions to improve confidence in the system being deployed to combatant commands. We are entering a period of unprecedented complexity and increased testing tempo based on that complexity. Our flight tests will also involve an increasingly stressful set of threat representative targets as well as longer range interceptors for our regional capabilities. Over the coming years, U.S. Government stakeholders—to include soldiers, sailors, marines, and airmen—and allies will have a larger role and impact in our test program than ever before.

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. Based on our analysis of the data from the successful January 2013 non-intercept controlled flight test of the CE–II GBI (CTV–01), we plan to conduct FTG–06b, an intercept flight test, this summer. CTV–01 demonstrated the successful dampening of the vibration environments that affected the navigation system and resulted in the failure of the FTG–06a mission conducted in December 2010. FTG–06b will demonstrate the ability of the CE–II EKV to discriminate and intercept a lethal object from a representative ICBM target scene. An increase in the number of GBIs in the fleet assumes a successful return to intercept of the CE–II EKV.

Last July, with FTG–07, we conducted an intercept flight test of the upgraded CE–I, or first generation, EKV. We made numerous improvements to the CE–I fleet through upgrades since the last successful CE–I flight test in 2008. In FTG–07 the EKV did not intercept the target because the kill vehicle on the GBI did not separate from the booster's third stage. The failure investigation is progressing toward a root cause. Once the investigation is concluded, we will take steps to make any fixes to the fleet that need to be made for both the CE–I and CE–II EKVs.

Today, 30 operational GBIs protect the United States against a limited ICBM attack from current regional threats, such as North Korea and Iran. Last year we began refurbishment of Missile Field 1 at Fort Greely, AK (FGA) to develop silo capacity to support delivery of an additional 14 GBIs, continued emplacing GBIs in Missile Field 2 (MF 2), and continued conducting GBI component testing and refurbishing currently deployed GBIs to test and improve their reliability. We are requesting approximately $1.3 billion in fiscal year 2015 for homeland defenses. We remain committed to a "fly-before-you-buy" acquisition approach. Pending a successful outcome of the GMD intercept flight test this summer, we will resume taking delivery of GBIs and emplace them in MF 2 and MF 1 as we progress towards 44 by the end of fiscal year 2017. Beginning in fiscal year 2016, we will acquire replacement GBIs to support GMD operations, testing, and spares, pending the outcome of flight testing.

Construction of the GBI In-Flight Interceptor Communication System (IFICS) Data Terminal (IDT) at Fort Drum, NY, is proceeding on schedule. Once it is operational in late-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.

We currently operate a forward-based X-band radar, the AN/TPY–2 radar, in Shariki, Japan, which is in the northern part of that country. In September 2012 the Secretary of Defense directed the deployment of a second AN/TPY–2 X-band radar in Japan to provide improved tracking coverage for launches out of North Korea. Working with our Japanese partners, we expect to complete the deployment of the second AN/TPY–2 radar in Kyogamisaki in southern Japan by the end of this calendar year. We will also deploy a new C2BMC capability which will enhance the overall performance of the radars when operating in a mutually supporting dual radar mode.

We will take additional steps to keep pace with the threats to the U.S. Homeland. We have requested $99.5 million in fiscal year 2015 to redesign and improve the GBI EKV. The redesigned EKV will be built with a modular, open architecture and designed with common interfaces and standards, making upgrades easier and broadening our vendor and supplier base. The new EKVs will improve reliability and be more producible, testable, reliable, and cost-effective and eventually will replace the kill vehicle on our current GBI fleet. We are currently assessing concepts, acquisition options, and timelines to test and field the redesigned EKV. Our goal is to

begin flight testing the redesigned EKV in fiscal year 2018. We also request $79.5 million, which includes $29 million in MILCON funding for planning and design, to begin development of a Long-Range Discrimination Radar, with deployment planned in 2020. The new long-range, mid-course tracking radar will provide persistent coverage and improve discrimination capabilities against threats to the Homeland from the Pacific theater. This new radar also will give more geographic flexibility to deploy the Sea-Based X-band (SBX) radar for contingency and test use.

MDA requests $122 million in fiscal year 2015 to support the Discrimination Improvements for Homeland Defense (DIHD) efforts. The goal of this effort is to develop and field an integrated set of capabilities to improve BMDS reliability, lethality, and discrimination. The end result will be a deployed future BMDS architecture more capable of discriminating and destroying a reentry vehicle. Our plans in this area will support a near-term DIHD capability (2016) and a DIHD capability fielding in 2020.

We are requesting $64 million in fiscal year 2015 for continued SBX radar operations. In collaboration with the Services, Joint Staff, U.S. Strategic Command (STRATCOM) and the COCOMs, we maintained the SBX radar in 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. In 2013 SBX supported real world operations, with 49 days at-sea, and the FTG–07 GMD test with a total of 110 days at-sea and demonstrated an autonomous acquisition capability.

We are also examining locations for a possible additional CONUS interceptor site. The current GBI sites at Fort Greely, AK and Vandenberg AFB, CA provide capability necessary to protect the Homeland. While there has been no decision by the Department to move forward with an additional CONUS interceptor site, such a site would add battle space and interceptor capacity should it be deemed necessary to proceed with deployment. Our CONUS Interceptor Site study determined the following sites are viable candidates and they are to be included in the Environmental Impact Statement: Fort Drum, NY; Naval Air Station Portsmouth SERE Training Area, Rangley, ME; Ravenna Training and Logistics Site, OH; and Fort Custer Combined Training Center, MI. The Environmental Impact Statement, which will take approximately 24 months to complete, will assess environmental impacts at each of the sites, to include potential impacts to land use, water resources, air quality, transportation, socioeconomics and other factors established by the National Environmental Policy Act.

For fiscal year 2015 we are requesting approximately $38.6 million for our network of strategic radars. We will continue missile defense upgrades of the Early Warning Radars in Clear, AK and Cape Cod, MA. We expect to complete the Clear radar upgrade in 2017 and the Cape Cod upgrade in 2018. 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. We also transferred sustainment responsibility for the Beale (California), Fylingdales (United Kingdom), and Thule (Greenland) Upgraded Early Warning Radars back to the U.S. Air Force.

REGIONAL DEFENSES

Deployment of regional defenses to protect our deployed forces, allies and international partners remains one of our top priorities. Our fiscal year 2015 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. MDA will continue to focus on threats from the Asia-Pacific and Middle East regions as we continue to support the European Phased Adaptive Approach to protect our deployed forces and our allies.

Terminal High Altitude Area Defense

In fiscal year 2013, MDA delivered 37 THAAD Interceptors and expended 2 in flight tests, for a total of 84 delivered to Army war stock. We also delivered hardware for fielding of the third THAAD battery: two Tactical Station Groups, six Launchers, and a set of Peculiar Support Equipment. Training of the soldiers who will operate the third THAAD battery has begun and we expect it to be completed in fiscal year 2015. This year we expect to deliver the fourth THAAD battery. In collaboration with the Services, Joint Staff, STRATCOM and the COCOMs, we achieved first operational deployment of the THAAD capability for the defense of Guam. In recent tests we demonstrated THAAD's ability to intercept an MRBM as part of an integrated operational test with Aegis BMD (FTO–01), the second intercept of this class of target since FTI–01. THAAD has put together a remarkable

record of success, successfully intercepting 11 out of 11 targets with the operationally configured interceptor.

For fiscal year 2015, MDA is requesting $464 million for THAAD procurement, which includes the purchase of 31 THAAD interceptors. We also are requesting $300 million in RDT&E funding in fiscal year 2015 and $76 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. THAAD will conduct two flight tests in fiscal year 2015. In FTT–18 THAAD will demonstrate an intercept of a separating IRBM target using the THAAD radar, launcher, fire control and communication, interceptor closed loop operations, and engagement functions. In FTO–02 THAAD will engage a SRBM with associated objects and demonstrate advanced radar algorithms.

Aegis Ballistic Missile Defense

Last year MDA completed six BMD Weapons System installations on Aegis ships: two Aegis BMD 3.6; three Aegis BMD 4.0; and one Aegis BMD 5.0 (USS *John Paul Jones*) in conjunction with the Navy's Aegis Baseline 9 installation. The USS *John Paul Jones* will replace the USS *Lake Erie* as the BMD deployable test ship to support MDA and Navy testing of Integrated Air and Missile Defense capabilities. We now have a total of 30 BMD capable Aegis ships in the Fleet. In 2013 we delivered 10 SM–3 Block IAs and 16 SM–3 Block IBs. By the end of 2015, over 65 SM–3 Block IBs will be delivered.

We are requesting $929 million in RDT&E funding in fiscal year 2015 to continue development, testing, and installation of Aegis BMD capabilities to defeat longer range and more sophisticated ballistic missiles launched in larger raid sizes. We request $435 million in fiscal year 2015 for Aegis BMD procurement, which includes $348 million for 30 SM–3 Block IB guided missiles and $12 million for operations and maintenance of SM–3 Block IAs. In response to the combatant commanders' demand for more BMD ships with the latest tested capability, Navy and MDA have incorporated Aegis BMD into the Navy's Aegis DDG Modernization Program and new construction DDGs. We will continue upgrading the capability of existing BMD ships and integrating new and modernized ships to the BMD fleet, with a planned operational availability of 43 Aegis BMD ships in fiscal year 2019. The homeport transfer of four Aegis BMD ships to Rota, Spain began this past February with the USS *Donald Cook*. Another Aegis BMD ship, USS *Ross* is scheduled to transfer later this year, and the remaining two Aegis BMD ships will transfer in 2015.

With the Japan Ministry of Defense, we completed multiple SM–3 Block IIA component Cooperative Development Project Critical Design Reviews, including: Staging Assembly, Steering Control Section, Guidance System, Third Stage Rocket Motor, Sensors, Kinetic Warhead Guidance Electronics Unit Assembly, Divert and Attitude Control System, and Kinetic Warhead, culminating with an overall missile system Critical Design Review, in October 2013. Also in October, the SM–3 Block IIA completed Propulsion Test Vehicle-01 in which the missile and new composite canister both demonstrated successful and safe ignition and egress from the vertical launching system.

Last year was a significant year for Aegis BMD testing, with five for five successful intercept tests and successful transmission of Long Range Surveillance and Track data through C2BMC to the GMD system in FTG–07. FTM–20 (February 2013) demonstrated the ability of the Aegis BMD 4.0 Weapon System to Launch on Remote using data from the Space Tracking and Surveillance System (STSS) demonstrator satellites. FTM–20 employed an SM–3 Block IA against a unitary medium-range target. High quality infrared fire control data from STSS was provided through C2BMC. C2BMC generated very high quality fire control quality data and passed the track data over operational communications links to the firing Aegis ship to conduct a launch on remote engagement. This complex test proved the value of an integrated C2 and sensor network and the use of space-based sensors to expand the BMD battle space. FTM–19 (May 2013) supported the development and assessment of the Aegis BMD 4.0 Weapon System and the SM–3 Block IB prior to an fiscal year 2014 full-rate production decision. A second Aegis BMD ship successfully acquired the target and conducted a simulated engagement using space-based sensor data.

In a span of 23 days, Aegis BMD was a principal player in three major operational flight tests: FTO–01, FTM–21, and FTM–22, which all achieved successful intercepts. FTM–21 (September 2013) and FTM–22 (October 2013) fired SM–3 Block IBs to validate operational effectiveness and suitability of the Aegis BMD 4.0 Weapon System and the SM–3 Block IB. FTM–22 was our fifth consecutive successful intercept mission using the 4.0 Weapons System and SM–3 Block IB and an impor-

tant milestone for Phase 2 of the EPAA. FTM–21 and FTM–22 also completed Director Operational Test and Evaluation Initial Operational Test and Evaluation flight testing requirements for the 4.0 Weapons System and the SM–3 Block IB.

To complete Initial Operational Test and Evaluation requirements for the 4.0 weapons system, we also conducted a tracking exercise, FTX–18, over the Atlantic Ocean in January 2014, which confirmed the capability of the 4.0 weapons system to track and engage a raid of three ballistic missile targets with simulated SM–3 Block IBs. In this event, multiple Aegis BMD baselines participated, yielding comparative raid performance data, including the Aegis Ashore Romania deckhouse at Lockheed Martin in Moorestown, NJ. The Aegis Ashore system will be deployed to Romania later this year.

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 Baseline 9 architecture, to include terminal defense with the SM–6 guided missile and the BMD 5.0 weapon system. In 2013, we completed the initial design phase and initiated software development for missile and weapon system modifications. We plan to test and certify the first increment of sea based terminal capability in 2015. We also finalized the requirements for the second increment of Sea Based Terminal capability, scheduled to certify in 2018.

The fiscal year 2015 Aegis BMD flight test program will include almost all of the Standard Missile variants, with firings of SM–3 Block IBs from ships as well as the PMRF Aegis Ashore Missile Defense Test Center, execution of raid scenarios with engagements in both Anti-Air Warfare and BMD warfare areas, Launch on Remote for long-range engagements, developmental Controlled Test Vehicle firings of the SM–3 Block IIA missile, and tracking exercises for the Sea Based Terminal weapon system configuration.

European Phased Adaptive Approach

We will continue to support the EPAA to provide coverage of European NATO territory from Iranian ballistic missile threats by investing resources for EPAA development, testing and deployment. Phase 1, which provides 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 (Forward Based Mode) to U.S. European Command (EUCOM) in Turkey, and the C2BMC Spiral 6.4 system at Ramstein AFB in Germany, has been operational since the end of 2011.

Our goal in EPAA Phase 2 is to provide robust capability against SRBMs and MRBMs. The architecture includes the deployment of the Aegis BMD 4.0 and 5.0 weapon systems with SM–3 Block IBs at an Aegis Ashore site in Romania and at sea. A formal ground-breaking ceremony for the Aegis Ashore site took place in Deveselu, Romania in October 2013. The start of construction of the Aegis Ashore site in Deveselu, Romania this year involves the delivery of the deckhouse from Moorestown, NJ, to Romania. The site will be integrated into the EUCOM command and control network, tested and operational by December 2015. MDA requests $123 million in fiscal year 2015 to continue development of the Aegis Ashore sites in Romania and Poland. We also request $226 million in fiscal year 2015 for the continued procurement of equipment for Aegis Ashore in Poland.

Four months after disassembly and transport of the Aegis Ashore equipment to the Pacific Missile Range Facility (PMRF) began, an Aegis Light Off ceremony was held on 6 December, 2013 to commemorate the first time the Aegis Combat System was powered on, with sailors manning the consoles and the system brought on-line at the PMRF deck house facility. We are now preparing for Aegis Ashore flight tests at PMRF this year and in 2015.

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. 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. MDA requests $264 million in RDT&E funding in fiscal year 2015 to continue the bilateral, cooperative effort. The upgraded Aegis Weapons System and C2BMC system with engage on remote AN/TPY–2 radar (forward based mode) capability combined with the faster, longer reaching SM–3 IIA will expand Aegis BMD battle space to counter more sophisticated threats and will extend coverage to NATO allies in Europe threatened by longer range ballistic missiles.

Working closely with Navy, we will deliver the upgraded 5.1 Aegis BMD Weapons System as a part of the Navy's Baseline 9 architecture on ships for deployment

worldwide in 2018 to support combatant commanders requirements to counter an expanded threat set. This past year we continued development of the Aegis BMD 5.1 fire control system.

Command, Control, Battle Management, and Communications and Sensors

In 2013 we continued to support warfighter operations of the EUCOM BMDS capability for regional defense. In partnership with the combatant commands, we maintain the capability to engage multiple simultaneous threat attacks in the region. As the foundation of BMDS, the MDA C2BMC team supported the warfighter in real world operations across multiple Areas of Responsibility, which included deployments to the Middle East, Turkey, and Kwajalein. Last year we fielded software upgrades to U.S. Northern Command (NORTHCOM), U.S. Strategic Command (STRATCOM), U.S. Pacific Command (PACOM) and Central Command (CENTCOM) and installed Spiral 6.4 MR–2 at PACOM, NORTHCOM, and STRATCOM. This year we completed software upgrades to CENTCOM and EUCOM. We also delivered the Distributed Training System to CENTCOM for Air and Missile Defense Exercise 13–2.

For the first time, in 2013, we conducted a flight test with successful debris mitigation (FTO–01) and also generated fire control quality track data from space sensors for a live fire Launch-on-Remote Aegis BMD 4.0 Weapons system and SM–3 Block IA engagement (FTM–20). In addition to continuing the enhancement of global BMD survivable communications and support for operations and sustainment of C2BMC at fielded sites, in fiscal year 2015 we will integrate Space Based Infrared System Increment 2 capabilities into C2BMC to support cueing of BMD sensors worldwide. We will also improve sensor data integration and battle management in C2BMC to support Aegis BMD cueing and launch-on and engage-on remote capability.

In support of homeland and regional defense, we continued to sustain AN/TPY–2 operations and supported the deployment of additional AN/TPY–2 radars and the C2BMC infrastructure. For the second AN/TPY–2 radar deployment to Japan, we identified candidate sites, conducted site surveys, selected sites, obtained agreements with the host nation, and initiated site design efforts. We deployed the AN/TPY–2 (Terminal Mode) as part of a THAAD battery in the PACOM Area of Responsibility. Last year we relocated the AN/TPY–2 radar in CENTCOM to a permanent location. Additionally, we accepted the AN/TPY–2 radar Number 8 and provided it to the 3rd THAAD Battery; awarded a production contract for AN/TPY–2 Number 12; awarded a production contract for an additional Prime Power Unit; and awarded a contract for AN/TPY–2 spares.

We request $393 million in fiscal year 2015 to develop and deploy BMDS sensors (includes Long-Range Discrimination Radar), and $183 million to operate and sustain the nine AN/TPY–2 radars and support the UEWRs and Cobra Dane radar. We request $444 million in fiscal year 2015 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 $31 million for continued operation of the Space Tracking and Surveillance System and Near-Field InfraRed (NFIRE) satellite system in fiscal year 2015. We continue to operate the two STSS–D satellites to conduct cooperative tests with other BMDS elements and demonstrate the capability of the satellites to cue and track 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 also continue to operate the NFIRE satellite, which has the capability to collect near-field phenomenology data for use in developing plume to hardbody handover algorithms for boost phase interceptor programs.

DEVELOPING NEW CAPABILITIES

We are developing fiscally sustainable advanced technology that can be integrated into the BMDS to adapt to threat changes. Our investments are focused on technology that brings upgradeable capability to the warfighter. Our advanced technology investments are determined by systems engineering, which permits us to evaluate and determine which emerging technical solutions will best address gaps in the BMDS and enhance its overall capability and performance. The goal of our technology investment strategy is to deploy a future BMDS architecture more capable of discriminating and killing reentry vehicles with a high degree of confidence, allowing the warfighter to dramatically improve shot doctrine. One of our greatest challenges is the ability to bring multiple sensor phenomenology (i.e., reflective and

thermal properties of the missile) into the missile defense architecture. Relying purely on terrestrial radar for precision tracking and discrimination of the threat is a potential weakness our enemy could exploit in the future. Adding persistent electro-optical sensors to our architecture is a high payoff solution for this gap.

MDA requests $45 million in fiscal year 2015 for Discrimination Sensor Technology. We will integrate advanced sensors on existing unmanned aerial vehicles and demonstrate their ability to create a precision track that shooters can use to target their interceptors quickly and accurately. We will test the first precision track sensors at PMRF this fall. In parallel, we will begin integration and ground test of an advanced sensor upgrade to these precision track sensors with follow-on flight testing in fiscal year 2016. MDA's Discrimination Sensor Technology development and test plan is a cost-effective, stepping stone to MDA's long-term goal of persistent discrimination coverage from a space platform.

Additionally, Air Force Space Command (AFSPC) and MDA are collaborating on future space sensor architecture studies and sensor performance assessments across a broad set of joint mission areas and on Analyses of Alternatives (AoA) studies with threat definition, technical evaluations, and cost analysis support. MDA is supporting AFSPC in its review of concepts that will inform an AoA for the future of protected military satellite communications and overhead persistent infrared systems. As an example, MDA is exploring the potential of BMDS-focused space sensors that also provide data contributing to Air Force missions such as Space Situational Awareness.

MDA requests $14 million in Weapons Technology in fiscal year 2015 to combine the knowledge gained from our Discrimination Sensor Technology effort with our high-power directed energy program to build the foundation for the next-generation laser system capable of addressing advanced threats and raids at a much lower cost than existing missile interceptors. We are pursuing a unique set of laser technology to execute missile defense missions from high-altitude, low-mach airborne platforms operating in the clear, low turbulence stratosphere. We have been developing two promising solid-state lasers: one at Lawrence Livermore National Laboratory and the other at the Massachusetts Institute of Technology's Lincoln Laboratory collaboratively with the Defense Advanced Research Projects Agency (DARPA). Both lasers achieved record power levels within the last year. MDA will continue high energy efficient laser technology development with the goal of scaling to power levels required for a broad spectrum of speed of light missile defense missions. This year, we are working with several aircraft prime contractors defining concepts for integrating a multi-kW class laser into a mid-altitude, unmanned aerial vehicle. A laser test platform addresses a broad spectrum of mission applications and we will continue our collaboration with our service partners, the Air Force Research Laboratory, and DARPA for joint development and test opportunities.

MDA requests $26 million in fiscal year 2015 for the Common Kill Vehicle (CKV) Technology effort. MDA's strategy is to achieve as much commonality among future GMD kill vehicles and other future kill vehicles for Aegis BMD and THAAD. In fiscal year 2014 this CKV technology effort will help establish the requirements foundation for the redesigned GMD EKV, which we are now planning as the first phase (Phase I) of our overall kill vehicle development strategy. Our fiscal year 2014 joint government and industry concept definition effort will also assess the ability of industry to meet those requirements. In follow-on CKV efforts, or Phase II, we will make investments that reduce the costs of production and weapon system operations through new kill vehicle architectures and scalable technology that improves the effectiveness and performance of our interceptor fleet against an evolving threat. Our investments in large format focal plane arrays, smaller inertial measurement units and high performance propulsion components as well as new kill vehicle architectures are key enablers. This technology development allows us to engage a more numerous and increasingly more complex threat, eventually establishing the technology foundation for killing multiple lethal objects from a single SM–3 or GBI.

MDA requests $16 million in fiscal year 2015 for the Advanced Research area which conducts leading-edge research and development with small businesses, universities, and international partners to create and advance future missile defense capability. This effort includes managing the Small Business Innovation Research and Technology Applications programs to help MDA-funded small businesses to transition their technology to missile defense applications. MDA is also seeking to leverage the creativity of our Nation's universities by sponsoring academic research focused on developing breakthrough capabilities for missile defense.

MDA requests $9 million in fiscal year 2015 for the Advanced Concepts & Performance Assessment effort, which delivers independent assessments of government, university, and industry technology concepts that, along with systems engineering requirements, support acquisition strategy decisions and define our technology focus

areas. This effort has greatly improved our assessment of advanced BMD technologies to address evolving threats for the warfighter. We work directly with universities, federally Funded Research and Development Centers, University Affiliated Research Centers and innovative small businesses to develop cutting edge data collection, modeling techniques, hardware-in-the-loop, and high performance computing platforms to speed the assessment of innovative technology concepts.

INTERNATIONAL COOPERATION

MDA is engaged with over 20 countries and international organizations, such as NATO. Our major international efforts reflect the Department's goals in the Asia-Pacific, Middle East, and Europe: building partner BMD capacity, supporting the strategic shift to Asia-Pacific, and executing EPAA deployments.

Building Partner BMD Capability

Since I last testified before the committee, we had several successes in our cooperative development programs with our Israeli partners. Through our cooperative efforts, Israel is developing a layered and robust BMD capability. In November 2013 the Israel Missile Defense Organization (IMDO) and MDA achieved a second successful intercept using the David's Sling Weapon System. This past January we successfully conducted the second fly-out of the Arrow-3 upper tier interceptor. These programmatic milestones provide confidence in future Israeli capabilities to defeat the evolving ballistic missile threat in the Middle East. Another recent and significant accomplishment for the Department is the precedent-setting international agreement with Israel regarding coproduction of the Iron Dome missile defense system that was signed on March 5, 2014. The agreement supports increasing U.S. industry co-production of Iron Dome components.

Our largest co-development effort is with Japan on the SM–3 Block IIA interceptor. Japan has committed significant funding for their part of this co-development project. Japanese and U.S. components will be fully integrated and flight tested in the coming years. The Japanese dedication to this program ensures we will remain on track to deliver SM–3 Block IIA in support of the EPAA Phase 3 in the 2018 timeframe.

After spending a year establishing processes, procedures, and an information technology infrastructure, the Defense Security Cooperation Agency designated MDA a Foreign Military Sales (FMS) Implementing Agency in February 2012 for the THAAD missile defense system and the AN/TPY–2 radar. MDA is currently executing one FMS case with the United Arab Emirates for two THAAD batteries and accompanying launchers, radars, and interceptors. We are actively engaged with several nations, particularly those in the Gulf region, to provide program information and pricing and cost data that may inform future decisions to procure THAAD as an upper tier missile defense capability.

Supporting the Strategic Shift to the Asia-Pacific

As I have already stated, along with the cooperative efforts on the SM–3 Block IIA, the United States and Japan are working together to support the deployment of the second U.S. forward-based AN/TPY–2 radar. Our Japanese partners should be commended for their efforts in supporting this deployment to the Japan Air Self-Defense Force (JASDF) base in Kyogamisaki in southern Japan. This radar will enhance both regional BMD capability and improve defense of the U.S. Homeland.

MDA also supported the deployment of a THAAD missile defense system to Guam for the defense of U.S. deployed forces in the region. This is our first long-term deployment of a THAAD battery.

Executing EPAA Deployments

Last October MDA and other Department leaders participated in a ground-breaking ceremony for the Aegis Ashore site in Romania. Site preparation work has started, and we are on schedule with military construction activities demonstrating real steps to deliver EPAA Phase 2 in the 2015 timeframe.

In addition to programmatic planning and deployment activities, MDA is also supporting EUCOM efforts to ensure the necessary Implementing Arrangements are in place to support EPAA fielding timelines. In the near-term, this means coordinating on and, where possible, streamlining the construction, site activation, and equipment acceptance processes in Romania. We are also laying the groundwork for these efforts in Poland. Again, all activities are on track to support the stated EPAA timelines.

We are also working through NATO to ensure U.S. C2BMC and NATO command and control networks are fully interoperable. The United States and NATO test existing and future ballistic missile defense capabilities through a series of ongoing

test campaigns in order to evaluate current capabilities and reduce risk for future development.

MDA will continue to engage NATO and regional Allies in support of U.S. national security strategy through international cooperation in missile defense. For instance, the United States is working with NATO on a study to identify cooperative opportunities for European nations to develop and procure missile defense capabilities to complement the U.S. EPAA contribution to NATO BMD.

MDA remains engaged and committed to expanding work with our international partners, to include conducting joint analyses to support partner missile defense acquisition requirements, cooperative research and development projects, co-development, deployments, FMS, and co-production. It is an honor to work with dedicated international partners on activities that benefit both U.S. and international contributions to missile defense architectures.

CYBERSECURITY

MDA has been working diligently to enhance the cybersecurity posture of missile defense networks and improve the protection of ballistic missile defense information. MDA has developed new policies, partnered extensively with industry and other Department of Defense organizations, and has continuously increased investments in cybersecurity to ensure our networks and information remain secure against cyber attacks.

I have coordinated policy Memoranda with the DOD Chief Information Officer's office and the Under Secretary of Defense for Acquisition, Technology, and Logistics and signed MDA Policy Memoranda on "Securing Ballistic Missile Defense Information on Government and Non-Government Networks and Systems." These require MDA program executives, program managers, contracting officials, and contractors to follow existing guidelines and implement new cybersecurity measures. We published MDA Manual titled: "Procedures for Protection of Critical Program Information and Mission-Critical Functions and Components within the Missile Defense Agency." We conducted a cybersecurity industry day titled: "The Emerging Role of Cybersecurity in Missile Defense Agency Acquisitions." This served to inform MDA industry partners of new cybersecurity requirements and threats and elicited feedback from industry representatives on how they can meet the new cybersecurity requirements. MDA also expanded a partnership with DOT&E to test and experiment with cybersecurity on MDA systems. This partnership leverages DOT&E resources and teams MDA with special cyber expertise and extensive knowledge of current threats.

The MDA Computer Emergency Response Team performs continuous monitoring of MDA government information systems to protect and defend the confidentiality, integrity and availability of MDA networks and data. MDA is enhancing the established integrated security architecture, aligned to the Defense Enterprise Security Architecture that constantly improves methods to protect, monitor, analyze, detect, and respond to unauthorized activity within MDA information systems. Cyber boundary protection measures include state-of-the-art firewalls, intrusion detection and prevention systems, and email spam/virus prevention capabilities. The Missile Defense Agency will continue to work closely with Federal agencies, industry partners, and others to identify and implement measures to further increase the security of missile defense information while continuously seeking to improve technologies and capabilities that protect MDA critical program information.

I am proud to report we completed our first experiment with DOT&E in February. In the first experiment, MDA successfully demonstrated cybersecurity improvements that are in development. As a result of extensive interactions with a live cyber Operational Force during the first experiment, MDA will pursue new ways to strengthen cybersecurity that will be demonstrated in future experiments.

CONCLUSION

Mr. Chairman, we have stayed focused on our core mission. We will continue our work with the warfighter to develop, test, and field a networked, global BMD system that is flexible, survivable, and affordable and 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. In order to ensure we are using the taxpayer's dollars wisely and deploying effective missile defense capabilities, we will continue to test elements of the system to demonstrate that they work before we commit to their fielding. It is vital that we provide the warfighters the cost-effective and reliable weapon systems they need to do their job. I remain dedicated to committing the manpower and resources to correcting the issues in our GMD program, executing a successful intercept flight test this summer, and keeping

the focus on reliability in our operational homeland defenses. We continue to make good progress in our work with our international partners, and I want to increase my focus on those important efforts.

I look forward to answering the committee's questions. Thank you.

Senator UDALL. Thank you, Admiral.

General Mann.

STATEMENT OF LTG DAVID L. MANN, USA, COMMANDER, U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/ARMY FORCES STRATEGIC COMMAND AND JOINT FUNCTIONAL COMPONENT COMMAND FOR INTEGRATED MISSILE DEFENSE

General MANN. Chairman Udall, Ranking Member Sessions, Senator Donnelly, Senator King: Thank you for your continued support of our soldiers, civilians, and their families. This is my second appearance before this subcommittee and it is an honor to appear before you today to talk about the importance of missile defense for our Nation and the need to maintain these capabilities in the face of maturing threats and declining budgets.

Today, I'd like to briefly discuss global missile defense operations, the SMDC/Army Forces Strategic Command's role as a force provider. To accomplish these assigned missions, we focus on three tasks, tasks that are very similar to what I discussed during the space hearing: to provide trained and ready missile defenders; to build future missile defense forces and capabilities; and to develop future technologies.

In addition, I'd like to outline my role as the Joint Functional Component Command for Integrated Missile Defense, basically an operational integrator on behalf of U.S. Strategic Command (STRATCOM). We execute four tasks in support of these responsibilities: first, to synchronize operational-level planning; second, to support ongoing operations and asset management; third, to integrate training and exercises and test activities; and finally, to advocate for future capabilities.

This subcommittee's continued support of missile defense capabilities and for our soldiers, sailors, airmen, and marines and civilians who develop, deploy, and operate these missile defense capabilities is essential.

Again, I appreciate the opportunity to speak on the value of missile defense for our Nation. I look forward to addressing any questions that you may have. Thank you.

[The prepared statement of General Mann follows:]

PREPARED STATEMENT BY LTG DAVID L. MANN, USA

Chairman Udall, Ranking Member Sessions, and distinguished members of the subcommittee, thank you for your continued support of our servicemembers, civilians, and families. I appear before you today 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 (STRATCOM), the Department of Defense, and the missile defense community. It is an honor and privilege to testify before this Subcommittee along with these distinguished witnesses who bring missile defense capabilities to our Nation, forward deployed forces, partners, and allies.

I have three main responsibilities. 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, as the Commander, Army Forces Strategic Command (ARSTRAT), I

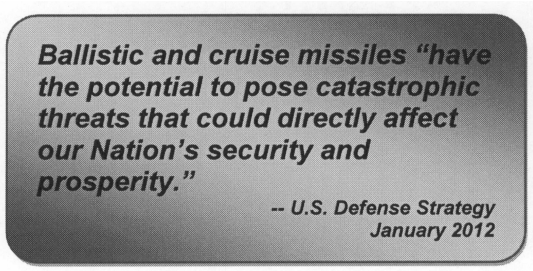
am the Army Service Component Commander (ASCC) to STRATCOM. I am responsible for planning, integrating, and coordinating Army forces and capabilities in support of STRATCOM missions. Third, as the Commander of STRATCOM's Joint Functional Component Command for Integrated Missile Defense (JFCC IMD), I am responsible for synchronizing missile defense planning, conducting ballistic missile defense operations support, and advocating for missile defense capabilities for the Warfighter.

In accordance with these responsibilities, my intent today is threefold: to highlight USASMDC/ARSTRAT's missile defense force provider responsibilities with respect to the Army and the geographic combatant commanders (GCC); to outline JFCC IMD's role as an operational integrator of joint missile defense for STRATCOM; and to summarize key Army ballistic missile defense activities and developments.

THE STRATEGIC ENVIRONMENT

Ballistic missile threats from regional actors such as North Korea and Iran are increasing, both quantitatively and qualitatively, and are likely to continue to grow over the next decade. In a resource constrained environment, we must be prepared to quickly adapt and confront various threats. Holistic strategies that effectively integrate offensive and defensive capabilities are essential. It is of utmost importance that we prioritize missile defense resources to optimize these capabilities for the Warfighter.

To meet the objectives of the current Defense Strategic Guidance, STRATCOM and the Army continue to provide and enhance homeland and regional missile defense. We have worked with partners in U.S. Pacific Command (PACOM), U.S. Northern Command (NORTHCOM), and STRATCOM to review and improve our capabilities in the PACOM area of responsibility in accordance with the Department's strategy to rebalance toward the Asia-Pacific region. The deployment of a Terminal High Altitude Area Defense (THAAD) battery to Guam has enhanced our ability to protect U.S. territories in the region and signal our commitment to our regional partners. The March 2013 Secretary of Defense announcement of the deployment of 14 additional Ground-Based Inceptors at Fort Greely, AK, and a second missile defense sensor in Japan will provide improved capability and capacity to defend the Nation against a limited ballistic missile attack. Toward this end, we continue to work with regional partners and allies to increase our information and data sharing.



The Defense Strategic Guidance also establishes a priority to maintain a strong commitment to security and stability in Europe and the Middle East. We are continuing to build capability and capacity in these regions consistent with the objectives of the Phased Adaptive Approach to regional missile defense. To further protect our allies and partners in these regions, the Army has deployed additional Patriot air and missile defense forces to Turkey and Jordan.

In summary, the growing complexity of the strategic environment based on technological advances of the threat and fiscal realities require cost efficient and effective methods of integrating current and future capabilities. We will continue to partner with the Missile Defense Agency (MDA) and combatant commands to ensure we pursue a fiscally responsible path to keep pace with evolving threats by identifying and prioritizing capability additions that provide the greatest operational value.

THE WORKFORCE—RECOGNIZING AND PROTECTING OUR GREATEST ASSET

These challenges I've highlighted cannot be mitigated without the dedication of our greatest asset—our people. During the DOD Space hearing before this Subcommittee a few weeks ago, I felt it appropriate to highlight our workforce and the Army's commitment to deter instances of sexual harassment and assault. At

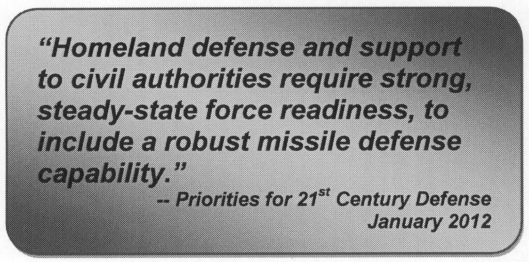
USASMDC/ARSTRAT and JFCC IMD, our people are our most enduring strength. The servicemembers, civilians, and contractors at USASMDC/ARSTRAT and JFCC IMD support the Army and joint warfighter each and every day, both those stationed in the Homeland and those deployed across the globe. Within USASMDC/ARSTRAT and JFCC IMD, we remain committed to providing trained and ready servicemembers and civilians to operate and pursue enhanced system capabilities for the Nation's ballistic missile defense system (BMDS).

In step with the Army, our USASMDC/ARSTRAT and JFCC IMD leadership team embraces the imperatives of Sexual Harassment/Assault Response and Prevention (SHARP). As stated by the Chief of Staff of the Army, sexual harassment and sexual assault violate everything the U.S. Army stands for, including our Army Values and Warrior Ethos. At USASMDC/ARSTRAT, I will continually assess the effectiveness of our SHARP efforts to ensure we are meeting the needs of our soldiers, civilians, and family members. Our workforce deserves nothing less.

ACCOMPLISHMENT OF MISSILE DEFENSE TASKS

USASMDC/ARSTRAT, a force provider for missile defense capabilities, is a split-based command with dispersed locations around the globe that are manned by multi-component soldiers, civilians, and contractors. Organizations around the world, including STRATCOM, NORTHCOM, and the GCCs leverage our capabilities. Our title 10 responsibilities include operations, 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 the Army's technical center lead to conduct air and missile defense related research and development in support of Army Title 10 responsibilities.

Our operational function is to provide trained and ready missile defense forces and capabilities to the GCCs and the Warfighter which address today's requirements. For example, USASMDC/ARSTRAT soldiers, serving in the Homeland and in remote and austere forward deployed locations operate the Ground-Based Midcourse Defense (GMD) system and the Army-Navy/Transportable Radar Surveillance Forward-Based Mode (AN/TPY–2 FBM) radars. A summary of the ongoing missile defense capabilities provided by our missile defense professionals is highlighted below.



Support to Global Ballistic Missile Defense (BMD):

Soldiers from the 100th Missile Defense Brigade, headquartered in 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 Fire Direction Center in Alaska, the Missile Defense Element in Colorado, 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. The GMD system remains our Nation's only defense against a limited ICBM attack.

Support to Regional Capabilities:

The 100th Missile Defense Brigade also supports GCCs with AN/TPY–2 FBM radar detachments and provides subject matter expertise on operator training and

certification. These operational capabilities are present today at strategic locations around the globe.

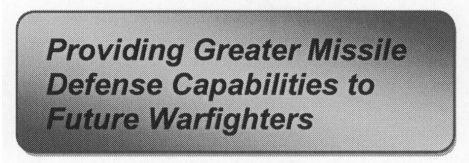
GMD System Test and Development:

In addition, soldiers from the 100th MD Brigade actively participate in GMD test activities and continue to work with MDA developers on future improvements to the GMD system.

Ballistic Missile Early Warning:

In support of 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 essential information to members of the air, missile defense, and operational communities. Our JTAGS Detachments are globally forward, providing 24/7/365, dedicated, assured missile warning to STRATCOM and GCCs in support of deployed forces.

Our second major task is to build and mature 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 350 soldiers and recertified as an Army Learning 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 domains to mitigate threats and vulnerabilities for 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.

In our third major missile defense task, USASMDC/ARSTRAT provides critical technologies to address future needs that will enhance Warfighter effectiveness—our materiel development function. 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 an OSD sponsored 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.

High Energy Laser Mobile Demonstrator:

As we have repeatedly witnessed during conflicts in both Iraq and Afghanistan, 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 kinetic energy capability in countering RAM projectiles. This directed energy weapon system will also have a significant capability against unmanned aerial vehicles (UAV). An initial demonstration was recently completed against short-range mortars, UAVs, and UAV-mounted intelligence, surveillance, and reconnaissance sensors. This demonstration served as a risk reduction for future subsystem development and integration while advancing this technology effort to a 50 kilowatt demonstration in 2017. The 50 kilowatt HEL MD will consist of a ruggedized and sup-

portable high energy laser with subsystems installed on a tactical military vehicle to enhance the safety of deployed forces. The synergy of both directed and kinetic energy systems has the potential to enhance significantly our Homeland defense capabilities, particularly against cruise missile and indirect fire threats.

Low-Cost Target Development:

The Army continues 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. Over the past year, using existing excess solid rocket motors, the Army realized significant savings within its operational testing account. The Army will continue to leverage technology advancements in order to realize less expensive targets that are representative of actual threats.

Missile Defense Testing:

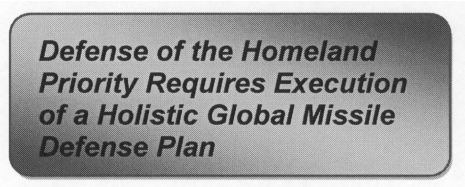
USASMDC/ARSTRAT operates the Ronald Reagan Ballistic Missile Test Site (RTS). RTS, located on the U.S. Army Garrison-Kwajalein Atoll in the Republic of the Marshall Islands, is critical to both offensive and defensive missile testing requirements, such as the GMD system and the U.S. Air Force strategic ballistic missile systems. In addition to their testing mission, personnel at the Reagan Test Site conduct continuous operational space surveillance and object identification missions.

JOINT FUNCTIONAL COMPONENT COMMAND FOR INTEGRATED MISSILE DEFENSE—SYNCHRONIZING MISSILE DEFENSE OPERATIONAL LEVEL PLANNING AND SUPPORT

The Joint Functional Component Command for Integrated Missile Defense (JFCC IMD) is STRATCOM's missile defense integrating element and has been operational for 9 years. Like the other Joint Functional Component Commands, JFCC IMD was formed to operationalize STRATCOM missions and allow the headquarters to focus on integration and advocacy. Headquartered at Schriever Air Force Base in Colorado Springs, Colorado, the JFCC IMD is manned by professional Army, Navy, Air Force, Marine Corps, civilian, and contractor personnel.

As the Secretary of Defense 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 fiscal environment. We are actively engaged with MDA and the combatant commanders to optimize and execute the administration's plan to increase the number of ground-based interceptors (GBI) at Fort Greely from 26 to 40 and to deploy a second AN/TPY–2 FBM radar to Japan.

We have collaborated with NORTHCOM, STRATCOM, and MDA to identify homeland interceptor sites that best meet operational requirements. The four sites recommended for Environmental Impact Statement analyses have been provided to this subcommittee. The operational contributions of a third interceptor site can vary based on the overall level of improvement to the strategic BMDS. Although MDA continues the planning work necessary to implement this measure, I recommend the priority of investment should be to programs that improve discrimination and tracking capabilities and overall GBI system reliability.



On behalf of STRATCOM, JFCC IMD 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, partners, and allies. The key force multiplier is "integration", which is a critically important mission area for JFCC IMD and directly supports STRATCOM's assigned Unified Command Plan (UCP) responsibilities for missile defense.

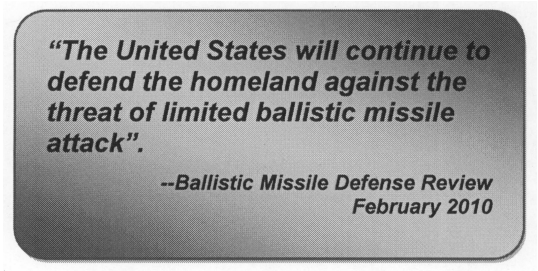
As an operational and functional component command of STRATCOM, JFCC IMD has derived five key mission tasks from the STRATCOM UCP responsibilities:

- 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 mission tasks, we maintain close collaborative relationships with the GCCs, MDA, the Services, the Office of the Secretary of Defense (OSD), the Joint Staff, and our allies. 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, partners, 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 the Missile Defense Architecture:

In response to the changing strategic environment, the Secretary of Defense directed us to bolster homeland and regional missile defense capabilities. In addition to the previously deployed AN/TPY–2 FBM radars and deployment of the THAAD battery to Guam, we are finalizing the plan to deploy an additional FBM radar in the PACOM area of responsibility, and we are expanding our missile defense collaboration with allies. We are maturing the European Phased Adaptive Approach (PAA) with the forward deployment and stationing of Aegis BMD ships in Rota, Spain, developing the Aegis Ashore site in Romania, and continuing the production of the SM–3 IB interceptors. 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.



Global Assessment:

As regional phased adaptive approaches mature, and with homeland defense at the forefront, JFCC IMD collaborates closely with the GCCs to assess the level of 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 have completed the 2013 Global IAMD Assessment and are currently conducting the 2014 assessment. For the 2013 assessment, we expanded the previous BMD-only assessment to look at integrating both air and missile defense assets to more accurately reflect the way we fight and the associated operational risks.

With regard to regional threats, JFCC IMD assessments indicate that addressing missile defense threats will remain a challenge. Our research, supported by the 2013 Global Assessment, reinforces the fact that GCC demands for missile defense capabilities exceed the available BMD inventory. We must continue to address this mismatch using mobile and re-locatable missile defenses and a comprehensive force management process. We also possess a full spectrum of offensive and defensive capabilities to deter and defend against the ballistic missile threat.

Global Force Management:

The increasing demand of BMD assets is managed by the Joint Staff and the Services. STRATCOM, as the designated Joint Functional Manager for missile defense, relies upon JFCC IMD to evaluate and recommend sourcing of BMD requirements based on assessed risk. 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' campaign and 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:

JFCC IMD, in coordination with STRATCOM and the GCCs, manages the availability of missile defense assets to balance operational readiness postures, scheduled and unscheduled maintenance activities, and MDA and Services' test requirements. This important process allows us to continually assess our readiness to defend against a ballistic missile attack and to recommend adjustments to optimize the overall BMD architecture.

Training, Exercises, and War Games:

JFCC IMD continues to focus on the integration of allies into regional missile defense architectures. We leverage training, exercises, and war games to increase dialogue and partnership. We are underway with Nimble Titan 14, our biannual multinational BMD war game. While budget constraints have caused us to reduce the scale for regional exercise from interactive war games to table-top exercises, we are still able to accomplish many of the stated objectives. For the first time, Nimble Titan 14 will include the participation of the Kingdom of Saudi Arabia, the United Arab Emirates, Turkey, Estonia, Norway, Sweden, and Finland. 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; explore options for increased regional multilateral BMD cooperation; and openly work coalition BMD issues with Middle East nations. We continue to focus on cross-regional coordination, offense/defense force integration, sensor integration, and multinational BMD planning solutions.

The Nimble Titan war game is an invaluable medium to advance U.S. missile defense policy. The war game allows us to mature cooperative relationships with our allies and partners as well as advance our Nation's and combatant command's regional security objectives. This event is critical to developing a common understanding of policy hurdles associated with combined BMD architectures. Conclusions derived from training, exercises, and war games 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:

In August 2012, the DOD designated STRATCOM as the lead for integrating and synchronizing Joint BMD training. This designation mandated the transfer of missile defense training resources and responsibilities from MDA to STRATCOM by the end of fiscal year 2013. JFCC IMD is executing this mission on behalf of STRATCOM and declared initial operating capability on October 1, 2013.

In coordination with STRATCOM, the Joint Staff, combatant commands, and the Services, we have developed a comprehensive program of actions and milestones to achieve a full operating capability with the creation of a Joint BMD training center of excellence by the end of next fiscal year. The center of excellence will be located in Colorado Springs and will coordinate and synchronize all aspects of BMD training

and education to further develop commanders, warfighters, and civilians engaged in BMD planning and operations. This approach builds upon existing capabilities and closes gaps between Service, Joint, and regional BMD training and education. As part of the center of excellence construct, our training capability will evolve into a "blended learning/higher education" approach to improve efficiency and reduce the cost of providing Joint BMD training and education.

Warfighter Acceptance and Integrated Master Test Plan:

As the missile defense architectures matures, operators call for a credible, comprehensive assessment of new capabilities to inform warfighter operational acceptance. In 2013, the DOD conducted a new regional operational test that assessed the integrated capability of Aegis BMD, AN/TPY–2 FBM, and THAAD. This first-of-its-kind test validated the THAAD's integrated regional capability against multiple threats in an operationally realistic environment. Our next operational test in fiscal year 2015 will build upon the success of the previous test. We plan to conduct an integrated test of key elements of EPAA Phase II, specifically the integrated capability in AN/TPY–2, Aegis BMD, and Aegis Ashore. Additionally, JFCC IMD is working closely with MDA, the Office of the Director, Operational Test and Evaluation, and NORTHCOM to address issues uncovered in recent GBI testing of both the CE–I and CE–II variants. Although the investigation into last year's CE–I flight test failure is not complete, the early indications provide assurance that technological remedies are being instituted for the GBI fleet. We will continue to partner with the MDA to ensure we maintain an annual test cadence to maintain warfigher confidence.

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 current and future ballistic missile threats. 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

The Army is a close partner with the MDA in supporting its materiel development efforts. We continue to develop and field systems that are integral 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 (IAMD):

Air and missile defense (AMD) is an enduring Army core function and an essential component of the Army mission to provide wide area security. To meet this mission, the 2012 Army AMD Strategy details a plan of action to develop a comprehensive portfolio of IAMD capabilities intended to provide protection against the expanding threat of ballistic and cruise missiles, unmanned aerial systems, and long-range, precision rocket, artillery, and mortar attacks.

Within the AMD arena, the IAMD Battle Management Command System (IBCS) remains the Army's highest priority effort and serves at the foundation for Army AMD modernization. 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. IBCS provides a comprehensive solution for the AMD gap by coordinating air surveillance and fire control across Services and with coalition partners. During this past year, soldiers demonstrated incremental capabilities of IBCS. Additional efforts are underway to integrate IBCS and C2BMC to support the BMD mission.

Patriot/Patriot Advanced Capability-3 (PAC–3):

Patriot/PAC–3 is the Army's premier weapon system against air and tactical ballistic missile threats. With the DOD decision to end U.S. participation in the Medium Extended Air Defense System program at completion of the design and development phase, the Army continues to make improvement investments to the Patriot system to support the AMD strategy. The aim is to increase reliability, drive down operational and sustainment costs, and remain viable well into the future. Seeing

that about half of all Patriot units are currently deployed, operational tempo and stress remain high.

A number of significant Patriot/PAC–3 capability enhancements have been accomplished over the past year. Among the accomplishments were the completion of the Army's planned upgrades to all 15 PAC–3 fire units, fielding of the 15th Patriot battalion, and continued successful operational flight tests of the next generation PAC–3 missile, the Missile Segment Enhancement (MSE). During recent successful testing, both tactical ballistic missiles and air breathing threats were simultaneously engaged. The Army conducted a successful Milestone C defense acquisition board and remains on track for delivery of the MSE to the Warfighter by the fourth quarter of 2015. Additionally, the Patriot radar received a new digital processor. Coupled with recent software upgrades, the new digital processor increases performance of the radar against evolving threats while dramatically improving reliability, availability, and maintainability.

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 of airborne objects such as cruise missiles, manned and unmanned aircraft, and large caliber rockets. The system has demonstrated the capability to track surface moving targets. In accordance with direction from OSD and the Joint Staff, the Army is scheduled to deploy the JLENS system to Aberdeen Proving Grounds, Maryland. With this deployment, the Army will initiate a 3-year operational exercise of how surveillance aerostats improve missile defense sensor capabilities.

Terminal High Altitude Area Defense System:

THAAD, a key component of the BMDS architecture, is designed to defend deployed and allied forces, population centers, and critical infrastructure against short- and medium-range ballistic missiles. THAAD is a high demand, low-density asset. A fully operational THAAD battery consists of 95 soldiers, an AN/TPY–2 FBM radar, 6 launchers, a fire control and communications element, a battery support center, and a support element. THAAD has a unique capability to engage threats in both the endo- and exo-atmosphere using proven hit-to-kill lethality. There are now four activated THAAD batteries. Equipment training and fielding has been completed for two of the batteries. In April 2013, one of these batteries conducted the first ever operational deployment of THAAD in response to the escalation of tensions in the Pacific region. The third THAAD battery is currently undergoing training and will be operationally available next year; the fourth battery is scheduled to become fully operational the following year. 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, partners, and allies.

CONCLUSION

Mr. Chairman and Ranking Member Sessions, as a member of the joint missile defense community, the Army will continue to pursue enhancements to the Nation's missile defense system. As a Service, the Army has lead responsibility for GMD, AN/TPY–2 FBM, Patriot, and THAAD. Our trained and ready soldiers operating 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, continues to integrate BMDS capabilities to counter global ballistic missile threats and protect our Nation, deployed forces, partners, 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. I appreciate having the opportunity to address missile defense matters and look forward to addressing any of your questions.

Senator UDALL. Thank you, General.
Ms. Chaplain.

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

Ms. CHAPLAIN. Chairman Udall, Ranking Member Sessions, Senators Donnelly and King: I'm pleased to be here today to discuss recent GAO findings on missile defense acquisitions. For the past 12 years, we've been mandated by Congress to assess MDA's progress in developing and delivering missile defense capabilities.

Overall, MDA has accomplished a great deal since it was formed in 2002, developing and delivering a broad set of systems that provide important protection to our Nation and our allies. But several acquisition challenges have persisted since we began our reviews.

First, in the face of time pressures, MDA has employed high-risk acquisition strategies that overlap overall development and production activities. While this practice has decreased over time, programs that began with highly concurrent strategies still face problems. For example, the recent failure during a test of the Aegis SM–3 Block 1B, just discussed, means that a component common to the 1B and the deployed 1A interceptor may need to be redesigned and flight tested. While the failure review is not yet complete, if a redesign is necessary, interceptors that were already produced may require retrofits. MDA continues to procure new 1B interceptors while it investigates the cause of the failure.

Also, a July 2013 failure in the GMD system test means that MDA did not demonstrate the CE–1 kill vehicle could perform under more challenging conditions than previously tested, further delaying knowledge of the interceptor's performance capability.

The GMD program has had many years of significant and costly disruptions caused by production getting well ahead of testing and then discovering issues during testing. Consequently, even though some assets have already been produced, MDA has had to add tests that were previously not planned and delay tests that are necessary to understand the system's capabilities and limitations.

In the 12 years we've assessed MDA acquisitions, we've also reported that testing has been hampered by reliability and availability problems with targets, as well as optimistic planning. MDA has worked to mitigate these risks. This year we reported significant progress in testing, with the first system-level operational flight test in 2013 that Dr. Gilmore just described.

A third area of challenges we have highlighted in the past decade is on reporting acquisition progress to Congress. Our recommendations have included making sure baselines and annual reports are complete, that they follow best practices, that they better explain variances, and that they be stabilized.

For fiscal year 2013, MDA's cost and schedule reporting still lack the clarity, completeness, and quality necessary to track actual costs and schedule growth over time. For instance, baselines were still not supported by independent cost estimates, nor did they fully reflect operations and sustainment costs.

In recent years, however, MDA has been devoting resources and attention to improving its baselines. For instance, we reported this

year that MDA took steps to explain most of the significant cost and schedule changes both in the short- and long-term. MDA is also in the process of implementing new cost reporting standards based on best practices. As such, we anticipate significant improvements in our next review.

Lastly, in a separate review this year we found MDA has enhanced management for deploying missile defense systems in Europe under the EPAA. Also, key EPAA programs, such as Aegis Ashore, are making good progress. However, the success of the EPAA policy hinges on the delivery and integration of an array of complex systems. Further, while the United States is generally meeting its commitments, some capabilities specifically needed to achieve greater levels of integration are not planned to be delivered as originally anticipated. Since integration is critical to achieving the capability desired in EPAA, we have recommended that MDA develop an integrated master schedule that pulls together the complex set of activities that need to be done. Such a schedule makes good sense whether we view EPAA as a policy or an acquisition program.

This concludes my statement. I'm happy to answer any questions.

[The prepared statement of Ms. Chaplain follows:]

PREPARED STATEMENT BY CRISTINA T. CHAPLAIN

MISSILE DEFENSE: MIXED PROGRESS IN ACHIEVING ACQUISITION GOALS AND IMPROVING ACCOUNTABILITY

Chairman Udall, Ranking Member Sessions, and members of the subcommittee: I am pleased to be here today to discuss the acquisition progress achieved and challenges that remain for the Department of Defense's (DOD) Missile Defense Agency (MDA). Since 2002, MDA has been charged with developing and fielding the Ballistic Missile Defense System (BMDS), which is expected to be capable of defending the United States, deployed troops, friends, and allies against ballistic missiles of all ranges and in all phases of flight. It has spent over $98 billion to develop and deploy a diverse collection of land-, sea-, and space-based assets, and has requested an additional $38 billion for fiscal years 2014 through 2018 to continue its efforts. Since its inception, MDA has been operating in an environment of tight timeframes for delivering capabilities—first with a presidential directive in 2002 to field a limited capability by 2004 and then with a presidential announcement in 2009 to deploy U.S. missile defense in Europe. Looking forward, it will also have to operate in an environment of budgetary constraints, which necessitate tough trade-off decisions. As a result, MDA will require additional steps to reduce acquisition risk to ensure it provides warfighters with systems whose performance and capability is understood, and which are delivered on time and on budget.

This year, we continue to report that missile defense acquisitions are high risk. MDA has made tangible progress in increasing the complexity and sophistication of missile defense tests, enhancing plans and processes for deploying U.S. missile defense in Europe, and increasing the completeness and clarity of cost and schedule reporting to Congress. However, two key programs face challenges stemming from higher-risk acquisition strategies that overlap production activities and development activities; testing overall continues to provide less knowledge than initially planned and considerably more improvements are needed in both reporting to Congress and in planning for deployment of missile defense in Europe. Many of the challenges MDA faces are tied to the technical and integration risks that are inherent in the capabilities MDA is seeking to deliver, while others are tied to tight timeframes placed on MDA as well as changing demands. Nevertheless, MDA still has opportunities to take steps to reduce acquisition risk, increase transparency, and enhance oversight. MDA's new Director is focused on doing so, though it may take time for his efforts to affect the MDA's broad portfolio of acquisitions, particularly older programs that began without sound foundations for success.

Since 2002, we have been mandated to prepare annual assessments of MDA's progress toward its acquisition goals.[1] Our report in response to this mandate was issued on Tuesday, April 1, 2014.[2] This testimony highlights the findings from that report as well as relevant findings from other recent related reports.[3] 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. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. Additional information on our scope and methodology is available in our 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 in flight for the strategic defense of the United States and regional defense of its deployed forces and allies. 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 some of the BMDS systems, which MDA refers to as elements, and programs included in this year's assessment. More details can be found in our report.[4]

Table 1: Description of Selected Ballistic Missile Defense System Elements and Programs

BMDS element/program	Description and key components
Aegis Ballistic Missile Aegis Defense (BMD) with Standard Missile-3 (SM–3) Block IB.	Aegis BMD is a sea-based system developed to defend against short-, medium-, and intermediate-range ballistic missiles in the middle part of their flight. MDA is developing several versions of missiles and associated ship-based software and processors. The SM–3 Block IB features additional capabilities over the previous SM–3 version to identify, discriminate, and track objects during flight. All sea-based Aegis BMD systems also include a shipboard radar and command and control systems.
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.
Command, Control, Battle Management, and Communications (C2BMC).	C2BMC is a globally deployed system 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.
Ground-based Midcourse Defense (GMD) System.	The GMD program is a ground-based defense system designed to defend the United States against a limited intermediate and intercontinental ballistic missile attack in the middle part of their flight. Key components include a ground-based interceptor consisting of a booster with a kill vehicle on top, as well as a communication system and a fire control capability. There are currently two versions of the kill vehicle: the initial design known as the Capability Enhancement-I (CE–I) and the upgraded design known as the Capability Enhancement-II (CE–II).

[1] National Defense Authorization Act for Fiscal Year 2012, Pub. L. No. 112–81, § 232 (2011) mandated our most recent report. Our reports include references to all prior legislation that mandated our work.

[2] GAO, Missile Defense: Mixed Progress in Achieving Acquisition Goals and Improving Accountability, GAO–14–351 (Washington, DC: April. 1, 2014).

[3] GAO, Missile Defense: Precision Tracking Space System Evaluation of Alternatives, GAO–13–747R (Washington, DC: July 25, 2013); and Regional Missile Defense: DOD's Report Provided Limited Information; Assessment of Acquisition Risks is Optimistic, GAO–14–248R (Washington, DC: Mar. 14, 2014). Currently, our work on Homeland Ballistic Missile Defense is ongoing.

[4] GAO–14–351

Table 1: Description of Selected Ballistic Missile Defense System Elements and Programs—Continued

BMDS element/program	Description and key components
Targets and Countermeasures	MDA develops and manufactures highly complex targets that represent realistic threat scenarios during BMDS flight tests to aid other BMDS elements' developmental efforts. MDA develops and manufactures a variety of targets including short-, medium-, intermediate-, and eventually intercontinental ranges.
Terminal High Altitude Area Defense (THAAD).	THAAD is a mobile, ground-based missile defense system designed to defend against short- and medium-range ballistic missiles in the late-middle and end of their flight. THAAD is organized as a battery, which includes interceptors, launchers, a radar, a fire control and communications system, and other support equipment.

Source: GAO analysis of MDA data.

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] Examples of key problems we have cited in reports in recent years and which continue to affect MDA's acquisitions are highlighted below.

- MDA's highly concurrent acquisition approach has led to significant cost growth, schedule delays, and in some cases, performance shortfalls. 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. At the very least, a highly concurrent strategy forces decisionmakers to make key decisions without adequate information about the weapon's demonstrated operational effectiveness, reliability, and readiness for production.[6] According to MDA officials, they have taken some steps to identify and track concurrency in their programs. However, high levels of concurrency adopted earlier for some programs persist today.
- Testing disruptions have reduced the knowledge planned to be available to inform acquisition decisions and understand performance. For example, flight test failures disrupted MDA's acquisitions of several components and forced MDA to suspend or slow production of three out of four interceptors, including the GMD interceptor and the Aegis BMD Standard Missile-3 Block IB (SM–3 Bock IB).[7] In the Ground-based Midcourse Defense (GMD) case, because MDA moved forward years ago with CE–I and CE–II interceptor production before completing its flight testing program, test failures have exacerbated disruptions to the program. Specifically, because the program has delivered approximately three-fourths of the interceptors for fielding, it faces difficult and costly decisions on how it will implement corrections from prior test failures. Additionally, after fielding these assets, the program has had to add tests that were previously not planned, in order to assess the extent to which prior issues were resolved. It also had to delay tests that were needed to understand the system's capabilities and limitations.
- MDA has been challenged to meet some of its goals for the European Phased Adaptive Approach (EPAA). 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. 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. Each successive phase is expected to defend larger areas against more numerous and more capable

[5] GAO, Missile Defense: Opportunity Exists to Strengthen Acquisitions by Reducing Concurrency, GAO–12–486 (Washington, DC: Apr. 20, 2012); Missile Defense: Actions Needed to Improve Transparency and Accountability, GAO–11–372 (Washington, DC: Mar. 24, 2011).

[6] GAO, Missile Defense: Opportunity to Refocus on Strengthening Acquisition Management, GAO–13–432 (Washington, DC: Apr 26, 2013) and GAO–12–486.

[7] GAO–12–486

threat missiles. DOD delivered the first phase, for short and medium range defense of Europe, in December 2011, and has been making progress in developing some systems to support future phases. However, in March 2013, the Secretary of Defense canceled two programs, planned for the fourth phase, thus eliminating the fourth phase, which was intended to provide additional layer for defense of the United States against intercontinental ballistic missiles. The cancelations were driven in part by affordability concerns, schedule delays and technical risks associated with these programs.[8] Our previous work found similar issues with other EPAA efforts.[9] We also found that MDA has lacked a comprehensive management approach to synchronize key EPAA activities.[10]

- Finally, MDA's acquisition baseline reporting has provided limited insight into the cost and schedule progress of the BMDS. Due to the acquisition flexibilities it has been granted, BMDS's entrance into DOD's acquisition process is deferred, and laws and policies that generally require major defense acquisition programs to take certain steps at certain phases in the acquisition process will not apply until the program enters this process. For example, major defense acquisition programs are generally required to document key performance, cost, and schedule goals in an acquisition baseline at certain phases in the acquisition process; because BMDS has not progressed through threshold phases of the DOD acquisition process, this requirement is not yet applicable.[11] To improve the transparency and accountability of BMDS development efforts, Congress has enacted legislation requiring MDA to establish some baselines.[12] MDA reported baselines for several BMDS programs to Congress for the first time in its June 2010 BMDS Accountability Report (BAR). Specifically, MDA's baselines, including resource and schedule baselines, are reported in the BAR and are updated annually. Since 2011, although progress has been made to improve the reporting, we have found issues affecting the 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.[13]

Our work has recommended a number of actions that can be taken to address the problems we identified. Generally, we have recommended that DOD reduce concurrency and more closely follow knowledge based acquisition practices. We also made recommendations designed to reduce testing risk, and to improve schedule and cost reporting. DOD has generally concurred with our recommendations, and has undertaken some actions to reduce acquisition risk, and improve accountability and transparency.

MDA MADE PROGRESS ON TESTING AND FURTHER IMPROVED SOME MANAGEMENT PRACTICES

This year we found that MDA gained important knowledge about the BMDS system-level performance and individual elements by successfully executing several flight tests. We also found that MDA further improved some of its acquisition practices for managing the European Phased Adaptive Approach (EPAA) and improved the clarity of its resource and schedule baselines.

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[8] The two programs canceled in fiscal year 2013 were the Standard Missile-3 Block IIB (SM–3 Block IIB) and Precision Tracking Space System (PTSS).

[9] GAO–11–372, GAO12–486, and GAO–13–432.

[10] GAO, Missile Defense: European Phased Adaptive Approach Acquisitions Face Synchronization, Transparency, and Accountability Challenges, GAO–11–179R (Washington, DC: Dec 21, 2010), and Ballistic Missile Defense: DOD Needs to Address Planning and Implementation Challenges for Future Capabilities in Europe, GAO–11–220 (Washington, DC: Jan.26, 2011).

[11] 10 U.S.C. § 2435 requires an approved program baseline description for major defense acquisition programs before the program enters system development and demonstration (now known as engineering and manufacturing development), production and deployment, and full-rate production. The BMDS program meets the definition of a major defense acquisition program, which is defined in 10 U.S.C. § 2430 and implemented by DOD in its acquisition policy.

[12] Pub. L. No. 112–81, § 231(a)(2011) (codified as amended at 10 U.S.C. § 225) requires MDA to establish and maintain baselines for certain elements or major portions of elements prior to the product development phase (or its equivalent) and prior to production and deployment, and report these to the congressional defense committees annually. See also, e.g., Pub. L. No. 110–181, § 223(g), repealed by Pub. L. No. 112–81, § 231(b)

[13] GAO, Schedule Best Practices Provide Opportunity to Enhance Missile Defense Agency Accountability and Program Execution, GAO–12–720R (Washington, DC: Jul 19, 2012), GAO–14–351, GAO–13–432, GAO–11–372.

Progress: MDA Demonstrates BMDS Capability Through Testing

In April 2014, we reported that MDA made progress in demonstrating the systems' capabilities by conducting the first system-level operational flight test in September 2013.[14] This is a significant achievement because it is the first time that MDA conducted an operational flight test that involved multiple elements working simultaneously. The test involved warfighters from several combatant commands, and according to independent testing officials, recreated a potentially realistic scenario. During this test, MDA launched two medium-range ballistic missile targets, including its newly developed air-launched extended medium-range ballistic missile (eMRBM). Both the Aegis SM–3 Block IA and THAAD successfully intercepted their targets, demonstrating progress towards achieving an integrated BMDS. In addition, the Aegis BMD SM–3 Block IB and GMD programs successfully conducted developmental flight tests in 2013 that demonstrated key capabilities and modifications made to resolve prior issues. Specifically, the Aegis BMD SM–3 Block IB intercepted all targets in its last three flight tests. GMD also successfully conducted a non-intercept flight test of its CE–II interceptor, demonstrating the performance of a guidance component that MDA redesigned in response to a December 2010 flight test failure.

Progress: EPAA Acquisition Management Improves

We also found that DOD improved the acquisition management of EPAA.[15] In our first report on the subject in 2010, we assessed progress of EPAA acquisition planning against six key acquisition principles that synchronize acquisition activities and ensure accountability.[16] We found that DOD has established testing and acquisition plans for technology development and engineering, and had begun work on identifying key stakeholders. This year, we found improvements in these areas. For example, DOD completed identifying EPAA stakeholders and in 2012 issued a directive updating the warfighter role in testing and capability acceptance.

Lastly, in April 2014, we found that MDA continued to improve the clarity of its resource and schedule baselines, which are reported to Congress in its annual acquisition report called the BAR.[17] In its 2013 BAR, MDA continued to incorporate useful changes it made last year, and took some additional actions to improve the completeness and clarity of the BAR baselines by:

- identifying the date of the initial baseline and, if applicable, the date when the initial baseline was most recently revised;
- explaining most of the significant cost and schedule changes from the current baseline estimates against both the estimates reported in the prior year's BAR and the latest initial baseline; and
- making the baselines easier to read by removing cluttered formatting such as strikethroughs and highlights that made some of the events listed in past BARs unreadable.

MDA CONTINUES TO FACE TESTING AND ACQUISITION CHALLENGES

Although MDA has taken some steps to improve its acquisitions, the agency continues to face several challenges that we have found in previous reviews. Specifically, it faces challenges stemming from high-risk acquisition practices, as well as challenges in BMDS testing, managing the development of EPAA capabilities, and reporting resource and schedule baselines that support oversight. Until MDA addresses these challenges, the agency and decisionmakers may not obtain the information needed to assess the capabilities of the BMDS or make informed acquisition and investment decisions.

Challenge: Implementing Higher Risk Acquisition Programs

While MDA has gained important insights through testing and taken some steps to improve management and increase transparency, it still faces challenges stemming from higher-risk acquisition strategies that overlap production activities with development activities. While some concurrency is understandable, committing to production and fielding before development is complete 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 2014 report found that Aegis BMD SM–3 Block IB and GMD, which have already produced some of their assets before completing testing, discovered issues during testing that

[14] GAO–14–351
[15] GAO–14–248R
[16] GAO–11–17R
[17] GAO–14–351

could affect or have affected production.[18] Although both programs demonstrated progress in resolving previous issues, some of which stemmed from their concurrent acquisition strategies, testing revealed new issues. Specifically:

- An interceptor failure during a September 2013 test of Aegis BMD SM–3 Block IB means that a key component, common to the deployed SM–3 Block IA, may need to be redesigned and flight tested. While the failure review is not yet complete, if a redesign is necessary, interceptors that were already produced may require retrofits. MDA continues to procure new SM–3 Block IBs while it investigates the cause of the failure.
- A GMD CE–I interceptor failure in a July 2013 flight means that MDA did not demonstrate the interceptor could perform under more challenging conditions than previously tested, further delaying knowledge of the interceptors performance capability. Additionally, the failure precluded confirmation that previous design changes improved performance, and delayed the upcoming test needed to resume production of CE–II interceptors. According to program officials, the failure review is not complete, but the failure could have been caused by a component common to both the CE–I and CE–II interceptors. It is still unclear what, if any, corrective action will be needed. The GMD program has had many years of significant and costly disruptions caused by production getting well ahead of testing and then discovering issues during testing. Consequently, even though some assets have already been produced, MDA has had to add tests that were previously not planned and delay tests that are necessary to understand the system's capabilities and limitations. Additionally, since it has delivered approximately three-fourths of its interceptors, MDA faces difficult and costly decisions on how it will implement corrections from prior test failures. As a result of these development challenges, the GMD program will likely continue to experience delays, disruptions, and cost growth.

We made recommendations to address the ongoing issues with both systems in our April 2014 report.[19] First, we recommended that the Secretary of Defense direct MDA's Director to flight test any modifications that may be required to the Aegis SM–3 Block IB, before the Under Secretary of Defense, Acquisitions, Technology, & Logistics approves full production allowing the program to manufacture the remaining interceptors. Second, we also recommended testing the fielded GMD CE–I interceptor in order to complete the original purpose of the failed test to (1) demonstrate the CE–I's effectiveness against a longer range threat in more challenging conditions, and (2) confirm the effectiveness of previous upgrades as well as (3) confirm any new modifications to address the failure work as intended. DOD partially concurred with the recommendation on the Aegis SM–3 Block IB, stating that MDA will verify the efficacy of any modifications by testing and that the full production decision will be vetted through the DOD process. DOD did not agree with the recommendation on GMD, stating that the decision to flight test the interceptor will be made by the Director, MDA, based on the judgment of other stakeholders.

Challenge: Gaining Expected Knowledge From Testing

In this year's reports, we found that testing has provided less knowledge than initially planned.[20] While MDA accomplished some testing goals, it experienced testing shortfalls, including failures of Aegis and GMD interceptors I mentioned above. The agency also combined, delayed, and deleted some tests, and eliminated test objectives in others. These changes reduced the knowledge expected to be available to understand the capabilities and limitations of the BMDS. Examples of key testing problems we cited in this year's reports are:

- Operational Integration—Although the September 2013 operational flight test demonstrated layered defense between Aegis BMD and THAAD, the Director, Operational Test and Evaluation concluded that the test did not achieve true integration. Specifically there were system network issues, interoperability limitations, and component failures. For example, the test uncovered several issues with communication networks that are needed for interoperability between the elements. Interoperability is important because it can improve missile defense effectiveness and mitigate some limitations of the systems working alone.
- Test plan revisions continue to reduce the knowledge planned to be available to understand BMDS performance and inform acquisition decisions. In

[18] GAO–14–351
[19] GAO–14–351
[20] GAO–14–351 and GAO–14–284R

> our March 2014 and April 2014 reports, we found that MDA combined, delayed, and deleted some tests, and eliminated test objectives in others. For example, MDA had to make some adjustments to its September 2013 operational flight test, reducing the number of targets from five to two and removing the participation of more mature elements. The agency also reduced the number of ground tests, which are used to assess performance and interoperability. While MDA added other ground tests to mitigate some effects of this reduction, they are smaller in scope and may not provide the same amount of data about how the systems work together.

Previously GAO has made recommendations to improve MDA's ability to gather expected knowledge from testing. For example, we recommended that MDA add non-intercept tests for new targets and ensure that its test plan can absorb unforeseen events, like failures, in order to minimize disruptions to the test schedule.[21] We also recommended that MDA synchronize its testing with development and delivery schedules for its assets.[22] MDA generally concurred with our recommendations, but has not fully implemented them.

Challenge: Managing Development and Deployment of U.S. Missile Defense in Europe

In March 2014, we found that while MDA made further improvements to the way it manages EPAA, it has yet to develop or implement a complete management strategy for synchronizing these efforts.[23] Specifically, MDA has not established an integrated schedule and has yet to completely define EPAA requirements. As a result, it remains unclear how different EPAA efforts are aligned together and what constitutes success in delivering EPAA capabilities. Considering that defensive capability planned for EPAA increasingly depends on integrated performance of the participating systems, an acquisition approach that identifies and synchronizes all needed activities becomes increasingly important. While flexibility is a hallmark of the EPAA policy, it also increases the risk of delivering less capability than expected without demonstrating the actual performance of what is delivered.

In fact, our March 2014 report found concurrency, fragmentation of development activities, and delays for some originally planned capabilities. For example, we found that some systems may be delivered later than originally anticipated for integration activities. This reduces the time to discover and correct issues. We also found schedule delays that reduced both the capability MDA plans to deliver and the understanding of how that capability will perform. For example, although MDA delivered the first set of capability in December 2011, an upgrade originally planned for 2014, is now expected in 2015. Additionally, we found that MDA split the delivery of capability it initially planned to deliver in 2015 into two segments. It now plans to deliver what it calls "basic" or "core" capability in 2015 and the remainder in 2017. Similarly, MDA also realigned its plans for the capability it initially planned for 2018 into two segments—designating a subset of originally planned capability to be delivered in 2018, with the remainder in 2020 or later. Finally, MDA postponed its plans to conduct a formal system-level end-to-end assessment of EPAA capabilities because of concerns with data reliability associated with such tests. MDA is currently making investments to develop the tools it needs to improve the reliability of their system-level assessments, but they are expected to be ready after two-thirds of EPAA capabilities have been delivered.

We have previously made recommendations to improve management of EPAA, which are highlighted in this year's report.[24] Although DOD generally concurred with these recommendations, it has not yet fully implemented them.

Challenge: Reporting Resource and Schedule Baselines that Support Oversight

Although we found in March 2014 that MDA took some additional steps to improve the clarity of its resource and schedule baselines, this was the fourth year that we have found MDA's resource baselines are not sufficiently reliable to support oversight.[25] Additionally, issues with the content and presentation of the schedule baselines continue to limit the usefulness of the information for decisionmakers. According to agency officials, MDA is taking steps to improve the reliability of their

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[21] GAO–13–432 and GAO–11–372

[22] GAO, Defense Acquisitions: Production and Fielding of Missile Defense Components Continue with Less Testing and Validation Than Planned, GAO–09–338 (Washington, DC: Mar 13, 2009).

[23] GAO–14–284R

[24] GAO–14–284R

[25] GAO–14–351

resource baselines, however, until MDA completes these efforts, its baselines will not be useful for decisionmakers to gauge progress.

Since MDA first reported baselines in June 2010, we have found that the underlying information supporting its resource baselines does not meet best practice standards for high-quality cost estimates.[26] MDA's resource baselines reported in its 2013 BAR remain unreliable because the agency is still in the process of improving the quality of the cost estimates that support its baselines. For example,

- MDA has not fully implemented its cost estimating handbook. In April 2013, we reported that, in June 2012, MDA completed an internal Cost Estimating Handbook, largely based on GAO's Cost Estimating and Assessment Guide which, if implemented, could help address nearly all the shortfalls we identified. According to MDA officials, the agency is still in the process of applying that handbook to its cost estimates and therefore revised estimates for BMDS elements included in the 2013 BAR were not ready for our review.
- MDA has not obtained independent cost estimates of the reported baselines. Officials from DOD's Office of the Director for Cost Assessment and Program Evaluation told us that although they examined costs for some BMDS elements over the last 2 years, they have not completed a formal independent cost estimate for a BMDS element since 2010.[27]
- MDA's cost estimates reported in the 2013 BAR do not include operation and support costs funded by individual Military Services. In April 2013, we found that MDA was not reporting the operation and support costs borne by other Military Services and concluded that as a result MDA's reported costs may significantly understate the full costs for some BMDS elements. We recommended MDA include these costs in its resource baselines reported in the BAR.[28] DOD agreed that decisionmakers should have insight into the full costs of DOD programs, but the department stated that the BAR should only include content for which MDA is responsible. However, limiting the baseline reporting to only MDA costs precludes decisionmakers from having insight into all the costs associated with MDA's weapons systems. We continue to believe that reporting these costs would aid both departmental and congressional decisionmakers as they make difficult choices of where to invest limited resources.DOD does not currently report the full costs for MDA's missile defense acquisitions.

In the National Defense Authorization Act for Fiscal Year 2014, Congress took steps to address concerns over MDA's cost estimates.[29] As a result, we did not make any new recommendations regarding cost this year. However, we plan to continue to monitor MDA's progress because establishing high-quality cost estimates that are accurate, credible, and complete is fundamental to creating realistic resource baselines.

In April 2014, we also found that assessing MDA's progress in achieving its schedule goals is difficult because MDA's 2013 schedule baselines are not presented in a way that allows decisionmakers to understand or easily monitor progress.[30] For instance, MDA's schedule baselines identify numerous events, but provide little information on the events and why they are important. In addition, MDA's schedule baselines do not present any comparisons of event dates. Because MDA's schedule baselines only present current event dates, decisionmakers do not have the ability to see if and how these dates have changed.

We recommended that the Secretary of Defense direct the MDA Director to improve the content of the schedule baselines by highlighting critical events, explaining what these events entail and why they are important, and by presenting information in a format that allows identification of changes from the previous BAR as well as from the initial baseline. DOD concurred with our recommendation.

This concludes my statement, I am happy to answer any questions you have.

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[26] GAO, GAO Cost Estimating and Assessment Guide, GAO–09–3SP (Washington, DC: March 2009).

[27] A formal independent cost estimate would be conducted or approved by DOD's Office of the Director for Cost Assessment and Program Evaluation. It would be an independent cost estimate of the full life-cycle cost of the program and would include all costs of development, procurement, military construction, and operations and support.

[28] Our previous and ongoing work notes the importance of including the long-term costs associated with operations and support in cost estimates for BMDS weapons systems (for example see GAO–11–372).

[29] Pub. L. No. 113–66, § 231.

[30] GAO–14–351

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 the work this statement is based on include David B. Best and Patricia Lentini, assistant Directors; Susan C. Ditto; Aryn Ehlow; Wiktor Niewiadomski; John H. Pendleton; Karen Richey; Brian T. Smith; Jennifer Spence; Steven Stern; Robert Swierczek; Jay Tallon; Brian Tittle; and Hai V. Tran; Alyssa Weir; and Gwyneth B. Woolwine.

Senator UDALL. Thank you, Ms. Chaplain.

Let me start. I think we'll do 7-minute rounds.

We've not had a successful intercept test with the GMD system since 2008, as has been acknowledged. But we have had a series of test failures with both the early and most recent model of deployed kill vehicles. Admiral Syring, you've said your highest near-term priority is to return to a successful intercept test this summer to demonstrate corrections to the system.

I want to ask if each of our witnesses agrees that it is our essential near-term priority to fix the problems we have encountered with our current kill vehicles and to demonstrate those fixes in realistic intercept testing before we build or deploy any additional interceptors. I assume these are yes or no answers, but I'll start with Ms. Bunn and move across.

Ms. BUNN. Yes, sir.

Senator UDALL. Dr. Gilmore?

Mr. GILMORE. I agree.

Senator UDALL. Admiral, I think you agree.

Admiral SYRING. Yes, sir. I'll keep it to two words: Yes, sir.

Senator UDALL. General Mann?

General MANN. Yes, sir.

Senator UDALL. Ms. Chaplain?

Ms. CHAPLAIN. Yes.

Senator UDALL. Using that same approach, let me turn to acquisition rigor for redesign of the GMD kill vehicle. Given the numerous problems we've encountered with our current GMD kill vehicles, the budget includes funds to start a redesigned kill vehicle for the GMD system, one that will be reliable, robust, producible, and other attributes that are lacking in the current kill vehicles because we did not follow rigorous design, engineering, and acquisition practices.

I want to ask each of our witnesses if they agree that in order to avoid repeating the kill vehicle problems we had with the previous rush to failure approach, we need to follow a very rigorous acquisition approach to the redesigned kill vehicle, an approach that includes robust design, engineering, development, testing, and demonstration of a kill vehicle before we deploy it.

Could I ask if you agree to that as well? Ms. Bunn?

Ms. BUNN. Yes, Mr. Chairman. Could I add one thing?

Senator UDALL. Please, yes.

Ms. BUNN. I think we have the right man to add that rigor to the acquisition process.

Senator UDALL. Thank you for that.

Dr. Gilmore.

Mr. GILMORE. I view that as essential.

Senator UDALL. Admiral?

Admiral SYRING. Absolutely critical. We have one chance to get this right.

General MANN. Yes, sir.

Senator UDALL. Ms. Chaplain?

Ms. CHAPLAIN. Yes. Thanks for asking.

Senator UDALL. Thank you for answering.

Let me try the same format one final time. I want to move to fly-before-you-buy for missile defense. Admiral Syring, your prepared statement makes clear that you are following a fly-before-you-buy approach on the GMD system, and that you will not build or deploy additional GBIs unless we have successful flight test results first.

I have a two-part question, first to ask you, Admiral, if you plan to use the same approach before deploying further variants of the GBI? Then after you've answered, I'd like our other witnesses, if they agree that we need to follow this fly-before-you-buy approach. Admiral?

Admiral SYRING. Sir, in this year's budget request we've requested an intercept test every year on an annual basis between now through the FYDP. But to address your question on 2017, there's an interceptor test that's scheduled before each next block of the interceptors is fielded. I'm confident that that will test the configuration before it goes into the ground adequately. As I've said before, intercept testing on an annual basis is a critical need for the GMD program.

Senator UDALL. Ms. Bunn.

Ms. BUNN. Mr. Chairman, the fly-before-you-buy was a policy enunciated in the ballistic missile defense review of 2010 and it continues to be our policy.

Senator UDALL. Thank you.

Dr. Gilmore.

Mr. GILMORE. I agree. I'd just like to add one thing, and that is, that the modeling and simulation that I discussed in my opening statement is also critical here, because we're never going to get enough replications to reach conclusions about statistical confidence in the system without rigorous modeling and simulation.

The flight testing and the modeling and simulation go hand in hand, and, in fact, I've been working with Vice Admiral Syring and his predecessors to assure that that's the case. Both are needed.

Senator UDALL. General Mann.

General MANN. Yes, sir. We're in total agreement with MDA's way ahead and the importance of testing.

Senator UDALL. Ms. Chaplain.

Ms. CHAPLAIN. Yes, we agree with the importance of fly-before-you-buy.

Senator UDALL. Let me direct a question to Admiral Syring, General Mann, and Ms. Bunn. You've each indicated that, in addition to improving interceptor reliability, our investment priority for Homeland defense is to improve our sensor discrimination capability, rather than deploying an additional interceptor site on the east coast. The budget requests funds for a number of sensor and discrimination improvements.

Can you each tell the subcommittee why improving our sensor and discrimination capabilities is so important and how it will im-

prove our existing Homeland defense system? For example, would they allow us to defeat more ICBM threats with our planned number of interceptors, thus making the system both more operationally effective and more cost effective? Ms. Bunn, do you want to take a shot at that first?

Ms. BUNN. Yes, sir. What you said, that is that better discrimination makes the interceptors we have more effective and more efficient.

Senator UDALL. Admiral.

Admiral SYRING. Sir, as the enemy continues to increase in both capacity and capability, the need for discrimination in sensoring is vital to, one, address those capability improvements of the enemy threat and, two, to get the most intercept capability out of our inventory of interceptors. Both are critical to the escalating capability and capacity of the threat missiles.

Senator UDALL. General Mann.

General MANN. Yes, Senator. I think it's acknowledged that we'll never have enough interceptors to address the size of the threat inventory out there. So it's very important that we're as effective as we are with what we have. Also, by improving the effectiveness of the missile, it gives us a little bit more breathing space in terms of how we operationally employ the system. I'll leave it at that. Thank you.

Senator UDALL. Let me follow up. There is, of course, no limit to what you could do. There's always a limit to resources. What I hear being said is that it's a higher priority to improve our sensor and discrimination capabilities than it would be to deploy an additional interceptor site on the east coast. I say that in the context that we don't have unlimited resources.

Ms. Bunn, would you comment on that, and then the Admiral and the General?

Ms. BUNN. Yes, sir. The priority for this budget is in improving the EKV on the interceptors that we have, redesigning that, and improving the discrimination. While an east coast site might provide additional defense against an emerging, not-yet-here threat from Iran, the next dollars spent need to be on EKV improvement and discrimination and sensors.

Senator UDALL. Admiral, do you have anything to add to that?

Admiral SYRING. Sensors and discrimination, really on an equal priority with improving GBI reliability. They both inform the warfighter shot doctrine.

Senator UDALL. General?

General MANN. Yes, sir, I concur with the previous witnesses.

Senator UDALL. Thank you for that.

My time is up. It's my privilege to recognize Senator Sessions, the ranking member.

Senator SESSIONS. Thank you.

Dr. Gilmore, testing has proved that we can utilize a kill vehicle to kill on a hit-to-kill basis, through the other tests of other systems; is that correct?

Mr. GILMORE. That's correct.

Senator SESSIONS. The concept is proven and we're doing it in others. But our GMD system is the one that's the most lacking and problematic at this time?

Mr. GILMORE. We have the least information——

Senator SESSIONS. The least testing.

Mr. GILMORE.—about the performance across the full possible battle spaces, to use the colloquialism, for GMD in comparison with the other elements of the BMDS.

Senator SESSIONS. The THAAD is 11 for 11 in its tests, as I understand it. Aegis is 18 for 21, Patriot 21 for 25. We were successful with the satellite engagement launch. But we're three for six on Ground-based Midcourse.

Mr. GILMORE. Yes, that's correct. In fear of adding too much, I would also point out that, yes, THAAD has a very good record, although we've only just in the past couple of years started testing against medium-range ballistic missiles. A lot of the testing had been against short-range ballistic missiles, and now THAAD is deployed on Guam because Guam otherwise wouldn't have a defense against an intermediate-range ballistic missile. Coming up shortly, Vice Admiral Syring, at the request of the combatant commands, is going to do a test of THAAD against an intermediate-range ballistic missile.

I certainly agree with all of the figures that you just cited. They're absolutely correct. I would just point out that there's still more to learn about the performance of these systems, and it's not just from the standpoint of what an independent operational tester might want to know. It's actually, even more importantly, from the standpoint of what the combatant commanders want to know about how these systems will be used, how they want to use them, and how they will perform.

Senator SESSIONS. Good. I think it's important that the Americans and our adversaries know that we have very effective missile systems that will work, but we have some testing to do.

Admiral Syring, my impression is that you are firmly convinced that testing must be more vigorous than we've had in the past and that you intend to see that that happens. Would you share your personal view with us about what it takes to ensure we have a viable missile defense system?

Admiral SYRING. Yes, sir. We've added and are requesting one GMD missile test every year now. I would say that we hadn't done enough before, for whatever reason. We haven't done the work necessary for us to improve the models, to give Dr. Gilmore confidence in an assessment of the system. All of that has been lacking.

But it's all anchored in flight testing and the need to test more often and for us not to be afraid to test. To not test a CE–1 interceptor for almost 5 years is not where we want to be long term. We want to continue to test and we'll continue to request annual testing of the GMD system.

Senator SESSIONS. I couldn't agree more.

Ms. Bunn, we thought we were putting in money for testing for the last several years. It's really surprising to me that we haven't had a GMD test in 4 years. Can you explain that?

Ms. BUNN. Sir, I've been in this office for a year, so I don't have quite the history for that. Could I defer to Dr. Gilmore?

Senator SESSIONS. Let's ask Dr. Gilmore. He's been there.

Ms. BUNN. He may have a more——

Mr. GILMORE. We've had tests, Senator. The last successful test——

Senator SESSIONS. Is he responsible to you?

Ms. BUNN. No, sir. We all work together quite closely, but no.

Senator SESSIONS. No, you have different roles, okay.

Mr. GILMORE. I'm the independent tester.

The last successful intercept that we had——

Senator SESSIONS. Explain that? You're part of DOD——

Mr. GILMORE. Sure.

Senator SESSIONS. But your role is set up to be an independent tester of the systems.

Mr. GILMORE. Correct.

Senator SESSIONS. To help Congress and others know that we're getting accurate testing, realistic testing, on the kind of situations we might face.

Mr. GILMORE. I'm charged by law with assuring the testing is adequate, meaning it is set up to give us the information we need about how the systems will perform in realistic combat conditions. I think that's an exact quote from the law. Then it's my responsibility to report factually, comprehensively, and objectively on the test results. I'm not supposed to be an advocate for the system. I am not. I should have no stake in the outcome one way or another and just serve up the facts the way they are, which is what I have tried to do.

Senator SESSIONS. How is it we haven't done any sufficient testing on GMD in the last several years?

Mr. GILMORE. The last successful intercept was in December 2008. Since that time we've actually done a bit more. We've attempted a bit more than one test per year. Unfortunately, with the exception of the captive carry test that was conducted last year of a partial solution to the problem that was manifested in the CE–2 kill vehicle failure in FTG–06A—that was a success, but it was a non-intercept test—all the other tests have failed.

We have been attempting to test, and, in fact, Admiral Syring had set up tests that were exceeding somewhat the pace of one per year. But unfortunately, because of problems with the kill vehicle and its design, those tests have failed. The very first failure, in FTG–06, had to do with a quality control issue. A cable wasn't securely fashioned and came loose in flight.

Then there was the problem that was discovered in FTG–06A with the Internal Measurement Unit (IMU) saturating because of vibrations in the structure of the kill vehicle, and that was unanticipated. Then there was the most recent failure——

Senator SESSIONS. Which is the reason you need to test, right?

Mr. GILMORE. Absolutely.

Senator SESSIONS. It's unanticipated.

Mr. GILMORE. Essentially, all of these failures, but you can put the quality control issue with the first failure in a separate bin if you would like. The other failures that have had to do with the IMU, for example, it saturating, and the failure with the CE–1 to separate, those are failure modes that really can't be predicted by modeling and simulation.

The modeling and simulation, although it's essential, basically assumes that the kill vehicles will function mechanically, for lack

of a better way to put it, the way that they're supposed to. However, it's turned out there have been some surprises there because of the way those kill vehicles were designed.

Senator SESSIONS. Admiral Syring, my time is basically up, but you intend to continue to deploy the next 14 interceptors. What kind of kill vehicle will you place on those? Then you have a plan to develop an entirely new kill vehicle that would replace those in the future—I mean, those that have already been placed on the system?

Admiral SYRING. Yes, sir. The plan to get to 44 by 2017 includes reliability improvements to the CE–2 interceptor.

Senator SESSIONS. That's the one now?

Admiral SYRING. Yes, sir, that's the current interceptor that we will fly this summer. There's small reliability—not small, but reliability improvements on top of that, that will be tested in fiscal years 2015 and 2016. One example would be the alternate divert thrusters, which will address the systemic problem of vibration that we addressed with isolating the IMU to get at the heart of the problem, to address not only the IMU issue but another issue we had with the divert system.

Again, before those are fielded, we'll go through intercept testing and prove to me and to Dr. Gilmore that we're ready to go.

Senator SESSIONS. Then finally, you will be bringing on a system that I guess uses some of the proven technology of the SM–3 and Patriot and THAAD for the future?

Admiral SYRING. Yes, sir. The components of those systems, which you articulated very well in terms of their success, would be candidates for the EKV design. We have three very interesting, viable, technically capable concepts from three companies that we'll be evaluating over the next year as we continue to work on requirements in the kill vehicle arena as well.

We have to get the kill vehicle requirements right. We have to get the Homeland defense requirements allocated properly across all parts of the kill chain, of which the kill vehicle is one.

Senator SESSIONS. Thank you.

Senator UDALL. Senator Donnelly.

Senator DONNELLY. Thank you, Mr. Chairman.

Thank you to all of you.

This would be for whoever wants to answer the question. We've seen extraordinary circumstances in Ukraine, along the border there, and actions taken by Russia and its leader. One of the things that had been worked on was a missile defense system very nearby. So I am wondering as to—we obviously have Navy ships in the area. But I am wondering if there has been any further discussion since these activities started where Russia invaded Crimea, massed troops on the Ukrainian border? Has there been any additional discussions with Poland, the Czech Republic, Romania, and other nations about the missile defense systems we have there?

Ms. BUNN. Senator Donnelly, let me say a couple of things here. The NATO missile defense, the EPAA, was designed against threats from the Middle East, not Russia.

Senator DONNELLY. I understand that. However, it was of significant concern to Mr. Putin.

Ms. BUNN. Yes, sir. Yes, sir, it was.

In general, I would say that Russia's intervention in Ukraine in violation of international law has put into flux a lot of our policies with regard to Russia. As Secretary General of NATO Rasmussen said yesterday, NATO is considering a lot of options for dealing with Russia now, relooking at its policies. General Breedlove calls it a paradigm shift.

Let me just say that the government's looking at a lot of options, the U.S. Government, NATO, yes, economic and diplomatic, but also what military options for strengthening collective defense. I don't want to get out in front of, in open session, our NATO allies.

Senator DONNELLY. Have you been speaking with our allies in Poland or in the Czech Republic or in Romania or our NATO allies?

Ms. BUNN. We've had a lot of discussions with them on a number of issues. As I say, I don't want to get out in front of our allies on a particular option.

Senator DONNELLY. Do you think at some point it would be a good indication to Mr. Putin to tell him we are working on these things, we are moving forward with these things, we are strengthening these things?

Ms. BUNN. I think indeed that's one of the reasons Secretary General Rasmussen came out, after the NATO ministerial of all the foreign ministers yesterday, and said we are looking at lots of ways to enhance our collective defense.

Senator DONNELLY. Okay. I guess maybe it's a game of semantics, but are we at some point planning to tell him that we're not just looking at them, but we're moving forward with some of them?

Ms. BUNN. Indeed, there have been things. We've moved forward with, obviously, some reinforcements of aviation detachments, Baltic air policing. There are some steps that have already been taken. Yes, there will come a point where——

Senator DONNELLY. I understand you may have to talk around this a little bit as well, but how long would it take to finish the missile defense shield system in the region?

Ms. BUNN. The plan is 2015 and 2018 for the next two phases. If you're asking what's technically feasible——

Senator DONNELLY. Have we talked to them about moving up those timelines? Mr. Putin apparently has no interest in timelines. So you know, he's not going to wait for 2018. His interests are not the same as ours.

Are we taking a look at our timelines and other things in regards to that? Are those timelines that are flexible, that can be moved up, if necessary?

Ms. BUNN. No discussions at this point with them——

Senator DONNELLY. By "with them" who do you mean?

Ms. BUNN. You asked about——

Senator DONNELLY. Our allies.

Ms. BUNN.—the nations——

Senator DONNELLY. Yes.

Ms. BUNN.—specific nations. I guess I would defer on the technical, what's possible, to Admiral Syring.

Admiral SYRING. Senator, if I can, the Poland capability in 2018 is on track. The program of record is doing well. It is hinged on two things. It's hinged on the SM–3 Block 2A development schedule, which is progressing well with our Japanese partners, but

again paced by development progress, schedule, and funding. Then the actual site proper for the military construction (MILCON) and the equipment. We've proven very successful in Romania. We've built the site now in Moorestown and at Pacific Missile Range Facility (PMRF) out in Hawaii. We'll build it again in Romania here before next year.

All of that funding is mostly in the fiscal year 2016 timeframe. To go faster it would require money in 2015 in terms of the technical feasibility of accelerating, which I don't have.

Senator DONNELLY. It may be more a question of money than the ability to technically move up timelines if we need it?

Admiral SYRING. It's money and it's the SM–3 2A development schedule.

Senator DONNELLY. Okay. When we look at our Navy-based systems—as we talked about, much of the ground-based is in concerns about Iran, but obviously caused concern by the Russians as well. With the Navy-based systems, they can be, based on where the ships are and the angles and all those things, they can cover other areas besides Iran. They can cover Russia, if necessary, couldn't they?

Admiral SYRING. In this forum I'll say they can cover a wide range of geographic areas.

Senator DONNELLY. Okay. When we look at Iran—and again, whoever wants to answer it—what is your best judgment on how far they are right now to having a nuclear weapon completed? Obviously, they're in discussions now, but if they were to decide, okay, the discussions didn't work out, how long would it take for them to reach completion?

Ms. BUNN. Senator, for the record, I'll go back and look at the Director of National Intelligence's worldwide threat assessment. We're trying to get them not to go there.

Senator DONNELLY. I'm hopeful of that, too.

Ms. BUNN. Yes, I understand. Let me get that for you for the record, because it's an intelligence assessment.

[The information referred to follows:]

[Deleted.]

Senator DONNELLY. If they complete that, do they have the delivery systems in place already to deliver it?

Ms. BUNN. They have short- and medium-range missiles already. That's the reason for the EPAA in Europe. They have those short- and medium-range missiles already. They're working on a longer-range missile.

Senator DONNELLY. Does that long-range—would that longer-range missile reach our country?

Ms. BUNN. If they are successful in developing and testing that. They are trying for it, and so yes, they're trying for one that would reach us.

Senator DONNELLY. Unfortunately, my time is up. Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator Donnelly.

Senator King.

Senator KING. Thank you, Mr. Chairman.

Would you give me an update—Ms. Bunn, maybe this is you; or if not, whoever the appropriate person is—on the status of the environmental impact statements (EIS) on the four locations for the GBI site, the east coast site?

Ms. BUNN. Admiral Syring is actually the best for that, because MDA has named the four sites and they've begun the EIS on the—let's see, Michigan, Maine, Ohio, and New York. I will ask Admiral Syring, with your permission.

Senator KING. Michigan's on the east coast? I hadn't noticed that. [Laughter.]

Ms. BUNN. In the eastern part of the United States, even though Michiganders might not like to——

Senator KING. The guy from Indiana——

Ms. BUNN. They don't want to call themselves——

Senator DONNELLY. Chairman Levin will be surprised. [Laughter.]

Senator KING. Oh, that Chairman Levin. [Laughter.]

Admiral?

Admiral SYRING. Yes, sir. We completed the down-select in January of this year to the four sites, and it's the Survival, Evasion, Resistance, and Escape facility in Portsmouth, ME; Fort Drum, NY; Camp Ravenna, OH; and Fort Custer, MI.

The EIS process has started. We've said it will take us 24 months to complete that. That's actually faster than the historical DOD EIS process, but we're confident that we have a great team in place that does this in terms of deployment for other systems that we deploy around the world.

We'll develop a contingency plan, and you know what that is, Senator, in terms of how would you do—how would you actually build the site, how would you design the site, how would you field what we call it, is a continental United States interceptor site, since it is both midwest and the east, based on the threat trajectories of the areas that we're considering. That'll be a cost, schedule, and acquisition-focused contingency plan.

We've actually already developed a very detailed requirements document, overarching requirements document, that we've been working on for the last 6 months. That'll inform the contingency plan and the detailed plan for all four sites to not wait if the decision is so made, to be able to get on with it if the requirement comes from the combatant commander and DOD makes that decision.

Senator KING. You'll have essentially a mockup of a plan, so you don't start from scratch after the EIS?

Admiral SYRING. Yes, sir. There's a plan—there's planning work that can go on at a level below the detailed planning level, that will be done on each of the sites, so we don't have to wait another 2 years for that work to be done. We can do a lot of this work in parallel prior to selecting a site, that will be then tailored to the individual site that we select.

Senator KING. Thank you.

I was in Israel a few months ago and visited an Iron Dome site. Talk about real-time research and development (R&D). I understand that we're doing a lot of funding of that system, but we're also getting a lot of the intellectual property back. Are we incor-

porating—and I know that's a different, that's not intercontinental. But it's certainly missile defense and it seems to be working. They claim an 85 percent efficiency.

Are we learning anything from that, from that system?

Admiral SYRING. We are. Let me address programmatically what we're doing and then I will pass it to General Mann if that's okay in terms of what the Army may be looking at. We were very successful with the Israelis to sign an Iron Dome coproduction agreement this year, which will set us up for 30 percent of production of that interceptor in the United States this year, 55 percent next year, which is a good thing for us and it's a good thing for Israel that that's in place, because we'll have a second source for the provider of that interceptor.

We've also requested in this year's budget $175 million for Iron Dome, both interceptor and battery procurement, that will be informed in terms of how many interceptors, how many batteries we actually buy, through the coproduction work that's going on.

There's a very detailed contract negotiation that's going on between Rafael and Raytheon today. We don't have any privity of contract on that, so our insight is somewhat limited. But I'm confident that as we allow that process to work forward that the right answer will come out.

Senator KING. But you're satisfied with the privity of intellectual property, if you will, that we're learning the lessons along with them?

Admiral SYRING. Yes, sir. The design and the technical data packages come, are coming and will come with it.

Senator KING. Now, having been through this hearing last year and then a briefing afterwards and another hearing today, it's clear that this is a tough problem. This is a tough scientific problem, physics problem. Are we thinking about alternatives? Is it possible, instead of sending a missile up, high-powered lasers or some other alternatives to this, what is appearing to be a very difficult piece of construction and engineering?

General MANN. I'll take this. I don't know if Admiral Syring wants to jump on. But there's a lot of different efforts that are under way. When you're talking about cruise missiles or rockets, artillery, mortars, things like that, we're looking at directed energy very aggressively. In fact, we've already had a successful test back in December of last year in the 10 kilowatt range, where we were able to knock out mortars and it was also effective against unmanned aerial vehicles (UAV).

What we're doing right now is we're working with the Navy. We've transported that demonstrator to Florida and we're doing testing with the Navy under more environmentally challenging scenarios. We're looking at by 2017 we could probably get up to the 50 kilowatt. Again, we're looking at threats that are low-level threats, whether it's UAVs, possibly cruise missiles.

I know that MDA is also looking at directed energy, really looking at a higher level platform, maybe post-launch or post-boost level type engagements. So we're working collaboratively with MDA to really leverage, like you were talking about, other technologies, in this case directed energy.

Senator KING. But in dealing with an intercontinental missile, the only option is another missile at this point?

General MANN. At this point.

Senator KING. One of our advantages is naval power. I'm worried about anti-ship missiles. How do we—in terms of missile defense, how do we—is that up to the ship or how do we think about missile defense of our naval vessels?

Admiral SYRING. I'll talk about the ballistic missile defense and then General Mann can talk about the cruise missile defense of the ship. We have a very robust sea-based terminal defense program that's requested in this year's budget, that helps us to defend the carrier sea base against that exact threat. I'd like to share the details of that in a classified forum, but it's based upon the SM–6 missile that the Navy has successfully tested and developed.

Senator KING. I'd like to, if we could follow up, have that briefing.

Admiral SYRING. Yes, sir, we'd be happy to.

Senator KING. Cruise missile defense?

General MANN. Again, cruise missile defense, right now, I think, there's 9 countries that are currently aggressively involved in cruise missile technologies, and I think there's another 20 that's looking into this. Right now—I talked about using directed energy as a technology that we can leverage to get after that threat.

We're also right here locally—I think you all are aware of the Joint Attack Netted Sensor that aerostat that we're going to be placing at Aberdeen Proving Ground. It's going to be a test from fiscal years 2014 through 2017. We're working with U.S. Northern Command on this, and that basically provides greater surveillance and fire control radar capabilities, so when netted with interceptors like the Norwegian Advanced Surface-to-Air Missile System that we have here locally that's protecting the National Capital Region—we're going to do a test that will provide us with greater range, greater sensor coverage of this area. We're looking forward to learning from that to help us get after the cruise missile threat, which is growing.

Senator KING. It's a serious threat.

General MANN. Yes, sir.

Senator KING. Admiral, I can't resist. The studies you're doing for the east coast site remind me of when God came to Moses and said: "I have good news and bad news. The good news is I'm going to empower you to part the waters of the Red Sea and let my people escape to freedom." Moses said: "What's the bad news?" God said: "You have to prepare the environmental impact statement." [Laughter.]

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator King.

Let me turn back to the GMD system and the question whether it protects all of the United States. I'll direct this to General Mann, Admiral Syring, and Ms. Bunn. In your prepared testimony you each state that the current ground-based midcourse protects the United States against a limited ballistic missile attack from North Korea and from potential Iranian ICBMs. This is an important point. I want to make sure the record is clear on this since there seems to be some confusion on this subject here on Capitol Hill.

Ms. Bunn, is it correct that our current GMB system covers the entire United States, including the east coast, from missile threats from North Korea and from Iran?

Ms. BUNN. Yes, sir, that's certainly my understanding.

Senator UDALL. Admiral Syring?

Admiral SYRING. Yes, sir.

Senator UDALL. General Mann?

General MANN. Yes, sir.

Senator UDALL. On that note, General Mann, is that why your prepared testimony says, "As the Secretary of Defense 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 a changing fiscal environment"?

General MANN. Yes, sir. But it also goes to the point where we need to continue to improve our technology, whether it's sensor discrimination, EKV improvements, because we know that the threat is not just satisfied with the current capability.

Senator UDALL. It's not static.

General MANN. Yes, sir.

Senator UDALL. It's not always symmetrical, either.

Ms. Bunn, let me go back to this question. In addition to the EPAA, we are pursuing regional missile defense enhancements in the Middle East and Asia, including significant efforts at cooperation with our allies and partners in each region. From a policy perspective, can you describe what we are trying to accomplish with our allies and partners in each region, including our efforts in the Middle East, with Israel and with the Gulf Cooperation Council (GCC), and our efforts in Asia with Japan and South Korea?

Admiral Syring and General Mann, after the Secretary comments, if you have anything to add, we'd appreciate it for the record.

Ms. BUNN. Mr. Chairman, as General Mann pointed out, as we've all pointed out, the supply of short- and medium-range ballistic missiles is greater than the number of regional defense missile interceptors that we have and will have for the foreseeable future. So I think for protecting both our deployed forces as well as our allies and partners, it's important for others to also have their own missile defenses. It's also important to net them together to make them interoperable in a way that the sensors that we each have can share information and make the use of each of our missile defense capabilities more effective, more efficient.

In the Middle East, we have a longstanding cooperative relationship with Israel. It goes back almost 28 years now. I was doing the math. I was the action officer for the first agreement with Israel. That was in 1986. That is a longstanding cooperative relationship.

We are making efforts with the GCC, as I said. A number of those countries are acquiring and interested in acquiring their own missile defense capabilities and, as the Secretary of Defense said in Manama recently, that working together, trying to get the GCC to also see that sensor interoperability, sensor sharing, makes every country's missile defenses more capable.

In the Far East, certainly with Japan, Japan is also—that was the other missile defense agreement in 1986. Japan, we've had a

longstanding cooperative program with, and, in fact, we are co-developing right now the SM–3 2A with the Japanese. They have their own deployed *Kongo*-class ships as well with missile defense capability. South Korea is examining some integrated air and missile defense, moving forward on that as well.

Senator UDALL. Thanks for that update.

Admiral?

Admiral SYRING. We're doing a lot around the world. Let me just highlight some of the main points, and I'll just add to what Ms. Bunn said. The NATO command and control system, I think, was a huge success in terms of that being operational at Ramstein and connected with our command and control system for the first time ever. That will enable us to add nodes to basically both networks in Europe.

Spain has been very forthcoming and we're very thankful for their ability to host the four destroyers in Rota as part of EPAA. Turkey hosted the TPY2 site. The Netherlands and Germany have stepped up with Patriot in Europe with Patriot batteries. Romania and Poland, their ability to host our Aegis Ashore sites and their willingness to accept our systems there, I think, goes without further mention.

Israel, again just a great partner, partnered on actually four development programs with them: Iron Dome, Arrow 2, Arrow 3, and David's Sling.

Asia, Japan, just shift to the west, the Japanese, in terms of the SM–3 2A development program, but they have the Aegis destroyers that have BMD capability on them as well, that actually serve on station. We're in active discussions with them on how to upgrade their capability as well.

In the Gulf, back east, great progress with the United Arab Emirates in terms of the THAAD agreement that we signed with them. I'm working actively for more opportunities across the Gulf region in the next year and hopefully we'll come back and report progress there.

Then South Korea, I think we're in the formative study discussions, just answering some of the questions that they have as well.

Finally, there's a lot of countries that have been discussing and are asking questions about how their ship sensors can help and how they can contribute to BMD in terms of search and track capability on our network.

Senator UDALL. General, do you have any additional?

General MANN. Just very quickly, Senator. In addition to the material acquisition programs that we're talking about here, we do a lot of collaborative exercises with a lot of our allies out there, especially in the CENTCOM area of responsibility (AOR). I'm also about to do a capstone exercise later this month that's going to involve 22 nations.

At those exercises, not only do we get into, in some cases, tactics, techniques, and procedures, but we also get into some of the policy issues related to sharing of data, which sometimes causes some sticking points on sharing data, whether it's sensor data or whatever it might be. Very robust engagements are ongoing right now with our allies.

Senator UDALL. The three of you took us on quite a tour. It's impressive what we're doing. I know we want to do more.

I know my time is about to run about. But Admiral Syring, a short, concise comment, if you could, on what would happen if sequestration came back fully in fiscal year 2016?

Admiral SYRING. It would put all of the efforts that we have requested to begin development back on the table.

Senator UDALL. Thank you.

Senator Sessions.

Senator SESSIONS. Let me just tell you, you're going to be looking at $521 billion. Is that sequestration or not? It's the same you had last year. Does that mean you can't fund what you've been talking about? We're talking beyond each other, like ships in the night, it seems to me, about numbers.

Admiral SYRING. Sir, with——

Senator SESSIONS. There is no more cuts if we stay on the Budget Control Act (BCA) numbers. I'm trying to figure out what we're saying here. That's what I was asking at the very beginning.

Admiral SYRING. If we take a cut, be it to the proposed fiscal year 2016 program——

Senator SESSIONS. The proposed program?

Admiral SYRING. Yes, sir, the requested program from DOD.

Senator SESSIONS. Is DOD requesting more than the BCA?

Admiral SYRING. We haven't put a 2016 budget together yet. We've put together a 2015 budget that assumes controls in 2016.

Senator SESSIONS. You better not be counting on spending more money than the BCA, because we already have extra money this year and next year. If we can get by spending at $521 billion this year and $521 billion next year, we go up $13 billion a year thereafter, we've made it past the danger period, which was this year and next year, really were the most crisis years.

We're going to have to keep talking about that, because there's just confusion out there. I do think sometimes our DOD is talking about the projections that assume more money than is in the BCA, assume we will have to have another vote to bust the budget and spend above that, and sometimes they're not. So it's confusing. We need to be apples to apples when we talk about these numbers.

Admiral Syring, so this redesigned kill vehicle, that need for the GBIs, the first test of that is supposed to be in 2018. When can we expect and you would hope and expect to be able to retrofit our 44 GBIs with this new system?

Admiral SYRING. Sir, the budget request asks for two flight tests in fiscal year 2018 of the new kill vehicle, first a non-intercept test and then an intercept test. But I would just caution that as we develop the acquisition approach and strategy, you have my commitment to make sure that we don't cut corners and we do it right.

Right now I think we can make a flight test in 2018, for a fielding of the first interceptor by 2020. But again, that's going to be informed by proper design progress and testing progress.

Senator SESSIONS. What can you tell us in a public forum about the intelligence estimates of Iran and North Korea with regard to a missile system that can reach the United States?

Admiral SYRING. The intelligence estimate is they're able to flight test, the projection is, to flight test an ICBM by 2015.

Senator SESSIONS. We don't doubt that they eventually have the capability to make that a successful missile if left to their own devices?

Admiral SYRING. I'd like to take that into a classified forum, sir.

Senator SESSIONS. They've made progress with missiles. They're pretty sophisticated in them, as are the North Koreans. We would think, as much as their people suffer, it's not possible, but it apparently is possible. They already have proven fairly sophisticated technology.

Admiral SYRING. They are making capability improvements and capacity improvements every day.

Senator SESSIONS. Now, the plan, General Mann, to protect Europe and what we are trying to do there—maybe this is your question—that plan is to deal with Iran, not Russia; is that correct?

General MANN. That is correct.

Senator SESSIONS. We're not pretending that we have the capability to protect Europe or the United States from a massive Russian launch.

General MANN. Senator, you're correct. That is for threats emanating out of the Middle East, Iran.

Senator SESSIONS. It's something I hope we can be successful on. I know we can if we work on that.

Thank you. I yield back my time.

Senator UDALL. Senator King.

Senator KING. One question. Admiral Syring, you said several times in your last answer, you talked about networks and connecting networks in Europe. It raises the question of how—are you thinking as you develop this project about cyber vulnerability? Because the good news is we have a very good, interconnected, wired society. The bad news is it makes us very vulnerable to cyber attack.

Is part of your design strategy cyber attack resistance as far as the command and control and the networks that connect the sites and those kinds of things?

General MANN. Yes, sir. A very robust cyber program within MDA.

Senator KING. Good. Thank you. I appreciate that.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator King.

We have a few more minutes. I have a few more questions, so I'll pick up where we left off on the budget. General Mann, the budget request, if it were approved by Congress, does it meet the needs of the warfighter for improving our missile defense capabilities?

General MANN. Yes, Senator.

Senator UDALL. Admiral Syring, does the budget request put us on a path to improving our ability to defend against both Homeland and regional missile threats? If so, what are some of the initiatives that will provide such improvements?

Admiral SYRING. It does put us on that path, sir. The one marker I'll put on the table is that discrimination capability to the east is equally important, and long-term we're going to be looking to address that gap. Right now the strategy would be to move sea-based

X-band radar to the east as the long-range radar is built to the west.

The other gap I would say would be infrared sensing capability, which is heavily in the R&D phase right now, and we're working hard on that.

Senator UDALL. I know Senator Sessions and you had an exchange about the budget. We talked briefly about ensuring that we're all on the same page, apples to apples, oranges to oranges. There will be additional time to discuss that as we move forward, and we'd welcome clarifications, additional information, in the testimony you'd submit for the record. I think it is important to understand where we are.

Ms. Chaplain, you've been patient. You're the watchdog that we all appreciate being involved. GAO has been a consistent advocate for the fly-before-you-buy approach and has warned for years that deploying missile defense systems before they're fully developed and tested could end up taking more time and costing more money than using a more rigorous acquisition approach.

We've spent, I think, at least 3 years trying to diagnose and fix the problems with the kill vehicles for the GMD and have conducted or will conduct a number of very expensive and previously unplanned flight tests to demonstrate those fixes. Can you give us a rough order of magnitude of what it has or will cost us to try to fix these problems after the fact, including the additional flight tests? I imagine it may be over $1 billion.

If we had used a more rigorous fly-before-you-buy approach with GMD, do you believe we might have been able to avoid those additional costs? I ask the second question not to pile on, but just because everybody in this hearing wants to learn from mistakes, shortcomings, you name it.

Ms. CHAPLAIN. Our estimate for fixing the problems in the flight tests and recovering from it is at $1.3 billion right now. So it is close to what you said, even more than that. We do believe those costs could have been avoided had a fly-before-you-buy approach been followed. [Pause.]

Senator UDALL. Excuse me. Thank you for that clarification. As the hearing comes to a close, I wanted to see if Senator Sessions had any other questions he might like to ask.

Let me ask one more question and go back to Dr. Gilmore. You've approved several versions of the integrated master test plan. That lays out the schedule and the testing for the objectives, I should say, for missile defense testing. There have been suggestions that we should substantially increase the pace of testing our missile defense systems, particularly our GMD system, and that that would greatly help accelerate system development.

Could you comment on the factors that drive our testing pace and whether you think we should or could accelerate testing significantly above the currently planned test pace? Although there have been some changes and delays in the testing, can you explain whether we've been able to really put in place a plan that helps us understand how we move forward?

I know you've been speaking of this. You're clearly the historian and the expert on much of this.

Mr. GILMORE. The historical pace of testing has been about 1.2, not to be too precise——

Senator UDALL. I want you to be precise.

Mr. GILMORE.—ground-based missile defense tests per year over the last decade since 2000. Early on the flight test pace was a little higher than that. It was up around 1.3, 1.4.

Senator SESSIONS. Are those complete tests? Or are some of those partial tests of the system?

Mr. GILMORE. I'm counting the tests that were meant to conduct intercepts.

Senator SESSIONS. Actual intercepts?

Mr. GILMORE. Yes. I can give you the details. I think I'm correct on that.

It's also true, because I've reviewed the historical record, that both General Kadish and General Obering had testified at various times on their plans for the program before this subcommittee and other committees that they hoped to be able to do three or four tests a year. They were never able to achieve that.

Would it be good to be able to do three or four or more tests per year for the ground-based missile defense system? Yes, it would. Can I sit here and say that there is absolutely no way that can be achieved with additional money? No, I can't prove that. But I can point to the historical record, where at least two MDA directors tried to increase substantially the pace of testing beyond one per year and did not succeed.

I can only guess to some extent, while that's true, but I hope you'll regard it as an educated guess, and this is based on my interactions with Vice Admiral Syring and his staff and his predecessor. There is just a certain amount—these are very complex tests and there's a huge amount of data that are collected, that have to be analyzed after the test. If you don't take the time to analyze those data, then you're not going to be able to learn and understand what the problems are and what the corrections should be and what you want to pursue in the next test and what you want to put into your development program to improve the performance of the system.

Moreover, it takes many months to plan these tests. This first operational test that we did, which didn't involve the ground-based missile defense system but did involve THAAD and Aegis, was a tremendously complex thing to plan. Then also Vice Admiral Syring's team had to deal with a lot of unanticipated events along the way, including problems with targets that had to be corrected in real time, and that's why the test got pushed out and why we didn't get all the information we hoped, but we still got a lot.

It's not just a matter of buying additional interceptors and buying additional targets. You would think it might be that simple: Instead of buying one additional GBI a year and one additional target a year, we'll buy more, that will enable us to test more. Certainly that's necessary, but you also have to have a lot of engineering expertise in-house. A lot of this work can't be done in parallel.

You'd have to have larger teams of experts if you wanted to plan two tests simultaneously or three and execute two or three tests simultaneously instead of three. Then you would run into the infra-

structure problems. There's only one Reagan Test Site, there's only one PMRF. There's only so much activity you can jam into them.

Could additional funding help increase the pace of testing for GMD or these other systems somewhat? Yes. But I think there's a limit. I can't state precisely what it is. I also know that it wouldn't happen overnight. It would take a number of years to build up the additional engineering teams, the additional hardware in the loop facilities that have to be used to prepare for the tests.

I can only go back to the historical record on GMD and these other tests, and the historical record is what I said. It's about 1.2 intercepts a year, even though various directors have tried to do more and, unfortunately, didn't succeed.

Senator UDALL. Thank you. I'd make two short comments, then I'll turn to Senator Sessions before we adjourn the hearing.

I think the average American family has 1.8 children, is that not right? Maybe there's some parallel here. [Laughter.]

Mr. GILMORE. I won't speculate on that.

Senator UDALL. Director Clapper was asked—by the way, for the record I wanted this, the comments that he made about the Iranian capability. I think he said the Iranians are moving to develop an ICBM. He said adding a weapon to that ICBM is a whole other problem. He implied that there would be additional time to weaponize that missile. But that doesn't mean we can rest easy, of course, and that's the mission you all are on.

I just want to thank you for your work, for your commitment to our country and our country's defense. Let me recognize Senator Sessions.

Senator SESSIONS. Thank you. I just wanted to take one moment before we adjourn to express my sympathy to the family of Dr. Schlesinger, who passed away March 27. What a national treasure he's been. He's given of himself to the country so much and was with Dr. Perry, former Secretary Perry, who was chairman, and he was vice chairman, of the American Strategic Posture Report in 2009, which I offered legislation to call for. They really produced a report. It was a bipartisan report, a bipartisan commission, that gave us, I think, the right advice on the strategic posture of the United States. We will make a mistake if we get far away from that, in my opinion.

In 1974, he was given credit for what came to be known as the Schlesinger shift when he was with Nixon, to move away from mutually assured destruction as the policy of the United States. Then he was Secretary of Energy under President Carter and just continued to be a source of wisdom on matters of technical and nuclear issues.

This subcommittee has benefited from hours of his time that he's given when he could have been doing other things. He was very valuable in helping us maintain a bipartisan strategic posture.

Senator UDALL. Thank you for that, Senator Sessions. I'd like to associate myself and the subcommittee with what you just shared with us. We'd do well to emulate Dr. Schlesinger's role.

Thank you all. We'll keep the record open through the end of the week. We may want to direct some additional questions to you. You may want to amplify or add to your statements. Thanks again for taking the time to be here.

The subcommittee is adjourned.
[Whereupon, at 4:03 p.m., the subcommittee adjourned.]
[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR MARK UDALL

INVESTMENT PRIORITY FOR SENSORS AND DISCRIMINATION

1. Senator UDALL. Ms. Bunn, Admiral Syring, and General Mann, you indicated that, in addition to improving the reliability of the Ground-Based Interceptor (GBI) and kill vehicles, our Homeland missile defense investment priority is the improvement of our sensor and discrimination capabilities, rather than deployment of an additional interceptor site on the east coast of the United States. Please explain why such improvements in sensors and discrimination capabilities are the investment priority, and how they will improve our Homeland missile defense capability.

Ms. BUNN. Investing in sensor capabilities improves the performance and efficiency of our Homeland defenses. The deployment of a Long-Range Discrimination Radar in Alaska would provide persistent missile defense radar coverage and improve discrimination capabilities against threats to the Homeland from North Korea and would provide the Sea-Based X-band (SBX) radar more geographic deployment flexibility for contingency and test use. Improved sensors have the operational effect of increasing the number of attacking warheads the Ground-based Midcourse Defense (GMD) system can intercept.

The intercontinental ballistic missile (ICBM) threat from Iran has not yet emerged, and the current GMD system provides coverage of the entire United States from North Korean and potential Iranian ICBMs. If an ICBM threat were to emerge in numbers that necessitated the deployment of additional interceptors, the steps being taken now, including completing an Environmental Impact Statement (EIS), would shorten the construction timelines associated with deployment of a new missile defense site.

Admiral SYRING. The Missile Defense Agency's (MDA) systems engineering process is based on allocating integrated Ballistic Missile Defense System (BMDS) requirements that balance capability and feasibility across sensors, command, control, battle management and communications, fire control, and weapons. Consistent with this process and our strategy to improve our Homeland defense capability, the MDA will engineer and allocate integrated system requirements to drive balanced and integrated BMDS development activities for improvements in sensors and discrimination capabilities. These activities, executed in parallel, include developing the long range discrimination radar, improving existing sensor hardware (including the Aegis SPY–1), improving discrimination threat databases in sensors and weapons, improving discrimination techniques in software across multiple BMDS elements, air and space electro optical/infrared sensor capabilities, and the next generation kill vehicle.

Discrimination is the ability of the BMDS to distinguish lethal reentry vehicles from other threat objects, such as decoys. Discrimination is executed across the BMDS. It begins with sensor measurements. It ends with kill vehicle selection of the target reentry vehicle. Improving discrimination via algorithm development and maximizing sensor utility is MDA's first investment priority. Through analysis conducted during the BMDS Vision Study, the missile defense community identified improved discrimination as an essential capability of the BMDS to counter increasingly complex threats, allowing for fewer interceptors to be expended against a threat cluster.

Adequate discrimination capability allows the BMDS to intercept the correct object while reducing the interceptor waste that results from committing interceptors to objects that aren't lethal reentry vehicles. An additional interceptor site on the east coast will increase GBI inventory, while allowing earlier engagements (increased battlespace) against threats from Southwest Asia (compared to interceptors launched from Fort Greely, AK and Vandenberg Air Force Base, CA).

An east coast interceptor site will increase the warfighter's time to shoot the interceptors according to shot doctrine, but the site itself doesn't improve the discrimination needed to select the lethal object hidden in a confusing threat complex. It doesn't reduce interceptor waste, because extra interceptors don't overcome the inability to distinguish the lethal object. For cost-effective success, we need the right balance between number of interceptors, the right sensor capabilities, and adequate discrimination capability.

General MANN. It is vital that we effectively employ our interceptors to counter a ballistic missile threat emanating from rogue state actors. Essential enhance-

ments to the current ballistic missile defense (BMD) sensor architecture enable more efficient and effective operational employment of limited GBIs by improving the ability to distinguish the target within the threat complex.

ACQUISITION RIGOR FOR REDESIGNED EXO-ATMOSPHERIC KILL VEHICLE

2. Senator UDALL. Admiral Syring, at the hearing you agreed that we need robust acquisition rigor for the redesigned Exo-atmospheric Kill Vehicle (EKV) and said that "we have one chance to get this right." What are the elements you believe are essential to a fully rigorous EKV redesign acquisition program, including for system engineering, design, development, test, and evaluation, to make sure that we do not repeat any of the problems we have had with the current prototype EKV design?

Admiral SYRING. The primary elements necessary to improve the success for the redesigned EKV and GBI acquisitions are identified below:

(1) Define stable requirements that reflect projected operational needs over the next decade;
(2) Allow adequate time to design necessary components to meet our requirements;
(3) Establish reliability, producibility, testability, maintainability, and cost effectiveness as design criteria;
(4) Conduct comprehensive design reviews with stakeholders to ensure program needs are met;
(5) Procure sufficient test assets early in development to thoroughly identify and handle design problems;
(6) Confirm the design meets requirements through extensive design verification testing and comprehensive qualification testing;
(7) Execute rigorous systems engineering processes to integrate components into the redesigned EKV, the redesigned EKV into the GBI, the GBI into the GMD and the GMD into the BMDS;
(8) Complete a methodical ground test campaign that proves system level performance using models and simulations that are anchored to test data;
(9) Conduct flight testing to demonstrate and assess system capabilities and provide data for modeling and simulation anchoring; and
(10) Enhance the Stockpile Reliability Program, Service Life Extension Program, and the obsolescence program to better understand the state of the GBI fleet throughout the lifecycle.

KILL VEHICLE FAILURE AND CORRECTION

3. Senator UDALL. Admiral Syring, last July, the flight test of the GMD system with the Capability Enhancement (CE)-I kill vehicle failed because the kill vehicle failed to separate from the booster. Please explain the cause of this failure; whether it is related to the more modern CE–II kill vehicle; how you plan to fix the CE–I problem and demonstrate the correction; and whether you will make any changes to the fleet of deployed CE–I interceptors.

Admiral SYRING. The FTG–07 Failure Review Board concluded the failure was the result of excess EKV battery current leakage. The leak caused EKV electrical component reset and the EKV's subsequent inability to separate from third stage.

For the CE–II EKV, we are considering two design changes. The first is redesigning the EKV battery. The second is incorporating improved grounding ties. Both hardware design changes will include software updates to the electronics unit (flight computer). We expect the redesigns to make the electrical system more robust, while improving EKV and GBI reliability.

For existing CE–Is, we are developing updated EKV embedded software (ESW) 22.2 to include electronics unit (flight computer) reset recovery capability. This capability will be demonstrated through accredited system level and formal qualification testing. ESW 22.2 can be loaded into CE–Is while the interceptor is in the silo.

4. Senator UDALL. Dr. Gilmore, do you believe there should be a future GMD intercept flight test with the CE–1 kill vehicle to demonstrate the objectives intended for the failed FTG–07 flight test last July?

Dr. GILMORE. Yes, I believe the MDA needs to fly a GMD intercept test with the CE–1 kill vehicle as I recommended in my 2013 Annual Report. This should be done to satisfy the test objectives not achieved on the FTG–07 mission.

5. Senator UDALL. Ms. Chaplain, do you believe there should be a future GMD intercept flight test with the CE–1 kill vehicle to demonstrate the objectives intended for the failed FTG–07 flight test last July?

Ms. CHAPLAIN. MDA should conduct a CE–I test once the cause of the July 2013 test failure is understood and any mitigations are developed in order to demonstrate the original objectives of FTG–07. Although MDA has demonstrated the CE–I's initial capability, FTG–07 was originally designed to assess CE–I performance against more challenging threats and longer range targets. Additionally, this test was intended to confirm the effectiveness of previous design changes made to improve the performance of the CE–I.

We recognize that MDA must balance several competing GMD priorities, including which flight tests to conduct, and conducting another CE–I flight test in the immediate future may not be feasible. However, there remain a number of uncertainties regarding the CE–I performance. Until those uncertainties are resolved, the warfighter may not be able to make the most effective use of the interceptor because they will not know the interceptor's full capabilities and limitations. As such, we maintain that flight testing the CE–I should continue to be a priority for the Department of Defense (DOD) since the CE–I constitutes a multi-billion dollar investment by DOD and serves as the primary defense of the U.S. Homeland against enemy ballistic missile attacks.

STANDARD MISSILE-3 TEST FAILURES

6. Senator UDALL. Admiral Syring, as noted at the hearing, there have been several flight test failures related to the Third Stage Rocket Motor that is common to both the Standard Missile (SM)-3 Block IA and Block IB interceptors missiles. Please explain what caused this problem; how you are addressing it; and how it will affect the full-rate production decision for the SM–3 Block IB interceptor.

Admiral SYRING. Two Flight Test Standard Missile (FTM) have experienced Third Stage Rocket Motor (TSRM) failures; FTM–16 (September 1, 2011) and FTM–21 (September 18, 2013). The TSRM is a dual pulse rocket motor that uses an interpulse delay (IPD) to vary the ignition start time of the second pulse which increases SM–3 Block IA and IB battlespace. The TSRM is controlled through a nozzle that can vector thrust during rocket motor burn and an integrated hybrid attitude control system during coast.

FTM–16 had an unexpected energetic event during second pulse TSRM operations causing the missile to lose control. The Failure Review Board (FRB) determined the failure to be a result of higher than expected heating of the rocket motor case and nozzle joint. The FRB discovered a dependency of heating severity on IPD where shorter IPDs overheated the aft closure joint. To address the issue, the heating effects were mitigated by limiting the minimum IPD. The FTM–16 FRB was closed and the final report was issued in December 2012.

FTM–21 was the first flight test to employ a dual salvo engagement of a single target and the first SM–3 intercepted the target, while the second missile experienced a TSRM anomaly in the second motor pulse during flight following a maximum IPD. A FRB to investigate FTM–21 has been established and the leading theory is that the TSRM failure was due to severe internal flow conditions that eroded an O-ring located at the rocket motor case and nozzle interface. The FTM–21 FRB is expected to close in December 2014.

Based upon ground and flight test firings, the TSRM currently meets overall design reliability requirements. Between ground tests and flight tests of the IA and IB, the TSRM has been 23 for 23 and 19 for 21, respectively. A TSRM Engineering Change Proposal (ECP) that addresses both FRB findings and adds design margin to the TSRM began in March 2014 with final ECP design scheduled for completion in third quarter fiscal year 2015. The ECP makes minor changes to the insulators at the motor case and nozzle joint, which will better protect the O-ring. The current ECP development and test schedule will support the fiscal year 2015 production and a retrofit decision for the current SM–3 fleet will be made after completion of ECP testing with a final decision based on a reliability cost-benefit analysis.

Operational testing of the SM–3 Block IB is complete and a production decision for the SM–3 Block IB for fiscal year 2015 and beyond is dependent upon system suitability and effectiveness determination by the Director, Operational Test and Evaluation (DOT&E), and submission of the Initial Operational Test and Evaluation report to the Secretary of Defense and congressional defense committees. It is anticipated that DOT&E will support full rate production.

EUROPEAN PHASED ADAPTIVE APPROACH

7. Senator UDALL. General Mann, the European Phased Adaptive Approach (EPAA) to missile defense is designed to provide increasing levels of missile defense capability for the North Atlantic Treaty Organization (NATO) Europe against Iran's growing regional ballistic missile threat. The first of 3 EPAA phases was deployed at the end of 2011, and we understand that Phase 2 is on track for deployment in Romania and at sea during 2015 and Phase 3 is on track for deployment in Poland and at sea in the 2018 timeframe. From a warfighter perspective, will the EPAA provide a necessary and significant military capability to defend NATO Europe against Iran's growing ballistic missile threat, including our forward deployed forces in the region?

General MANN. Yes, additional military capabilities will be achieved to defend NATO and our forward deployed forces against the growing threat. Upon completion of Phase 2 in 2015, the EPAA will provide a more robust capability to defend against short- and medium-range ballistic missile threats. Operational deployment of sea- and land-based SM–3 Block IBs will provide multiple, in-flight, opportunities to engage and destroy threat missiles. The follow-on 2018 operational fielding of Phase 3 capabilities, to include sea- and land-based deployment of SM–3 Block IIAs, will result in added ability to counter more sophisticated threats and extend coverage to European partners and forward deployed forces threatened by longer range ballistic missiles.

8. Senator UDALL. Ms. Bunn, what is the level of support from our NATO allies, particularly Romania, Poland, Turkey, and Spain, for our planned EPAA deployments, and what actions are they taking to improve NATO missile defense?

Ms. BUNN. All NATO allies fund the expansion of the missile defense command and control system through NATO common funding. NATO also operates a BMD Operations Center (BMDOC) in Ramstein, Germany. The BMDOC is operational 24-hours a day, 7-days a week, and is staffed with officers from several NATO countries.

Several NATO allies are also making voluntary contributions, which vary from hosting U.S. missile defense assets (Romania, Poland, Turkey, and Spain) to fielding operational capabilities available for NATO deployments. Poland currently possesses RAT–31 radars and has announced its intention to spend U.S. $10 billion to acquire integrated air and missile defense capabilities for territorial defense. Poland will host a U.S. Aegis Ashore site and will be responsible for external site security. Romania will also host a U.S. Aegis Ashore site and will be responsible for external site security. Spain currently has one PAC–2 battery in its inventory. It has also agreed to host four U.S. Aegis ships in Rota and will be responsible for external site security. Turkey currently possesses RAT–31 radars and has decided to acquire a lower-tier air and missile defense system. Turkey currently hosts a U.S. AN/TPY–2 radar and is responsible for external site security. Other NATO countries are evaluating potential national contributions to NATO BMD. The United States welcomes any member's decision to contribute to this important mission.

9. Senator UDALL. Admiral Syring, you have indicated that EPAA Phases 2 and 3 are on track for deployment in 2015 and 2018, respectively. You also indicated that Phase 3 will depend on the successful development and testing of the SM–3, Block IIA interceptor we are jointly developing with Japan. Please explain the current development and test schedule risks for the SM–3 IIA interceptor, and whether you will adhere to the fly-before-you-buy approach of demonstrating its capability in realistic intercept flight testing before deploying the system.

Admiral SYRING. The SM–3 Block IIA is currently on schedule to meet EPAA Phase 3 deployment (by end of calendar year 2018). At this stage, development and test schedule risk is in component level qualifications. To reduce risk, the program has established and is conducting a comprehensive ground-based qualification test plan for all principle components. These ground tests will validate missile component design and performance and reduce risk in advance of flight testing in second quarter of fiscal year 2015. One such ground test was the Propulsion Test Vehicle-01 conducted in October 2013 in which the missile and new composite canister both demonstrated successful and safe ignition and egress from the vertical launching system.

The SM–3 Block IIA program will adhere to the fly-before-you-buy approach. Program flight testing as defined by the current MDA Integrated Master Test Plan (IMTP) is:

SM–3 Cooperative Development (SCD) Flight Test events:

• Controlled Test Vehicle-1 (CTV–1) scheduled for the second quarter of fiscal year 2015;
• CTV–2 scheduled for the fourth quarter of fiscal year 2015;
• SCD Flight Test Mission-1 (SFTM–1) scheduled for the third quarter of fiscal year 2016;
• SFTM–2 scheduled for the first quarter of fiscal year 2017;

Post SCD Flight Test (support for production decision) events:

• Flight Test Mission 29 scheduled for the first quarter of fiscal year 2018;
• Flight Test Operation 03 Event 1 scheduled for the third quarter of fiscal year 2018;
• Flight Test Operation 03 Event 2 scheduled for the third quarter of fiscal year 2018; and
• Flight Test Operation 03 Event 3 scheduled for the fourth quarter of fiscal year 2018.

IRANIAN ICBM DEVELOPMENT ESTIMATE

10. Senator UDALL. Ms. Bunn, Admiral Syring, and General Mann, at this full committee's worldwide threats hearing in February, the Director of National Intelligence (DNI), James Clapper, was asked about public estimates that Iran could be ready to test an ICBM as soon as 2015, and whether it would take Iran more time to actually integrate a nuclear weapon onto an ICBM. DNI Clapper answered: "That's quite right. What we're speaking of here is simply a missile system that could potentially have ICBM-class range. That's not to say anything about their actually mating it with a nuclear weapon. That's another problem." Do you agree with DNI Clapper's assessment that, while Iran might start testing longer-range missiles as soon as next year, it would be an additional problem for Iran to integrate an operational nuclear weapon onto an ICBM, and take more time—if Iran were to decide to pursue nuclear weapons?

Ms. BUNN. Yes, I concur in DNI Clapper's assessment that it would take Iran additional time to integrate an operational nuclear weapon with an ICBM.

Admiral SYRING. Yes, I agree with DNI Clapper's assessment.

General MANN. Yes, I agree with DNI Clapper's threat assessment regarding Iran.

TESTING CONTENT AND SCHEDULE

11. Senator UDALL. Dr. Gilmore, you noted in your testimony that scheduled missile defense tests have often slipped for a variety of reasons. The MDA has indicated that, as reflected in the IMTP, it has worked to realign tests to maintain as much planned test content—meaning test objectives measured by Critical Engagement Conditions and Empirical Measurement Events—as early as practicable. Please provide your views on whether the evolving IMTP has managed to realign the collection of such empirical data without undue delay.

Dr. GILMORE. The MDA uses a very rigorous process to revise the IMTP twice a year to account for the results of past testing, including failures, and to maintain progress in collecting the empirical data needed to validate and accredit the models that must be used to fully evaluate the performance of the BMDS. I am an integral part of that process and approve the document once finalized. To date, I am satisfied that the MDA's revisions to the IMTP have placed appropriate priority on collecting key empirical data (specifically, Critical Engagement Conditions (CEC) and Empirical Measurement Events (EME)) without undue delay. Tracking progress in collecting those data over time will become substantially easier in the future. The MDA and the BMDS Operational Test Agency (OTA) have recently jointly developed a software tool that allows quick, automated assessment of the impact of IMTP changes on CEC/EME data collection, and ultimately its impact on digital model verification, validation, and accreditation.

QUESTIONS SUBMITTED BY SENATOR JEFF SESSIONS

REDESIGNED EXO-ATMOSPHERIC KILL VEHICLE

12. Senator SESSIONS. Admiral Syring, is the focus on improving reliability of the current kill vehicle or improving performance? In other words, will the redesigned kill vehicle be more capable?

Admiral SYRING. The redesigned EKV (RKV) will improve EKV reliability and performance. We initiated a rigorous system engineering process to define balanced requirements to make a producible, reliable, available, and testable redesigned EKV. It will be built to improve performance against the emerging threat in the context of balanced BMDS architecture. The architecture includes a long-range discriminating radar (LRDR) and a BMDS-wide set of discrimination improvements for Homeland defense.

13. Senator SESSIONS. Admiral Syring, if your first test of the RKV is fiscal year 2018, what year can we expect to start and complete the retrofit of our 44 GBIs with the new RKV?

Admiral SYRING. We plan to begin fielding the RKV in fiscal year 2020. More details will be provided in the acquisition strategy for the RKV later this summer. The strategy will define cut-in points for the RKV plus a cost benefit analysis to determine the best value among: (1) refurbishing existing CE–I and CE–II EKVs; (2) replacing those EKVs with RKVs; or (3) replacing fielded GBIs with new GBIs using the RKV.

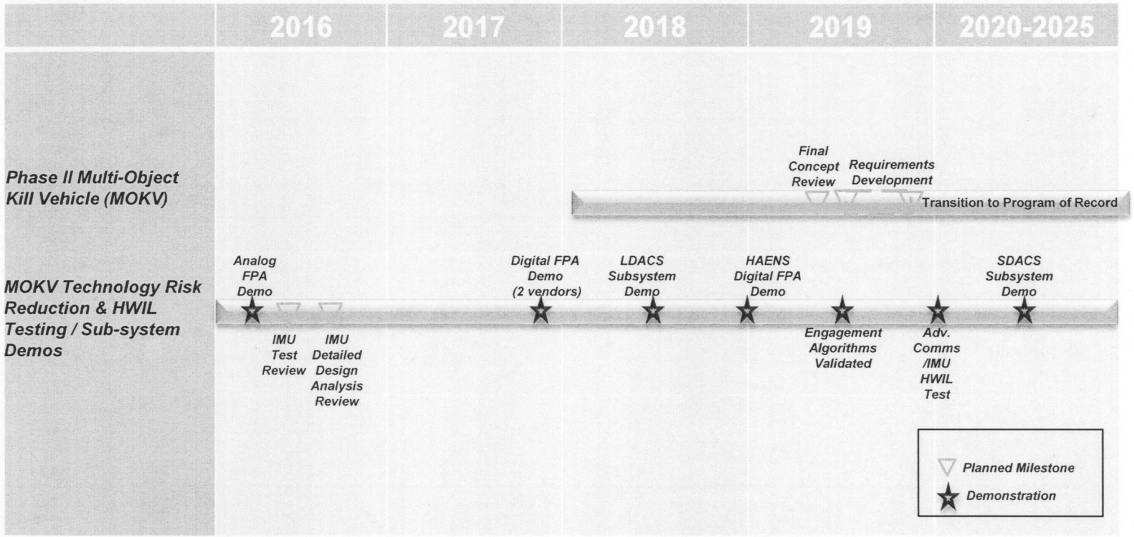
14. Senator SESSIONS. Admiral Syring, are there plans to develop a multiple EKV (placing more than one EKV atop a GBI)? If so, what is the schedule?

Admiral SYRING. Yes. As part of Common Kill Vehicle Technology effort, we will invest in multi-object kill vehicle technology. These investments reduce costs of production and weapon system operations. Cost reductions made through new kill vehicle architectures and scalable technology will improve the performance of our interceptor fleet against an evolving threat. Our investments in large-format focal plane arrays, smaller inertial measurement units, and high-performance propulsion components (plus kill vehicle architectures) are key enablers. Technology development lets us engage numerous and increasingly complex threats. It will eventually establish the foundation for killing multiple lethal objects from a single SM–3 or GBI and lead to developing a multiple kill vehicle capability beyond 2021; see schedule attached.

Attachment:

As stated

Multi-Object Kill Vehicle
Concept Definition and Key Technology Development



Adv – Advanced
Comms – Communications
Demo - Demonstration
FPA – Focal Plane Array
HAENS – High Altitude Exo-Atmospheric Nuclear Survivability
HWIL – Hardware in the Loop
IMU – Inertial Measurement Unit
LDACS – Liquid Divert and Attitude Control System
MOKV – Multi-Object Kill Vehicle
SDACS – Solid Divert and Attitude Control System

Attachment

15. Senator SESSIONS. Admiral Syring, is there funding in the Future Years Defense Program (FYDP) for this effort?

Admiral SYRING. Yes. See the chart below for the EKV funding breakout:

Fiscal Year (FY) 2015 - 2019
($ Millions)

	PE	Budget Project	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2015-19
Redesigned EKV	0603882C	MD97	$99.5	$264.0	$261.5	$67.0	$13.0	$705.0
Redesigned EKV - Testing	0603882C	MT08			$11.0	$22.0		$33.0
		Total	$99.5	$264.0	$272.50	$89.0	$13.0	$738.0

GROUND-BASED MIDCOURSE DEFENSE SYSTEM IMPROVEMENT

16. Senator SESSIONS. Admiral Syring, in addition to the RKV, what other steps is MDA taking to improve the GMD system and how much will these various efforts cost?

Admiral SYRING. The four major steps to improve GMD reliability and capability are: (1) redesigning the EKV; (2) upgrading GBIs in the fleet to resolve known risks and problems; (3) increasing the robustness of the stockpile reliability program; and (4) improving discrimination through improved ground and interceptor software.

The President's budget 2015 submission for these steps is shown in the table below:

	FY14	FY15	To Go
Redesigned EKV	-	99.500	605.500
Upgrades & Operational Spares	29.243	17.434	392.619
Reliability Program	33.275	34.291	149.409
Discrimination Improvements for Homeland Defense (DIHD)		62.400	41.700

17. Senator SESSIONS. Admiral Syring, while you've added about $660 million to the GMD program over the next 5 years, the cost to develop a RKV is about $700 million. How can you accomplish these other objectives?

Admiral SYRING. The primary Homeland defense objectives include discrimination improvements for Homeland defense (DIHD), LRDR, and the RKV.

The fiscal year 2015 budget request for DIHD is $122 million, spread across various MDA program elements (PE): PEs (0603179C, 0603882C, 0603884C, 0603890C, and 0603896C).

The fiscal year 2015 budget request for LRDR is $79.5 million, which includes $29 million in military construction (MILCON) funding for planning and design. The remaining $50.5 million for LRDR is in PE 0603884C/Project MD96.

For the RKV, the amount budgeted in PE 0603882C/Project MD97 is $705 million for fiscal years 2015 to 2019, with $99.5 million requested in fiscal year 2015.

The fiscal year 2015 budget request provides for continued development of these new GMD and Homeland defense objectives. We will continue to assess the requirements and funding required for the GMD program and Homeland defense in future budget requests.

18. Senator SESSIONS. Admiral Syring, do you still have plans to develop and test a two-stage GBI? What are the advantages, what is the schedule?

Admiral SYRING. Yes, the MDA plans to flight test a two-stage GBI. The next test planned for fiscal year 2019 is Flight Test GMD (FTG)-17.

The two-stage GBI provides flexibility to the warfighter due to an increase in battle space and opportunities for multiple shot engagements. The GMD program of

record (POR) supports test article design improvements (trajectory fly-out fans, software timing, etc.) and a two-stage flight test.

Deploying a two-stage GBI requires additional activities (system design that leads to production decision, non-recurring engineering to complete GBI design, updating operational software) that are not included in the GMD POR. The MDA is working with the warfighter to develop operational requirements that will be reflected in an acquisition strategy for future GBIs to be approved this summer.

RUSSIA

19. Senator SESSIONS. Admiral Syring and General Mann, what missile defense capabilities might be useful as part of a potential military response to Russian aggression in Crimea? Russia deploys short range ballistic missiles and cruise missiles that could be vulnerable to our Patriot, THAAD, and SM–3 missiles.

Admiral SYRING. [Deleted.]

General MANN. Although the actual effectiveness of any defensive system is dependent on scenario specific variables, the Patriot, THAAD, and SM–3 missile defense systems are designed to defend critical assets from short- and medium-range missile threats. Patriot also has a capability to defend against cruise missiles. These systems are low-density/high-demand assets currently deployed to several areas of operation, to include the U.S. European Command. I defer to the Office of the Secretary of Defense on any discussion regarding their potential deployment to address the Crimea situation.

20. Senator SESSIONS. Admiral Syring and General Mann, could we accelerate current plans to field SM–3 missiles in Romania (2015) and in Poland (2018)?

Admiral SYRING. The MDA is on schedule to deliver Aegis Ashore to Romania in 2015 and to Poland in 2018 in support of EPAA Phases II and III. Should DOD decide to accelerate deployment of these systems, it would be costly. Acceleration wouldn't include the more capable SM–3 Block IIA guided missile, and there are other associated risks.

With regard to Romania, construction began at the Aegis Ashore Romania site in October 2013. No opportunities exist to accelerate the schedule on the ongoing MILCON project due to procurement schedules of long-lead items.

By increasing shift work, we could accelerate Aegis BMD weapon system (AWS) installation, integration, and testing by approximately a couple of months with additional Research, Development, Test, and Evaluation (RDT&E) funding. Any acceleration to the Navy's integration and testing and manning schedule and plans must be determined by the Office of the Chief of Naval Operations.

With regard to Poland, there are two options to accelerate deployment of Aegis Ashore Poland:

Option 1. Acceleration of Aegis Ashore Poland by 9 months

Shorten MILCON contract acquisition time by awarding a negotiated sole source contract

- May result in a higher negotiated cost requiring more MILCON funding
- Coordination with United States Army Corps of Engineers (USACE) as DOD construction agent is required to revise acquisition strategy and obtain sole source approval
- Current Aegis Ashore host nation-Poland (HN–PL) AWS equipment contract delivery date supports this option

Option 2. Acceleration of Aegis Ashore Poland by 18 months

Requires MILCON funding availability in the fiscal year 2015 budget

- May result in a higher negotiated bid requiring more MILCON funding
- Contracting acceleration; issue a sole source design-build contract
- Requires coordination with USACE as the DOD construction agent to revise acquisition strategy and obtain sole source approval

Requires more RDT&E funds due to an accelerated schedule requiring complex premium shift work and additional equipment. Includes specialized material handling equipment during site activation, installation and checkout, and transition and transfer leading to initial operational capability

Requires AWS equipment swap with Navy, coordinated with Navy program executive officer, Integrated Weapon System, and must be authorized by Congress

- Maintains current Aegis Ashore HN–PL AWS equipment contract delivery date

- AWS ship set accelerated delivery does not require modification of funding
- Margin exists in AWS delivery where both options support operational capability

The accelerated Aegis Ashore system will be able to launch SM–3 Blocks IA and IB guided missiles. The Aegis BMD 5.1 weapon system (required to launch the IIA missile) and SM–3 Block IIA missile will not be available earlier than 2018. However, compliance with section 223 of the National Defense Authorization Act for Fiscal Year 2011 (P.L. 111–383) requires us not to procure other than long-lead or deploy operational missiles on European land until operationally-realistic testing of the interceptor and system are certified to Congress.

MDA can only address costs and programmatic impacts of MDA responsible efforts. A more complete response requires coordination with the Navy and other organizations to more fully reflect DOD costs, operational impacts, and national security policy implications.

Note: The MDA delivers all SM–3 missiles to U.S. Fleet Forces Command for allocation to combatant commanders. U.S. Fleet Forces Command determines the mix of variants deployed to ships and ashore based on BMD requirements through the Global Force Management process. Deploying SM–3 interceptors to Poland before delivery of the SM–3 Block IIA in 2018 would reduce the availability of SM–3 Block IB guided missiles.

General MANN. I defer to the MDA to address this question but my understanding is resource constraints, planned production, fielding and manning schedules, and basing agreements with the host countries may impact the ability to accelerate the current plans.

21. Senator SESSIONS. Admiral Syring and General Mann, does MDA have any plans to develop space-based interceptors if Russia becomes a direct and aggressive threat to the United States and its allies? If not, why not? Is it a matter of technology, funding, or simply policy?

Admiral SYRING. [Deleted.]

General MANN. I defer to the MDA to respond.

EAST COAST MISSILE DEFENSE SITE

22. Senator SESSIONS. Ms. Bunn, what kind of ICBM threat from Iran would prompt the administration to make a deployment decision on a third site?

Ms. BUNN. The improvements to the GMD system, including the deployment of 14 additional interceptors, give the United States the ability to stay ahead of a projected ballistic missile threat from Iran.

If an ICBM threat from Iran were to emerge in numbers that necessitated the deployment of additional interceptors beyond the 44 currently planned, the steps being taken now, including completing an EIS, would shorten the construction timelines associated with deployment of a new missile defense site.

23. Senator SESSIONS. Ms. Bunn, Admiral Syring, and General Mann, the administration was surprised by the threat from North Korea—prompting the March 2013 decision to add back the 14 GBIs in Alaska, which DOD cancelled in 2009. How do we know we won't be surprised by the Iranians?

Ms. BUNN. We continually monitor the long-range ballistic missile threat from Iran and North Korea, and we made the decision to expand the number of deployed GBIs on the basis of those threat projections. The expansion of our Homeland defense will also provide additional capability against potential Iranian ICBMs. We continue to make investments in order to stay ahead of the ballistic missile threat to the Homeland by improving sensor capabilities and interceptor reliability.

Admiral SYRING. This question requires an intelligence assessment to answer. Accordingly, the MDA respectfully defers this question to the DOD Intelligence Community for a response.

General MANN. The research, development, and testing regimen required to develop a missile capable of intercontinental ranges is significant. The Intelligence Community continually assesses research and development, testing, infrastructure, and operational readiness data in order to provide indications and warnings of an adversary's ballistic missile capabilities. Testing conducted by Iran would likely be detected by a number of national and international monitoring activities and would serve to provide insight into their ballistic missile program development progress.

We must continue to enhance our own BMD capabilities against the evolving threat. Improved sensor capabilities and interceptor reliability will serve to further enhance our ability to counter these threats.

24. Senator SESSIONS. Ms. Bunn, Admiral Syring, and General Mann, what steps can we take to shorten the time necessary to field a third site in the United States?

Ms. BUNN. The administration is taking steps now to shorten the timeline for fielding another interceptor site in the United States. The MDA has evaluated potential sites and has chosen four sites for additional evaluation. MDA will complete an EIS that encompasses the four sites. Preparing an EIS would shorten the timeline for deployment should the administration make the decision to do so.

Admiral SYRING. The administration has not made a decision to execute a continental U.S. interceptor site (i.e. east coast missile defense site). The MDA is taking steps to shorten the timeline for fielding another interceptor site in the United States. The MDA evaluated potential sites and selected four candidates for further evaluation. The $20 million provided by the fiscal year 2014 Omnibus Appropriations Act for National Defense Authorization Act for Fiscal Year 2013, section 227 activities allows MDA to allocate funds and initiate the efforts related to the continental U.S. interceptor site. Those efforts include conducting an EIS encompassing all four candidate sites, conducting geotechnical and unexploded ordnance surveys, developing non-site specific master plans, and refining modeling and simulation tools to address the inclusion of another interceptor site.

If the administration decides to accelerate work on a continental U.S. interceptor site, regardless of the year started, the first year would require approximately $30 million of MILCON Planning and Design funding on non-site specific design to shorten the timeline for site activities.

General MANN. The most prudent step to reduce the timeline to field a potential third missile defense site is already in progress. Compliance with section 227 of the National Defense Authorization Act for Fiscal Year 2013, which directs evaluation and environmental impact assessments of potential U.S. missile defense sites, will shorten the time necessary to achieve an operational site by an estimated 24 months. If a decision to field a third site is made, predictable resources and rapid contracting authority would assist in optimizing the schedule timeline.

EAST COAST MISSILE DEFENSE RADAR

25. Senator SESSIONS. Ms. Bunn and Admiral Syring, there is no funding in the FYDP for an additional LRDR. How do you plan to address the need for an additional discriminating radar directed against Iranian threats?

Ms. BUNN. The fiscal year 2014 President's budget request includes funding to begin development of the LRDR. Over the FYDP, DOD plans to continue LRDR development and to acquire one radar.

The administration has not made a decision regarding the acquisition of a second LRDR. This decision will be based upon the projected threat and the capabilities needed to counter that threat.

Admiral SYRING. The MDA is evaluating options and has not made a decision on the acquisition of a second LRDR. We plan to address the need for a second LRDR by monitoring the maturation of the threat, potentially moving the Sea-Based X-Band Radar to the Atlantic, and potentially developing a second LRDR.

26. Senator SESSIONS. Ms. Bunn and Admiral Syring, ultimately, is the plan to purchase another LRDR for the east coast? Shouldn't we see such funding in the FYDP?

Ms. BUNN. The administration has not made a decision regarding the acquisition of a second LRDR. This decision will be based upon the projected threat and the capabilities needed to counter that threat.

Admiral SYRING. The MDA is evaluating options and has not made a decision on the acquisition of a second LRDR. This decision will be based upon the maturation of the threat and the capabilities needed to counter that threat. There is an option to deploy the Sea-Based X-Band Radar to the Atlantic while the need for a second LRDR is assessed.

DEPARTMENT OF DEFENSE AUTHORIZATION OF APPROPRIATIONS FOR FISCAL YEAR 2015 AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, APRIL 9, 2014

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

NATIONAL NUCLEAR SECURITY ADMINISTRATION MANAGEMENT OF ITS NATIONAL SECURITY LABORATORIES AND THE STATUS OF THE NUCLEAR SECURITY ENTERPRISE

The subcommittee met, pursuant to notice, at 2:35 p.m. in room SR–222, Russell Senate Office Building, Senator Mark Udall (chairman of the subcommittee) presiding.

Committee members present: Senators Udall [presiding], Donnelly, King, Sessions, and Fischer.

OPENING STATEMENT OF SENATOR MARK UDALL, CHAIRMAN

Senator UDALL. The Strategic Forces Subcommittee will come to order. Good afternoon to all who are attending.

Let me make a short comment initially on questions and timing of this hearing. We have two panels today, and I'd like to conclude the hearing at 4 p.m., with 45 minutes per panel. That means the first panel will go until about 3:15 p.m., and then the second panel will go until about 4 p.m.

I want to note that we have a series of five stacked votes starting at 3:30 p.m., and I'll stay as long as possible past 3:30 p.m., and then go vote. Then hopefully some of my other colleagues will have had a chance to vote and they can come back and close the hearing, if that's okay with my colleagues, and I'm sure it will be.

I'm going to ask my colleagues if 7-minute rounds makes sense. Seeing no objection, we will go with 7-minute rounds.

With that, let me start off with our first panel with Dr. McMillan, Dr. Hommert, and Dr. Goldstein.

I think I'm going to put my statement in the record and turn to Senator Sessions if he had any comments because I know we want to get to some questions.

[The prepared statement of Senator Udall follows:]

PREPARED STATEMENT BY SENATOR MARK E. UDALL

Let me bring today's hearing to order. This afternoon, we will receive testimony regarding the National Nuclear Security Administration (NNSA) Laboratories and the Status of the Nuclear Security Enterprise. I'd like to thank all of the witnesses for taking the time to appear here this afternoon.

We will have two panels today; the first panel will consist of NNSA Laboratory Directors, Dr. Charles McMillan of Los Alamos, Dr. Paul Hommert of Sandia; and Dr. William Goldstein of Lawrence Livermore. The second panel will consist of Mr. Norman Augustine and Admiral Richard Mies, co-chairs of the Congressional Committee on the Governance of the Nuclear Security Enterprise at the Institute for Defense Analysis.

The heart and soul of our Nation's nuclear deterrent are the scientists and engineers working in our NNSA laboratories.

The relationship between science and the nuclear enterprise was best highlighted by Robert Oppenheimer who at the end of World War II, looked back on the Manhattan Project and said to his fellow scientists at Los Alamos that:

> "If you are a scientist you cannot stop such a thing. If you are a scientist you believe that it is good to find out how the world works; that it is good to find out what the realities are; that it is good to turn over to mankind at large the greatest possible power to control the world and to deal with it according to its lights and its values."

The core mission of these laboratories has not changed since Oppenheimer reflected on the nature of the scientific enterprise that serve as the foundation of our deterrent. That scientific base is a fragile enterprise that needs constant oversight by the witnesses here today—and by this subcommittee. Congress needs to ensure the resources are available to maintain this scientific enterprise so that our nuclear deterrent remains an effective one.

The testimony of the first panel will be on the NNSA laboratories relative to the fiscal year 2015 budget. I look forward to the views of the laboratory directors as they are our eyes and ears on the state of health of the laboratories and the stockpile.

The second panel will inform us of the status of the nuclear security enterprise as a whole—including the relationship between the laboratories and the NNSA. Mr. Augustine and Admiral Mies already have a track record of being forthright and I expect as much today in their testimony.

With that, I'll turn to Senator Sessions for his opening statement and then we'll move to the witnesses for their opening statements.

STATEMENT OF SENATOR JEFF SESSIONS

Senator SESSIONS. Right, we do, and we, unfortunately, have had three votes coming up all of a sudden here.

Please note that I think all of us believe that we need a modernized nuclear force, that we're past due for that, and we need the help of the labs to get there. But, I'll just say it this way. I'm glad you're reevaluating, intensely, construction of new buildings and some of the other things. Imagine that we might just ask France to do this for us, and I suspect it would be cheaper. We've created such a large infrastructure over the decades that we're not as lean as we ought to be. We are just hammering the military. We just had the Army people in, this morning, talking about going from 570 to 490 to 450 and maybe 420 in uniformed troop levels. So, the money's tight.

The nuclear program, including the triad, is only about 5 percent of our budget, but that's not an excuse for not managing every dollar carefully. You probably know that my view is that we have to get this done, we'll pay the price that's needed to get there, but if we can do it for less, and effectively, that's what I believe is our responsibility to do.

Mr. Chairman, thank you. I've enjoyed working with you on this subcommittee. You've done a good job, and I believe that we're re-

flecting, pretty much, the national interest. That's what I'm pleased about.

Thank you. I'll look forward to hearing from the witnesses.

Senator UDALL. Thank you, Senator Sessions.

I do owe each of you just a brief introduction, and to connect you to the laboratories that you all helm. We have the National Nuclear Security Administration (NNSA) laboratory directors: Dr. Charles F. McMillan, of Los Alamos; Dr. Paul J. Hommert, of Sandia; and Dr. William H. Goldstein, of Lawrence Livermore.

Dr. McMillan, why don't we start with you.

STATEMENT OF DR. CHARLES F. MCMILLAN, DIRECTOR, LOS ALAMOS NATIONAL LABORATORY

Dr. MCMILLAN. Thank you, Chairman Udall and Senator Sessions. I appreciate the opportunity to appear here before the subcommittee today.

I am Charlie McMillan, the Director of Los Alamos National Laboratory (LANL), and I ask that my written comments also be entered into the testimony as part of the record.

Today, I want to focus on Los Alamos' ability to deliver today's commitments while ensuring our capabilities for an ever-changing future. There are three areas that I'd particularly like to draw your attention to: first of all, the plutonium strategy; and very much to the point you were making, Senator Sessions, reductions in critical program budgets; and then harmonizing requirements and budgets.

I bring these concerns to your attention because, particularly within the current global environment, I believe the work at our laboratories is fragile. Because of severe budget constraints over the last 2 years, there is no longer management flexibility, at least at my lab, to address further funding shortfalls, balance risks, and meet mission requirements.

We now have, in my view, a sound business case, agreed on with NNSA, for a realistic plutonium strategy. We need approval to move forward in order to execute our plutonium missions, which cannot be accomplished with current aging infrastructure. Senator, it's one that we believe is at a much lower price point than the Chemistry and Metallurgy Research Replacement (CMRR) was.

Recent budget guidance reduces our funding in three key areas: facility and maintenance; security; and our science, technology, and engineering base. Any reduction in facility budgets undermines mission capabilities, especially to sites such as Los Alamos, where infrastructure continues to age and, in some cases, dates back to the beginning of the Cold War. Current requirements in the area of physical, cyber, and information security are outstripping our funding allocations and necessitate more prudent management decisions that balance risk and available funding.

As I contemplate the body of science needed to continue assessing the safety and reliability of the stockpile in the future, underfunding our science base is increasingly risky today. I understand that budgets will not grow significantly. We've heard your message. Therefore, we must work with the Department of Energy (DOE) and NNSA to develop better risk-informed requirements. Let me give you an example.

The design basis threats for our physical security posture are a place where I believe we could reexamine requirements. Following September 11, we added guns, gates, and guards to our physical security systems. With security technology improvements that are available today and better threat analysis capabilities, it's possible to reduce the security costs while at the same time maintaining an appropriate security stance, but the requirements would have to change.

The laboratory and its people are committed to our mission, solving our Nation's security challenges through scientific excellence; however, they must have the tools in order to deliver. Congress, the administration, and the laboratory need to continue working together to develop an agreement on nuclear facility strategies. We face an uncertain future that may be as complex as any we have dealt with since the Cold War. We need decisions on out-year funding levels that balance risk and can be sustained for the complex. Predictability is important. We also need decisions on the role of the science, technology, and engineering base at our three laboratories.

Thank you, Mr. Chairman, and I look forward to your questions.

[The prepared statement of Dr. McMillan follows:]

PREPARED STATEMENT BY DR. CHARLES F. MCMILLAN

Chairman Udall and Ranking Member Sessions, thank you for inviting me to testify today. I am Dr. Charles McMillan, Director of Los Alamos National Laboratory. I am pleased to have the opportunity to testify before the subcommittee on the health of Los Alamos.

As I have stated previously before the committee, NNSA governance will play a key role in determining both our efficiency and effectiveness as we address mission and budget challenges. Over the past year, I have interacted with both the Congressional Panel on NNSA Governance and the National Academy of Sciences. Should I be asked to participate in the review established by the fiscal year 2014 Omnibus Appropriations Act, I will do so again. I am hopeful that theses panels will deliver recommendations that enable a successful nuclear program. Future success of the enterprise depends on governance as well as budgets and balancing of the program.

Today I will provide an update on: recent Los Alamos technical and scientific achievements; the proposed plutonium strategy under evaluation in numerous national security circles; and, Los Alamos budget realities that pose challenges to meeting our mission requirements.

ACCOMPLISHMENTS

Since I last appeared before you, our weapons and science programs have achieved significant technical breakthroughs, and our operations and environmental management organizations have delivered on significant commitments.

In regard to our weapons program, we again completed, on time, my letter to the Secretaries of Energy and Defense regarding the 2013 Annual Assessment. We successfully conducted two B61 hydrodynamic shots, which were executed as planned and within committed budget levels. Los Alamos executed the important subcritical experimental series, Gemini, and I am pleased that the fiscal year 2015 request recognizes this success by including an increase for the Los Alamos subcritical experiments at Nevada (I'll note that the team was just recognized with the Department of Energy, Secretary's Achievement Award; their highest non-monetary award). The capabilities supported by the increase will provide an important new tool for stewardship, building on the success of the Gemini series, and filling a present gap in our technical understanding.

Also during the past year, we successfully completed production of three W87 development pits. We developed the Plutonium (Pu) Strategy in partnership with the National Nuclear Security Administration (NNSA), and worked with the Department of Defense (DOD) Cost Assessment and Program Execution organization and the Nuclear Weapons Council (NWC) on a business case analysis, which affirmed our strategy on plutonium infrastructure.

Over the course of the year, Los Alamos responded to several technical issues on the W76–1 that enabled continued production to remain on schedule. Los Alamos provided lead design agency support for the first successful lot of PBX 9502 (Insensitive High Explosive) produced in over 20 years that will benefit both DOD and the Department of Energy (DOE). Each of these demonstrates that weapons program mission execution remains our key focus, but I'd also like to spotlight some remarkable accomplishments from our scientists and engineers that go beyond our core mission.

We continue to excel at the science that underpins all of our mission assignments. Los Alamos scientists put several pieces of significant hardware and power sources on the Mars Curiosity Rover. One of the most impressive called ChemCam, which was developed by a team of collaborating institutions, has verified the presence of water on Mars and fired over 100,000 laser shots gathering unprecedented data that is still being assessed. The tremendous data capabilities for the technology do not stop there. The laser, which was originally developed for an environmental mission, is an example of technology that has been used in a variety of applications and then "spun into" one of the Lab's core missions. While the laser has now delivered results in the environmental and space realms, just this year it was repurposed for a nonproliferation mission application tool for inspection and diagnostics needs of the International Atomic Energy Agency.

Members of our Earth Sciences team at Los Alamos have released research over the last several years outlining the causes of large scale forest mortality. This research is critically important because we all see the wildfires on the news every summer and question what droughts mean for our Western forests. Our research shows that as the West experiences increased temperatures; it is the warmth, not necessarily the lack of moisture, which will kill our forests because of the water evaporating out of the soils. Using our data, it is now possible to forecast forest health or mortality by decreasing or increasing ambient air temperatures. We also now have indicators of where the greatest fuels loads will be for wildfire preparation purposes.

Los Alamos biologists continue to play a key role in the development of a vaccine for the AIDS virus. The considerable diversity and adaptability of HIV worldwide represents a critical challenge for designing an effective HIV vaccine. Through work done at Los Alamos, it appears that a vaccine computationally optimized for immunologic coverage of global HIV diversity, called a mosaic vaccine, confers protection from infection in an animal model. HIV mosaic vaccines are being moved into human trials, and the approach has the potential to be groundbreaking in the global fight to combat this deadly disease. This research has been done in collaboration with several universities and has been funded by the Federal Government and non-profits like the Gates Foundation.

In addition, Los Alamos has recently made progress on two key operational issues related to our Plutonium facility that have now been either resolved or are well on their way to resolution:

- Nuclear Materials Safeguards and Security Upgrades Project II: This complicated, multi-layered technology security project challenged the Laboratory on many dimensions. But I can tell you today that working with NNSA, we have completed this important upgrade. The new integrated security systems are now operable and protecting assets.
- We are making significant progress in resolving the criticality safety concerns at our plutonium facility that caused us to pause operations. We have improved our criticality safety posture and are in the process of resuming our important activities and deliverables.

Finally, the environmental management cleanup campaign to remove 3,706 cubic meters of transuranic waste from the site by June 30, 2014 has been one of the largest and most complex waste cleanup challenges the Laboratory has undertaken. As of February when the Waste Isolation Pilot Plant (WIPP) experienced issues and suspended incoming shipments, we were at 85 percent Campaign completion. Today, box and drum processing is complete for the remaining 120 shipments, and we have identified alternate temporary storage for them. Shipment to Waste Control Specialists in Texas commenced the first week of April and completion of the 3,706 m3 Campaign by the deadline is again on track. We will continue to support WIPP in their investigation efforts so this important resource will once again be available in the future.

I am very proud of the hard work put forth by the Laboratory staff to achieve these impressive successes. What I hope will continue to be a positive story is the next update regarding our proposed alternate Plutonium strategy.

PLUTONIUM STRATEGY

Last year in testimony before this subcommittee I outlined the structure of an alternate Plutonium Strategy that would provide the country with critical plutonium capabilities, including pit production, in the absence of the Chemistry Metallurgy Research Replacement-Nuclear Facility (CMRR–NF) at Los Alamos. Over the past year, we have worked hard to turn these ideas into a plan.

The Strategy proposes a three-phased approach. The phased approach is designed to manage both safety and programmatic risk in the near, mid, and longer term timeframe and to address risks in the timeworn Chemistry and Metallurgy Research (CMR) Facility and Plutonium Facility (PF)-4 respectively. I believe the current plan, if fully implemented, will both preserve our critical plutonium capabilities once the CMR building is finally shuttered, and it will greatly extend the life of our existing Plutonium processing capability at Technical Area (TA)-55. This plan is effective, efficient, and timely, and is the best fiscal solution for this country.

Getting more out of our existing facilities and breaking up new construction projects into small achievable pieces, reduces many of the problems associated with prior "big box" nuclear construction projects. Issues such as large annual funding requirements and decades-long acquisition periods will be scaled down to manageable levels and will be adaptable to future changes in requirements.

The three key elements of the current plan involve modifying CMRR–Radiological Laboratory Utility Office Building (RLUOB) so we can slightly increase the amount of material in the facility per revised guidance, while keeping it as a radiological facility (thanks to the efforts of NNSA in updating regulations to bring the facility into alignment with modern safety standards). The ability to increase the materials from about the mass of one nickel's worth of weapons grade material, to about two nickels' worth of mass may not sound like much, but it is significant. We are currently in the process of outfitting RLUOB with equipment that will enable us to take advantage of the increased material allowed in the building.

However, I believe that RLUOB is not a silver bullet because we still must have the capability to handle kilograms of material not just the gram quantities currently allowed at the facility. The requirements lead us into our proposed Phase II recommendation which is to better utilize our existing high hazard nuclear space in PF–4.

Reconfiguring PF–4 would allow us to accommodate the analytical and materials chemistry capabilities that cannot be transferred to the CMRR–RLUOB (see attachment 1). Over the past decade, many of our planning assumptions that were valid when CMRR was designed have changed, allowing us to reclaim about 10 percent of the valuable lab space in PF–4. In combination with Phase 1, this space can enable us to terminate operations in the CMR Facility for less than the overall cost compared to constructing CMRR–NF. This reduced cost profile also comes with limits to manufacturing capacity and lacks a long-term vault, but near-term requirements have changed to the point where this is a reasonable compromise for the near term.

We have plutonium recovery requirements that were implemented during the Cold War to preserve as much of our limited supply of this vital metal as possible. We now have an abundant supply of the material, so if we reduce the recovery requirement and eliminate the redundant equipment needed for these operations, we now have very valuable vacant existing space. This space can be converted over the span of a few years for missions of far greater consequence. Also, from a cost and regulatory perspective, it is typically less expensive and faster to create new missions inside an existing permitted workspace.

Finally, there will be an unavoidable need to construct new high security, nuclear workspace because it is simply not possible to indefinitely meet program requirements with the available space. Here again, we have come to a conclusion and are proposing to NNSA, that smaller, segmented, or modular facility additions will be the most effective path forward. Whether it is a plutonium storage vault, a pit processing facility, or a radiological diagnostic suite, we will need space for these operations after we determine which is least appropriate for inclusion in our existing plutonium facility. These modest steps should be sufficient to preserve our plutonium capabilities into the future and hopefully avoid some of the pitfalls we have experienced trying to construct very large multipurpose nuclear facilities over several decades. These additions are intended to "scale", not solve, most of the past acquisition challenges with "big box" nuclear projects and be adaptable for a broad range possible futures—not just at Los Alamos. Another significant benefit to moving operations to modules would be to extend the life of PF–4 for several decades.

I would like to touch on the recent Pit Production report by the Congressional Research Service (CRS). Many of the ideas in the report were originally contemplated

by Lab staff as they began to look at alternatives to CMRR–NF. While the report is comprehensive, it fails to recognize many of the risks and challenges certain options would face.

The report envisions sending analytical and materials chemistry work that supports the production mission, around the complex to take advantage of existing capabilities. This is an approach that we still believe to be valid should we need some type of bridging capability. However, in the long-term, there will be increased risk by the additional shipments of samples through commercial shipping vendors, and increased risk in the timeliness of completing the work. In our expert opinion, the country needs analytical and materials chemistry capabilities to reside at the same place where pits are produced.

The NNSA and Laboratory's Plutonium Strategy plan does not envision the kind of massive upgrade or legislative acceptance of much greater risk contemplated by the CRS report. The report suggests that Los Alamos could somehow massively upgrade our RLUOB facility to a Hazard Category II facility. Nuclear facilities are designed from the ground up for their intended purpose. RLUOB was designed as a radiological facility, not a Hazard Category II facility. Under the CRS upgrade scenario, the proposal would necessitate improvements in security, seismic reinforcement, air handling, fire suppression, and other systems that were not designed to nuclear facility standards, and therefore unable to ultimately address the nuclear safety basis requirements. I believe that Los Alamos has the most credible and cost effective path forward that could potentially be completed to meet the proposed 2019 closure timelines for the CMR Facility.

Before moving on I would like to mention one more issue related to our plutonium mission. With the future Life Extension Programs (LEP) schedule delayed, you will likely hear that the need to produce pits is no longer on the same timeframe. I think it would be a mistake for the country's pit production capabilities to be tied to the future of any one-weapon system. In my opinion, it is critical that our country maintain this capability and continue to develop a stable and responsive pit production infrastructure. We need to heed past lessons learned: when this capability was incapacitated for a short period, then exorbitant time, energy, and money was spent to bring it back on line when the country was again in need. This will always be a cornerstone capability, no matter the weapons modernization strategy of the time.

Regardless of the nuclear weapons systems the United States decides to move forward with or when, if we do not rejuvenate our limited plutonium capabilities, we will have few options going forward. This scenario would be particularly troubling should an unforeseen problem emerge in our existing systems or if there was a dramatic technological or geopolitical surprise with another nuclear armed country. Because of delays in project start-up since the decision to defer CMRR–NF, I am concerned that we will miss the target date to terminate program operations in CMR by 2019. Should we be forced to terminate CMR operations before they can be transferred to CMRR–RLUOB and PF–4, our ability to execute plutonium missions will be jeopardized.

Mr. Chairman, our world is becoming more unpredictable. It would be a mistake to take our current capabilities for granted. For the most part, the infrastructure that supports our stockpile was built during the early years of the Cold War. Upgrades to our facilities and supporting infrastructure continue to be delayed. There will be a period when the infrastructure fails and it will take time and significant funding to replace.

BUDGET

In that vein, I am particularly concerned about the latest budget guidance we have received from the Office of Infrastructure and Operations in NNSA. Their planning direction would significantly reduce our facility operations and maintenance budgets in fiscal year 2015 by $56 million, an 18 percent cut compared to fiscal year 2013, with additional reductions planned for fiscal year 2016. It will be very difficult to deliver on mission requirements if our already-aging infrastructure is further undermined, and there will undoubtedly be scope impacts to our mission deliverables.

The past few years have seen deferral of CMRR–NF and reductions in the funding available to operate and maintain our aging buildings. Such trade-offs can be made in the short term, but over the long term they will inevitably be detrimental to our ability to field experiments and preserve or build capabilities with metals such as plutonium that further our understanding of the stockpile and prepare us to respond with future LEPs or other solutions. Simply put, within the existing budget allocation, the plutonium sustainment, infrastructure and science, and engineering campaigns need attention and a significant increase in priority.

We are living in a period in which we are underfunding our science, technology, and engineering base (ST&E). As evidence, both physics laboratories are seeing flat or declining budgets at a time period in which the NNSA's overall budget has increased by 26 percent (fiscal year 2009 compared to fiscal year 2015 request). This stagnation has removed all the flexibility we once had to manage our way through budget challenges. This gives me serious cause for concern as I contemplate the body of science needed to continue assessing the safety and reliability of the stockpile in the future.

Regarding mission funding, I am encouraged by the national consensus surrounding the B61 LEP effort, and believe that the Nation needs to sustain the momentum associated with full funding, consistent with the Nation's treaty commitments to our allies.

However, it is increasingly clear to me that there is a growing divide between the annual funding allocations and the requirements placed on us by our partners. The B61 LEP is possible only because we invested many years into capability research and development. As we move forward, the funding needs for short-term deliverables should not come at the expense of the underlying science and engineering base and at the expense of our infrastructure to serve tomorrow's mission needs. These are again, trade-offs that can be made for limited periods of time, but they are not sustainable in the long term. The LEP is the eventual deliverable, but multi-year capability investments enable such an outcome.

A plutonium manufacturing capability to sustain newly-manufactured pits for the Design Agencies takes many years of investment. These capabilities, together with plutonium devices for scaled subcritical experiments such as the Gemini series, are essential components of our deterrence, as well as critical technologies for enabling the confidence to move towards a smaller stockpile.

As I have stated on previous occasions, it is the ST&E base in combination with first-class computational and experimental research facilities that will guarantee that we will attract and retain the workforce needed to address complex stockpile issues in the future. There is no single budget line for "sustain knowledge-based deterrence", but let me assure you that this knowledge base will be the foundation on which our future deterrence will rest, particularly as our underground testing program passes into the realm of a historical artifact.

I recognize that everything in the nuclear weapons complex typically comes with significant funding requirements attached to it; however, the things we need funding for are getting reduced and our suggestions to reduce some costs are tabled. I have real, operational, working insight on actions that would reduce costs in Pu processing, line item projects, and risk/cost analysis in a number of areas. If we could get leverage for these ideas and get decisions made, it would make a big difference. In the interim, our NNSA mission and performance requirements are increasing and there is no reprieve that could be provided by prudent management and decisive actions.

To give you some example, we have seen very little relief in the mountain of oversight reviews we must support. Risk aversion among our partners is driving our safety mandates to the point where actually doing work is becoming increasingly difficult. More generally, simply trying to gain permission to build a facility or execute a work scope has become problematic because the many layers of permissions now routinely generate a "non-concur" that stops the process.

Security requirements are another interesting microcosm. I am worried about proposed funding reductions to our physical, cyber, and information security budgets as we update our assessment of threats to reflect current reality and try to operate within more stringent requirements. I have already asked NNSA for permission to reduce the size of my physical security staff to meet these reduction targets, but our risks will be increased as a result. In addition, our information and cyber security budgets are barely staying flat, yet cyber-attacks on our computer systems continue to accelerate.

This is one area that keeps me awake at night because as we have seen across this country, cyber intrusions are getting more complex and more damaging within both the commercial and government worlds. Again, I believe that we could better manage our security needs through realistic assessment of risk and make prudent management decisions to balance that risk and available funding.

NUCLEAR SECURITY ACTIVITIES

Ensuring broader mission delivery in a dynamic and changing world is an important part of what the National Laboratories do—and this mission delivery is at risk in the present budget. The broad topics of nuclear proliferation, nuclear counter proliferation, emergency response, and nuclear terrorism are key elements of this nu-

clear security strategy and mission. For example, nuclear counter proliferation is a set of activities designed to defeat the development and use of nuclear weapons and improvised nuclear devices by sub- or extra-national groups, as well as states of proliferation concern. In our examination of the National NCP context we see Lines of Operation that include identification and prediction of nuclear threats, monitoring and detection of proliferation and nuclear terrorism activity, upstream defeat of nuclear threat pathways, defeat of nuclear weapons of mass destruction (WMD) threats, and attribution of the nature and pathway of developing nuclear WMD proliferation.

Although there is no single U.S. Government Department or Agency responsible for all of these lines of operation, NCP is a particular focus of Los Alamos because the work is consistent with the objective of preventing nuclear terrorism and proliferation that was placed at the top of U.S. Nuclear Policy agenda by the Nuclear Posture Review, and because countering nuclear threats requires exquisite expertise in nuclear weapon design, global monitoring, nuclear intelligence, and technical nuclear forensics.

In order to respond to threats or incidents of a certain type, DOE/NNSA is required to provide technical assessments, based on nuclear design principles, to tactical, operational, and national-level decision makers. Los Alamos has a lead role in doing so based on years of investment intended to make our nuclear weapons program capability available in a tactical, operational environment. Although our nuclear weapons program capability is directly applicable to defeating nuclear WMD, the materials, processes, and phenomena that may be present in nuclear threat objects can be significantly different than the U.S. stockpile.

Therefore, special attention and effort is required to address this mission and we can do so in a way that is also synergistic with the stewardship of technical capabilities for the U.S. stockpile. However, funding within the Counterterrorism and Counterproliferation Programs and Nuclear Counterterrorism Incident Response components of the NNSA's Weapons Activities account has been volatile recently and may not adequately address the requirement to provide technical assessments based on nuclear design principles for aspects of the NCP mission. It is yet another example where national requirements for which we have responsibility are at significant risk of not being met.

I bring these budget and risk issues to your attention because in past years I would look for ways to mitigate the funding repercussions without impacting my mission requirements, but this year I believe we are cutting it too close. The U.S. nuclear policy related to weapons systems, critical facilities, and commitments to maintain core defense and science capabilities is in a period of transition that translates into program risk and ultimately a national security risk.

CONCLUSION

Mr. Chairman, as I look to the future, if these requirements and budgets persist, I have significant concerns about the health of the weapons program and the skills and capabilities of Los Alamos. We need weapons design work to exercise our weapons scientists, we need appropriate nuclear facilities to work in, and we need to sustain the broader science base required at Los Alamos to feed our national security programs.

Without some coordination of our mission requirements to our funding allocations, and dexterity in management, we are going to see an accelerated loss of capabilities because my technical staff will continue to be pursued by those in private industries offering better opportunities to exercise their drive and innovation. It is only through the steadfast commitment, hard work, and utmost dedication of our people to serving the Nation that we experience our successes and achievements, so retention of this talent is a priority.

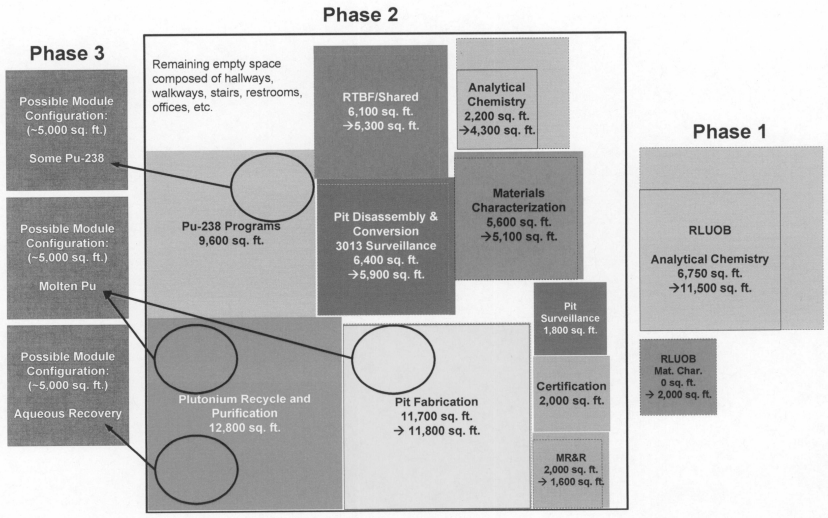
Congress and the administration need to develop an agreement on what our nuclear facilities strategy will be as we enter an uncertain future in a landscape we have not dealt with since the Cold War. We need decisions on appropriate funding levels that can be sustained for the complex through the out years, and decision on what role a broader science and engineering base has at the NNSA Laboratories.

Thank you Mr. Chairman for the opportunity to testify today and I would be happy to answer any questions.

Attachment 1

Current PF-4 and RLUOB Laboratory-Floor Space Allocation by Program/Activity*
PF-4 is approximately 280-ft on a side

Phase 1: RLUOB space modifications shown as dashed lines [total RLUOB laboratory space (19,500 sq.ft.) or total laboratory-floor space (40,000 sq. ft.) not shown]
Phase 2: PF-4 space modifications shown as dashed lines
Phase 3: Provides three possible module uses



*The placements of the space-blocks represent, to scale, the space allocations but are not representative of geographic location within PF-4.

MR&R = Materials Recycle and Recovery
RTBF = Readiness in Technical Base and Facilities
RLUOB = Radiological Laboratory Utility Office Building

Senator UDALL. Thank you, Dr. McMillan.
Dr. Hommert.

STATEMENT OF DR. PAUL J. HOMMERT, DIRECTOR, SANDIA NATIONAL LABORATORIES

Dr. HOMMERT. Chairman Udall, Ranking Member Sessions, and distinguished members of the Strategic Forces Subcommittee, thank you for the opportunity to testify today.

I am Paul Hommert, Director of Sandia National Laboratories. I'd like to briefly summarize the key points of my written testimony.

First, I am pleased to report that my laboratory is now successfully executing three full-scale engineering development efforts and supporting the continued production of the W76–1 life extension program (LEP). I want to thank Congress for the support of these

programs in the fiscal year 2014 authorization and appropriations bills. That support allows me to report that each of these programs remains on or under original cost estimates. In the case of the B61 LEP, the largest of these programs, I can report that we have already been able to realize $120 million in savings over the life of the program.

In the case of the B61, we have had to adjust schedule as a result of the funding profile we received being different from our original June 2012 planning basis. However, the cost savings I just mentioned will help us significantly mitigate any cost growth that would result from funding-induced schedule slip. We have achieved this cost performance by increasing our program management rigor, having a strong focus on controlling labor cost growth, and utilizing, where appropriate, common technology across the programs.

I brought with me today an example of common technology. Last year when I testified before this committee, I showed you a radar module designed for the B61 air delivery system, the green board here. We successfully tested that module in the B61 in August. Here I'm holding an electrical model of the W88 ALT 370 arming, firing, and fusing assembly with that very same radar module incorporated. This assembly, which will become a key component of our submarine launch ballistic missile deterrent, will be part of a Navy flight test later this year. This radar component will also be used in our work with the Air Force Mk21 program. The use of this common technology across three systems brings considerable cost savings, on the order of $170 million, and confidence to these three major design activities. Furthermore, the fiscal year 2015 President's budget request supports these programs at a level that will allow us to meet current first production unit schedules.

While I am sanguine about our progress on the modernization programs, I am concerned about what I see as an increasing imbalance in the overall program. The resource required to execute modernization, which is the clear priority, is causing us to reduce efforts in other areas that increase long-term risk. Examples at my laboratory include surveillance, advanced and exploratory technology development, and, very importantly, high-priority infrastructure recapitalization. In fact, as I elaborate in my written testimony, I believe more is being asked of us today at budget levels in constant dollars less than we've had at—in comparable periods at any time in the last 30 years. In addition, we face new cost pressures, such as pension and medical care, that we haven't faced before.

Let me be clear. I raise these concerns, fully cognizant of the overall fiscal constraints you face and to which Senator Sessions just spoke, however, I do believe those of us entrusted with the stewardship of the Nation's nuclear deterrent must acknowledge and look to mitigate risks. Two examples of areas that can mitigate these risks are increased programmatic flexibility inside a budget top line and support for synergistic work we do for other national security missions. For my laboratory, these broader efforts have often been a means to further advance technology for the weapons program of the type you're looking at in that component.

I do have some thoughts on the topic of your next panel—namely, governance—but, in the interest of time, I will save those for your questions, to which I look forward.

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 2015 budget and on the National Nuclear Security Administration (NNSA) governance of the National Security Laboratories. I am Paul Hommert, President and Director of Sandia National Laboratories. I am pleased to join Charlie McMillan and Bill Goldstein, 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 NNSA. Sandia is one of 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, including research and development in synergistic defense products, cyberspace, nuclear assessments and warning, and global nuclear dangers. Examples of areas where Sandia has applied its expertise with a direct nexus between nuclear weapons (NW) work and non-NW benefits for the Nation include the development of satellite technology, synthetic aperture radar, hypersonic vehicles, global monitoring systems for nuclear material detection, and our contributions to cyber defense, which are enabled by our longstanding work in the command and control of nuclear weapons.

MAJOR POINTS OF THIS TESTIMONY

Today, Sandia is executing its NW mission in the context of three overarching imperatives. First, take care of the current U.S. stockpile through such activities as annual surveillance and stockpile maintenance through limited-life component exchanges; second, sustain the stockpile into the future through life extension programs and alterations; and third, maintain and advance Sandia's required engineering and science capabilities, operations, and infrastructure.

My statement will provide an update since having testified before this subcommittee on May 7, 2013, and before the House Subcommittee on Strategic Forces on October 29, 2013. Itwill emphasize Sandia's execution of a full suite of modernization programs in full-scale engineering development, address the status of the NW stockpile regarding the other two imperatives, and describe the synergistic connection between Sandia's NW mission and other major national security missions. Today, we would not be able to deliver on our nuclear weapons mission without these synergistic relationships. All these topics will be viewed within the context of the administration's request to Congress for the fiscal year 2015 budget. Listed below are the major points of my statement.

1. Sandia is successfully executing a full suite of modernization programs in full-scale engineering development: the B61 Life Extension Program (LEP), W88 ALT 370, and Mk21 Fuze Replacement.
2. As of March 2014, we have met all major B61 LEP milestones on schedule as adjusted against receipt of program appropriations. By employing effective cost-management measures, we were able to minimize cost impact due to schedule delays caused by discrepancies between planned and received funds.
3. Our assessment of the administration's fiscal year 2015 budget request to Congress is that support for the modernization programs is consistent with first

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

production unit (FPU) plans. However, although the budget emphasis placed on modernization is understandable, it presents challenges for supporting the current stockpile and the underpinning capability, particularly in the long term.

4. At Sandia, the NW mission is strongly connected to other key national security mission areas: reducing global nuclear dangers, which is the work we do in nonproliferation, treaty monitoring, and securing nuclear facilities; nuclear assessments and warning, which involves foreign nuclear weapons assessments; cyberspace, which has grown from our early work in NW use control; and synergistic defense products, which refers to a set of products on which we work for the Department of Defense, which are synergistic with the products for the NW program.
5. We support the goals of the Congressional Advisory Panel on the Governance Structure of the NNSA and offer what we believe are guiding principles for improving the construct.

EXECUTING A FULL SUITE OF MODERNIZATION PROGRAMS

We are currently in full-scale engineering development on the B61 LEP, W88 ALT 370, and Mk21 Fuze Replacement. Indeed, for the first time since the end of the Cold War, we are executing three Phase 6.3 programs simultaneously. We are confident that our in-depth scientific, engineering, and technical expertise, combined with increased rigor in project management and cost control, will enable successful completion of these programs. Several years ago, we recognized the magnitude of the challenge before us, coupled with the expectations of high rigor in all aspects of cost, schedule, and performance. Thus, we took steps to prepare the institution to execute in this environment.

During the past calendar year, we completed co-locating the core design teams, enhancing our classified networks to reflect the volume of the work, and most significantly, staffing the programs and training the workforce. I will now summarize our progress in each of the modernization efforts.

The 861 LEP: Sustaining the 861 Safety, Security, and Reliability

As I stated in my testimony of October 27, 2013, the B61 LEP includes a prudent mix of the following activities: (1) requalification and reuse of existing components that we can certify for at least an additional 20-year lifetime, (2) remanufacture of some existing component designs, and (3) replacement with new designs, where required.

This approach to the program reduces the number of components to be developed, as well as the technical and programmatic risk associated with the life extension, but it does add lifetime risk to the B61–12. The resulting B61–12 design is the minimum that

- Meets threshold military requirements, including compatibility with future digital aircraft interfaces
- Addresses known end-of-life and technology obsolescence issues
- Sustains and updates safety and security for this system
- Consolidates the B61 Modifications (Mods) 3, 4, 7, and 10 into a single B61 Mod 12

Cost and Schedule Performance

The B61 LEP can be thought of as having three major phases—design, component and system qualification, and production. We are now about 75 percent complete on design, and by late fiscal year 2015, we will be at a 95 percent design point and will be ready for a planned first flight test of this bomb. This remarkable progress is the result of a significant effort on our part. As we learn more about the design, we will look for opportunities to consolidate some of the follow-on tests on subsequent development builds for the B61 in order to provide margin to the cost and schedule. For example, as I stated in October 2013, at the start of our Phase 6.3 on the program, the radar component was considered high risk. In August 2013, we tested our new radar for the B61–12 at the Tonopah Test Range in Nevada. The test of the new design was so successful that we have decided to consolidate three originally planned tests into the one we have completed, thus having an estimated $300,000 as contingency for budgetary fluctuations.

We have been successful in bringing innovative approaches to the B61–12 execution to reduce risk and cost. For example, in February 2014, Sandia collaborated with the Air Force to successfully perform a key aerodynamic test with multiple configurations at the Air Force Arnold Engineering Development Center in Tennessee. In this test, the bomb included the new tail kit developed by the Air Force. The test

sharpened our insight into the bomb's spin motion during freefall and led to enhanced understanding of a complex spin phenomenon, which in turn provides better understanding of the B61–12 flight performance.

As of March 2014, we have costed $350 million of the estimated incremental cost for Sandia to execute the B61 LEP. This amount is consistent with the June 2012 cost estimate that specifies an incremental cost of $2.65 billion for Sandia to execute the B61 LEP over 11 years. Against those expenditures, we have met all major milestones on schedule as adjusted against receipt of program appropriations. By using sound program-management measures, we are working to minimize cost impact due to schedule delays caused by discrepancies between planned and received funding. In fact, we currently project cost savings of approximately $120 million over the life of the program, which will go a long way to offset such discrepancies.

Our success in cost control reflects in part our commitment to manage labor costs, which are the largest component of the overall program cost. As an example, our efforts to manage healthcare cost and pension cost obligations have allowed us to keep labor rates for fiscal year 2014 below those we used in our cost estimate reflected in the Weapon Development Cost Report.

Further Modernization Efforts at Sandia

As discussed, we are currently executing two additional full-scale engineering development efforts: the W88 ALT 370 and the Mk21 Fuze Replacement. Across these two programs and the B61 LEP, we have taken an overall system approach, using common technology and components to an unprecedented extent. This approach is significantly reducing risk and cost in these programs. For example, a modular arming, fuzing, and firing (AF&F) design is being developed for the W88 ALT 370 and the Mk21 Fuze Replacement. Given the benefits of a common-technology approach, we will look to use it in all our future efforts.

W88 ALT 370

The W88 ALT 370 is well into full-scale engineering development and is executed on schedule and within budget relative to an FPU scheduled for December 2019. This modernization program replaces the AF&F assembly and adds a nuclear-safety connector for enhanced lightning protection.

Sharing technologies and components with other modernization programs, the W88 ALT 370 is cost-efficient and presents reduced risk, in keeping with the Nuclear Weapons Council's (NWC) plan for stockpile modernization. The W88 ALT 370 has not only developed a common subset of fuze requirements to support the W87/Mk21 fuze replacement application, but it also features a common radar module with the B61 LEP. Already prototyped, this radar will be included in a D5 missile Navy test flight later this year, which will evaluate radar performance in the unique reentry environment. The results of this flight test, as part of the rigorous performance testing and qualification efforts, will not only further the design of the W88 ALT 370 program, but also of the B61 LEP.

Significantly, through our surveillance and component evaluation programs, we were able to save tens of millions of dollars by requalifying the Bell XI sensor (originally used in the W88–0) and making it available for use in the W88 ALT 370 inertial navigation module. Like the B61 LEP, the W88 ALT 370 is being managed with increased program and cost rigor.

Mk21 Fuze Replacement

The Air Force has a requirement, validated by the NWC, to replace the Mk21 arming and fuzing assembly (AFA). Because of our expertise and ability to leverage similar work done for the W88 ALT 370, Sandia was chosen to replace the fuze. Leveraging other work enables efficiencies in design, development, production, and life cycle support. We entered Phase 6.3 of the program in August 2013. The team, including approximately 100 staff, is on track to establish the program baseline this summer.

During this fiscal year, a requirements review documented and confirmed key requirements that enabled us to launch full-scale engineering development in November 2013. A few months later, in January 2014, we conducted a key compatibility test for a Mk21 fuze component by using the U.S. Air Force test bed that simulates a missile interface. This test is significant because it confirms design decisions to enable the fuze to communicate effectively with the Air Force missile. It also demonstrates that the program is making appropriate progress toward fielding a replacement AFA.

Together, the B61 LEP, W88 ALT 370, and Mk21 Fuze Replacement provide substantive required upgrades to all three legs of the U.S. nuclear weapons triad.

W76–1

The W76–1 LEP continues with broad-ranging production across the entire national security enterprise. Beginning with the first production unit in the fall of 2008, Sandia has teamed with the NNSA and Navy to meet delivery schedules while working through the challenge of relocating the Honeywell FM&T Kansas City Plant to a new facility. Production is targeted for completion at the end of September 2019. Embedded in this effort is requalification of all the production lines and maintaining deliveries to the Pantex Plant.

Executing the modernization programs requires that we have absolute confidence in the safeguards and security aspects of our work. Sandia is committed to ensuring that we have trusted information systems, supply chains, and employees throughout all phases of the stockpile stewardship life cycle.

Future Modernization Efforts

W78/88–1 LEP

In June 2012, the NWC authorized a Phase 6.2 study for a W78/88–1 LEP interoperable warhead. Based on recent NWC guidance, NNSA deferred this program and established a new projected FPU in fiscal year 2030. NNSA does not propose to fund this life extension beyond fiscal year 2014 until such time that the Phase 6.2 study is restarted. Remaining fiscal year 2014 funds are directed toward a 120-day study to consider stand-alone warhead options for Mk21 and MkS aero shells and toward the orderly suspension of W78 LEP activities. The program will document the results of Phase 6.2 activities for the W78/88–1 LEP through end of fiscal year 2014, archive program files, and develop a restart plan for use if and/ or when future funding is allocated to the program.

LRSO

NNSA and the U.S. Air Force joined forces in a Phase 6.1 (concept assessment) Long-Range Standoff (referred to as LRSO) study to begin on July 1, 2014. Sandia will potentially be asked to conduct a Phase 6.2 and 6.2A (engineering feasibility; cost estimation) study from fiscal year 2016 to fiscal year 2018 and initiate a Phase 6.3 effort starting in fiscal year 2019.

BUDGET CONSIDERATIONS

First, I would like to express my appreciation for the bipartisan efforts of the Senate and the House to enact fiscal year 2014 authorization and appropriations that recognize and support the most critical nuclear weapons modernization efforts. Specifically, the fiscal year 2014 enacted authorization and appropriations provide the necessary resources for the modernization programs to remain on schedule and meet all the NNSA and Department of Defense performance requirements. As I stated in my testimony to this subcommittee in May 2013, fiscal years 2014, 2015, and 2016 are critical to maintaining the cost, schedule, and performance of the overall program.

In this regard, we are also pleased to see the strong support for the weapons program in the administration's fiscal year 2015 budget request to Congress. As I have previously testified, budget continuity is the most significant risk to maintaining schedule, and therefore overall program costs, on the life extension and alteration programs. In my opinion, the fiscal year 2015 President's budget request for the nuclear weapons account, if fully supported, will provide such budgetary continuity and allow the nuclear security enterprise to continue on a successful path toward delivering on the modernization commitments. However, as I have stated in other sections of this testimony, support for the current stockpile and the underpinning infrastructure and capability presents challenges, particularly when viewed in the long term.

OVERALL PERSPECTIVE ON A BALANCED NATIONAL NW PROGRAM

In the preceding sections of my testimony, I have discussed the progress my institution has made on the stockpile modernization programs. Given their overall scope and time urgency, it is appropriate that these programs dominate Sandia's work activities. However, as I discussed earlier, the entirety of the NW program must also be judged against the imperatives to steward the current stockpile and maintain the science and engineering base and infrastructure necessary to both sustaining and modernizing the stockpile now and in the future.

When I consider the fiscal year 2015 budget request, I am concerned that the NW program is drifting out of balance as efforts to sustain the current stockpile, conduct appropriate levels of advanced and exploratory work, and support critical infrastructure continue to see reduced funding given the understandable emphasis on the

modernization programs. The pressure on infrastructure extends even to support for projects necessary for the execution of the modernization programs. A case in point is the recapitalization of Sandia's facility for radiation-hardened microelectronics fabrication. Fiscal year 2015 is the third year in a 6-year $150 million effort to mitigate production risk for the current modernization programs, but this recapitalization effort is not supported in the fiscal year 2015 budget request. This example is symptomatic of what I see happening across the program, namely, budget pressure forces greater risk acceptance in areas not perceived to have immediate impact. Other clear examples are that, despite the stockpile being the oldest yet in our history, the surveillance program is facing further reductions and advanced and exploratory work has decreased by 80 percent in the past 4 years. Given the overall fiscal constraints facing the country, it is appropriate to set priorities in a way that preferentially reduces risk to the most urgent programs. I understand and support that approach; however, it is important that all of us engaged in the stewardship of the Nation's nuclear deterrent acknowledge and explicitly look to minimize the overall risks that are increasing over time. In that regard, I urge both Congress and NNSA to maximize program management flexibility within an overall budget level.

To understand the pressure the current program faces, I will make some historical comparisons. Although details are often hard to compare for different periods, I believe a simple high-level view of Sandia's weapons program in 2014 compared with 2 previous years is informative. Consider first 1987. At that time, Sandia was executing weapon design activity comparable with what we are doing today. The stockpile was essentially new and required little or no surveillance, our infrastructure was receiving continuous recapitalization, and we were executing a healthy advanced and exploratory program. In constant dollars, the budget then was comparable with the budget today, but the demands on the program were very different. For example, we did not face the challenges posed by an old stockpile or the loss of nuclear testing. Now consider 2005, just 9 years ago. We were executing two full-scale engineering efforts although one (the W80) was terminated in that year; so, the scope of design work was less than it is today. In addition, we were making major investments in stewardship facilities (pulsed power and the microelectronics research and fabrication facilities) and in computing, and we were executing a robust surveillance program. In my view, the program in 2005 was in overall balance and at a budget level slightly higher than today. I believe that today, the program is not in balance. We are executing three modernization programs and are continuing needed stewardship tool application and development. However, we are deferring investments in the production infrastructure and curtailing surveillance activities for an aging stockpile. In addition, we also face labor cost drivers, such as pension and medical care costs, which were either nonexistent in 1987 and 2005 or considerably less in constant dollars. From this simple historical comparison, two overall points emerge about the program at Sandia:

1. More is being demanded of us today than at any other time since the end of the Cold War and the cessation of nuclear testing, yet budget levels are essentially flat or slightly down. This situation is leading to the imbalance and risk that I spoke to earlier.
2. The modernization programs are being executed with increased efficiency primarily because we are using the tools of stewardship (e.g., simulation) and overall enterprise cost reductions.

SANDIA'S STOCKPILE SURVEILLANCE AND ASSESSMENT, INFRASTRUCTURE, AND PEOPLE

In this section, I will focus on our achievements and challenges in sustaining the current nuclear stockpile, maintaining the underpinning infrastructure and capabilities, and attracting the people who will carry the work of today into the future. I will refer to these aspects in the context of the administration's fiscal year 2015 budget request to Congress.

Stockpile Surveillance and Assessment

An effective surveillance program at Sandia has made it possible to sustain confidence in the current stockpile and requalify parts from the current B61 stockpile for an additional 20 years of use in the B61–12. It also enabled us to extend the life of neutron generators by better characterizing aging phenomena and to support life extension of the current W78 warhead by providing confidence that the warhead components are aging gracefully. These achievements represent significant cost savings while allowing us to sustain confidence in the stockpile.

As I testified last year, funding allocations for Sandia in fiscal years 2013 and 2014 required that we constrain surveillance efforts, and current indications are that fiscal year 2015 funding for Sandia will impose additional constraints on our

surveillance program. At Sandia, we recognize the realities of the current fiscal environment, and thus we continue to apply a risk-based prioritization approach to our surveillance activities and infrastructure. I am concerned, however, that continued funding shortfalls in this area over long periods will lead to fewer lab and flight tests, testing fewer of the full-range operational environments, and reduced safety testing.

Science-Based Infrastructure and Capabilities

Sandia stewards the microelectronics research and fabrication facilities for the NW program, as well as for the Department of Energy's nonproliferation payloads. In those facilities, we design and fabricate an array of unique microelectronics, specialty optical components, and microelectromechanical sjrstem devices. When discussing the National NW program, I stated that the recapitalization of the facility for radiation-hardened microelectronics fabrication is not being supported in the fiscal year 2015 budget request. This lack of funding will increase the risk for delivering the modernization programs.

We also have significant recapitalization needs at other experimental and test facilities critical to the success of the B61 LEP, W88 ALT 370, and future life extensions, particularly at the Tonopah Test Range and our large-scale test facilities. The fiscal year 2015 budget request for recapitalization continues the downward trend from fiscal year 2014 and therefore further restricts our ability to reduce risk to the modernization programs. These infrastructure needs are impacted by the fiscal year 2015 budget request for the Readiness in Technical Base and Facilities program.

Sandia's high-performance computing capabilities, vital tools for our mission responsibilities in stockpile surveillance, certification, and qualification, continue to prove indispensable to our broader national security work. On a positive note, the resolution of the fiscal year 2014 budget resulted in an executable program in high-performance computing that can support critical work for our modernization programs. We are pleased that the fiscal year 2015 budget request continues to provide funding for high-performance computing.

Sandia is a recognized world leader in the developmnt and applications of pulsed power, as evidenced by our Z facility and the research program that it supports. Z is indispensable to conducting high energy density physics research critical to the stockpile stewardship program. An important deliverable for fiscal year 2015 is an assessment of the national program in inertial confinement fusion. Funding stabilitjr in this program area is needed for the long-term health of the stewardship program. The fiscal year 2015 budget request takes a step in restoring the funding needed to efficiently develop and utilize the full capabilities of the Z facility.

Future Stewards of the NW Stockpile

To execute the demanding modernization programs with which the Nation has entrusted us, we knew we would have to attract and retain new staff, the future stewards of our stockpile. Since fiscal year 2010, we have hired approximately 1,000 scientists and engineers-typically for us, two-thirds engineers and one-third scientists. These individuals were hired for the totality of our national security work. Fifty-seven percent of these new hires are in the first 3 years of their professional career and were recruited broadly from the Nation's finest research universities with the highest standards. Coupled with our experienced staff, they are responsible for the execution and progress on the modernization efforts. These hires, however, have a different social contract. They no longer have a defined benefit pension plan, and they are encountering an operational environment of a complexity that they might not have anticipated. Yet they are fundamentally attracted to the Laboratory by the nature of our work. Consistent with our role as a federally funded research and development center (FFRDC), we hire new talent for the long term. When the modernization programs are completed, we expect that recently hired staff will continue in nuclear weapons or other national security missions at Sandia. In recruiting, we have used the Laboratory Directed Research and Development program as a critical element, particularly for Ph.D. candidates.

Staffing three modernization programs has been a tall order in two significant ways: attracting many new hires with the right qualifications expeditiously and maintaining a stable Lab size. We were successful on both counts. As discussed above, we have a strong contingent of new hires, and the overall size of Sandia grew by only about 2.5 percent since 2010. To keep the Lab size stable, we shifted some personnel among the national security missions conducted at the Laboratory. For example, Sandia engineers may be expected to work on the weapons program one day and on an effort for the Department of Defense the next day. To ensure their successful contributions to the programs on which they are working, we have devel-

oped common tool sets and defined the necessary experience and the expectations of doing engineering at the Laboratory.

SYNERGY BETWEEN OUR NW MISSION AND OTHER KEY NATIONAL SECURITY MISSIONS

At the beginning of my testimony, I referred to the synergistic connection between Sandia's NW mission and other major national security missions. To energize and sharpen its nuclear weapons competencies and mitigate risk, 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 helps us attract and retain the new talent we need. Such an environment is essential for us to succeed against the challenges we now face.

I strongly believe that today it is not possible for my Laboratory to 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 NW mission.

In the next three sections, I will discuss some of the broader national security work we are conducting at Sandia, which we view to be particularly synergistic with the NW mission.

Reducing Global Nuclear Dangers

Around the world, the risks posed by nuclear weapons, materials, and knowledge are increasing. The explosive growth of the nuclear power enterprise has resulted in at least 18 countries planning to build their first nuclear power plants, and major new construction is underway or planned around the globe. This nuclear power expansion, occurring with an unevenly applied approach to safety and security, may well increase the likelihood of proliferation over the long term. Nuclear "lockdown" is progressing, but work is still necessary to attain our security goals-both domestically and abroad. Sandia has a broad portfolio of nuclear nonproliferation activities, working collaboratively with Los Alamos, Lawrence Livermore, and several other DOE laboratories. Sandia has long-standing expertise in nuclear security and safeguards and engages cooperatively with partners in more than 100 countries to reduce the threat of proliferation and terrorism.

While the fiscal year 2015 budget request to Congress understandably emphasizes stockpile stewardship and the life extension programs, we are concerned about the size of proposed decreases in nuclear nonproliferation programs. Cooperative relationships with nation states having at-risk nuclear materials and nuclear weapons programs are hard to establish and potentially harder to rebuild, so these cuts may reverse the benefits from important work already completed. There is not enough national attention on helping the civilian nuclear enterprise grow in a safe and secure manner.

Similarly, increased focus is needed on the strategic requirements for next-generation technology and expertise to support our national nuclear nonproliferation policy goals. Sandia continues its commitment to helping reduce global nuclear dangers, but its resources for such work will need to shift to other activities if this budget is enacted as submitted.

Nuclear Assessments and Warning

The long-term vision for Sandia's nuclear assessments and warning mission area is to ensure that the United States will achieve an integrated, comprehensive, persistent monitoring and responsive warning architecture for NW activities worldwide. To achieve this vision, we research, develop, and deploy products and services that ensure the effectiveness of our nuclear deterrent and counter foreign efforts from impacting our national security capabilities and interests. Thus, we provide sensing systems and analysis to detect nuclear detonations and nuclear material and to understand nuclear threats against the United States and its allies, covering all aspects of the nuclear timeline.

One of our key programs is development and delivery of the satellite payloads for the U.S. nuclear detonation detection system. Through NNSA's NA–22 program, the satellite payloads program is fully funded in the fiscal year 2015 President's budget request, which is critical to maintaining a strong nuclear warning program for the United States.

Cyberspace and Synergistic Defense Products

Sandia's extensive cyber research and development program is rooted in its rich history of work in the command and control of nuclear weapons. Sandia integrates scientific understanding, technology development, and complex requirements-driven engineering to develop solutions to cyber challenges. Work in this mission area also involves management of trusted components for the modernization programs.

In the mission area we refer to as synergistic defense products, Sandia delivers a set of products in support of Department of Defense missions, such as combatting terrorism at home and abroad and dominance across the full spectrum of warfare. Among those products are real-time synthetic aperture radar and hypersonic vehicles, which actively draw from and feed back into the NW program.

GOVERNANCE

On the topic of NNSA governance, I look forward to the recommendations of the Congressional Advisory Panel. In our interactions with the Panel, we have stressed three important principles that we believe should shape the character of any recommendations:

1. Mission. In our view, the three nuclear weapons laboratories have evolved into unique national security science and technology institutions. Built around the core nuclear weapons capabilities, they offer broad value to the country's 21st century national security challenges. Any governance construct should reinforce this mission reality.
2. FFRDCs. The laboratories are FFRDCs. Any governance construct should enable them to fully embody key features of the FFRDC model as described in the Federal Acquisition Regulation. Some of those key features are the following: The FFRDCs attract and maintain high-quality personnel; maintain currency in their fields of expertise; meet special long-term research or development needs; and operate autonomously in the public interest with objectivity and independence and are free from organizational conflicts of interest.
3. Management fundamentals. Any governance model must rely upon and demonstrate sound management principles. Clear line-management accountability, a focus on strategic outcomes as articulated by the government, and independent and effective oversight that supports continuous improvement are particularly important.

Based upon my 38-year career, including senior leadership positions in two U.S. laboratories, it is my opinion that the NNSA construct has made it more difficult to manage and lead these institutions in a manner that fully demonstrates the value of these principles.

CONCLUSIONS

As I discussed at the beginning of my statement, Sandia is executing its NW mission by taking care of the current U.S. stockpile, sustaining the stockpile into the future, and maintaining and advancing Sandia's required engineering and science capabilities, operations, and infrastructure.

We are currently executing three modernization programs-the B61 LEP, W88 ALT 370, and Mk21 Fuze Replacement-on schedule and on (or under) budget. As I discussed earlier, budget continuity remains the largest risk to these programs. I believe that the fiscal year 2015 budget request supports the modernization programs consistent with FPU plans.

The overall demands of the NW program are significant-in many respects, they are unprecedented-and I am concerned that they are causing an imbalance in the program by increasing risk. As discussed in this statement, a budget emphasis placed on modernization is understandable, but it presents challenges for supporting the current stockpile and the underpinning capability in the long term. By the same token, considering the fiscal constraints facing the country, it is appropriate to set priorities in a way that preferentially reduces risk to the most urgent programs. It is therefore all the more important for all of us engaged in the stewardship of the Nation's nuclear deterrent to acknowledge the risks and work hard to minimize them. Significantly, Sandia's broad mission space is essential to mitigating risk to the NW program and delivering unique value to solving the Nation's national security challenges.

The recommendations of the Congressional Advisory Panel will be important as I believe the NNSA construct has made it difficult to meet the original intent of strengthening the nuclear weapons enterprise.

Finally, I want to restate that Sandia is committed to fulfilling its service to the Nation with excellence in all aspects of the program. We appreciate the leadership role of Congress in authorizing a sound path forward for U.S. nuclear deterrence.

Senator UDALL. Thank you, Dr. Hommert.

Doctor, would you help me pronounce your name properly, if it's—is it "Goldsteen" or——

Dr. GOLDSTEIN. It is, in fact "Goldsteen."

Senator UDALL. "Goldsteen."

Dr. GOLDSTEIN. Thank you.

Senator UDALL. Thank you, Dr. Goldstein. You are recognized.

STATEMENT OF DR. WILLIAM H. GOLDSTEIN, DIRECTOR, LAWRENCE LIVERMORE NATIONAL LABORATORY

Dr. GOLDSTEIN. Thank you. Chairman Udall, Ranking Member Sessions, distinguished members of the subcommittee, on behalf of the more than 6,000 men and women of Lawrence Livermore National Laboratory (LLNL), thank you for this opportunity to provide perspective on our work.

I've submitted my full statement to the subcommittee, and I ask that it be made part of the record.

My name is William Goldstein. I'm the Director of LLNL. In the spirit of full disclosure, I should note that, although I'm in the 30th year of my career as a scientist there, this is my 11th day as director. So, while I can claim to know a great deal, I'm quickly learning how much I don't know.

As director, I have three major objectives: first, to ensure that the best and most innovative science, technology, and engineering is brought to bear to sustain the confidence in our nuclear deterrent and to support cost-aware options for warhead LEPs and infrastructure modernization; second, to operate the National Ignition Facility (NIF) safely and efficiently as a national user facility where nuclear weapons designers can hone their skills and test their models, where students can be trained in the fundamental science that underpins nuclear performance, and where we can explore the path to ignition and, hopefully, fusion burn in the laboratory; and third, to apply the unique strengths of the lab established by, and required by, our core nuclear deterrence mission to new and evolving challenges in national and global security.

This past year, with the support of this subcommittee, we've made progress in all of these areas. LLNL successfully met its annual assessment responsibilities and achieved all deliverables for the W78/88–1 LEP and long-range standoff (LRSO) study in support of the Air Force. NIF has provided data needed for stockpile stewardship, including advancing our understanding of the physics associated with ignition.

Working often in coordination with Los Alamos, we successfully conducted a series of hydrodynamic experiments at our contained firing facility, and Los Alamos' dual axis radiographic hydrotest facility, including a successful test of a pit reuse concept.

In partnership with National Security Technologies personnel at the Nevada National Security Site, we significantly increased the shock rate at the Joint Actinide Shock Physics Experimental Research Facility, and have continued to support studies on pit and

secondary assembly production at Los Alamos and Y–12, respectively.

In addition, we've provided innovative support to the Intelligence Community, the Department of Homeland Security, and the Department of Defense (DOD), among other agencies responsible for the National Security Enterprise and the Nation.

The President's fiscal year 2015 budget proposal helps strengthen our ability to deliver for stockpile stewardship by providing a modest increase in funding for our core weapons activities. This small increase in directed stockpile work and the science campaigns would enable us to improve our capabilities in support of current stockpile warheads, continue the development of cost-aware LEP options for the future, and help us recruit and retain new stockpile stewards as senior weapons experts retire.

The budget request also stabilizes funding for the NIF, following 2 years of significant reductions, and this will allow us to continue our recent restructuring of the facility and its operations in order to increase experimental opportunities and allow researchers to effectively support the stockpile stewardship mission.

These small increases for core weapons activities are especially critical in light of the delays in the LEPs for the W77/88 and the LRSO, which limit opportunities for our scientists and engineers to learn and practice the skills needed for weapons development and engineering.

Now, we've had some success exercising weapon engineering skills in work for DOD on conventional munitions, such as the BLU–1298 low-collateral-damage weapon, a notable example of work for other agencies that helps us sustain the health and vitality of the laboratory. This work exercises some, but not all, of the skills required to support sustaining the nuclear stockpile, and therefore, retaining these needed skills continues to be a challenge in the current program and budget environment.

I also have some comments on the relationship between the laboratories and NNSA, but, again, in the interest of time, I'd like to delay for the questions and again thank the subcommittee for its continuing support of the Stockpile Stewardship Program (SSP) and for the dedicated men and women of Lawrence Livermore who are committed to making our Nation a safe and secure nation.

[The prepared statement of Dr. Goldstein follows:]

PREPARED STATEMENT BY DR. WILLIAM H. GOLDSTEIN

OPENING REMARKS

Mr. Chairman and members of the subcommittee, I am William H. Goldstein, the Director of the Lawrence Livermore National Laboratory (LLNL). Thank you for the opportunity to provide my perspective on the President's fiscal year 2015 budget request and governance of the Department of Energy/National Nuclear Security Administration's (DOE/NNSA) national security laboratories. I will also report on ongoing and future activities at LLNL in support of NNSA's Stockpile Stewardship Program (SSP) and our other important national security missions in the context of the budget proposal.

As one of the DOE/NNSA national security laboratories, LLNL is responsible for helping sustain the safety, security, and effectiveness of our Nation's nuclear stockpile. A large part of that responsibility involves developing and maintaining the skilled workforce and broad set of capabilities and facilities that constitute a key component of the U.S. nuclear deterrent. Consistent with our mission, we also apply our capabilities to develop innovative solutions to important 21st-century national and global challenges.

This subcommittee's continuing support of the SSP has helped enable us to sustain confidence in the nuclear weapons stockpile without nuclear testing. The successes of the SSP would not have been possible without these investments.

Stockpile Stewardship Program Challenges

The 2010 Nuclear Posture Review noted that "significantly increased investments" were required to "sustain a safe, secure, and effective nuclear arsenal as long as nuclear weapons exist." As our weapons age, we must strengthen the science, technology, and engineering base that underpins the U.S. nuclear stockpile and, when required, extend the life of warheads in accordance with national policy. The needs of the SSP include:

- Stockpile Assessments. While currently assessed to be safe, secure, and effective, stockpile warheads have aged well beyond their original design intent. Maintaining confidence in the stockpile requires a vigorous assessment program, subject to rigorous peer review, made up of both physical and enhanced surveillance, underpinned by NNSA's science, technology, engineering, and production capabilities. If Life-Extension Programs (LEPs) are prolonged or postponed, assessment tools and capabilities must be enhanced to address a growing set of issues, and to help guard against technical surprises.
- Life-Extension Programs. Because weapons in the stockpile continue to age beyond their intended service life, timely execution of planned LEPs is important. The LEP strategy supports the United States Strategic Command's "3+2" vision for the future stockpile (three future missile-delivered warheads and two future air-delivered weapons), endorsed by the Nuclear Weapons Council. Recent high-level decisions have resulted in a postponement of the ongoing W78/88–1 LEP, and the stretch-out of the incipient Long Range Stand-off (LRSO) LEP. These delays impact the needs of ongoing annual assessment activities and create challenges for workforce management.
- Modernization of Facilities. A healthy complex is a crucial component of the Nation's nuclear deterrent capabilities, and provides a hedge against technological surprise and changing world conditions. Plans for modernization of two major capabilities are evolving because of budget constraints and will result in delays in their availability: the Uranium Processing Facility at the Y–12 National Security Complex, and modernized plutonium research and pit production capabilities at the Los Alamos National Laboratory (LANL). Other facilities are aging across the complex, leading to many smaller-scale but important infrastructure investment needs, including needs at LLNL.
- The Science, Technology, and Engineering (ST&E) Base. The ST&E capabilities at the NNSA laboratories are the foundation of the SSP. The people and their tools are needed for assessing and, where necessary, refurbishing our nuclear warheads. As the stockpile continues to age, and while LEPs and new production capabilities are delayed, our scientists and engineers face increased challenges in addressing the effects of aging on weapon safety, security, and effectiveness. We must continue to improve the ST&E capabilities that underpin the SSP.

In facing these challenges, LLNL remains focused on caring for the existing stockpile and sustaining or modernizing weapon systems consistent with national policy. To this end, we are strengthening the underpinning science, technology, and engineering of stockpile stewardship, and striving to maintain a responsive infrastructure, including innovative support to the NNSA production facilities. We are working to ensure that our workforce has the training and skills to meet current and future mission requirements. We are carefully considering cost-risk-benefit tradeoffs as we work on LEP warhead design options, to inform future LEP decisions. More generally, we continue to partner with NNSA and others in the complex to move the NNSA enterprise forward and offer innovative approaches to ensuring the effectiveness of our nuclear deterrent.

BUDGET PERSPECTIVE

Balancing investments across priorities is an enormous challenge. The nation cannot overfund one aspect of the SSP and put at risk others that are essential to long-term success. Fiscal constraints are stretching out the schedules for many SSP activities, investments, and deliverables. This increases program risk by leaving the complex potentially less prepared to deal with unanticipated technical problems, or a surprise brought on by the ever-evolving capabilities of adversaries. Resource con-

straints put a premium on early identification of stockpile issues, which increases the pressure on our ST&E base.

In this regard, we have previously expressed concerns to this subcommittee about the sufficiency of long-term ST&E and surveillance investments in the program needed to support annual assessment. Under the President's budget request for fiscal year 2015, the prospect for LLNL is a modest, 4 percent, increase in funding relative to fiscal year 2014 for core weapons activities. This is a welcome change after 2 years of significant budget decreases for two major reasons:

- It provides needed capability improvements and program stability. The proposed funding increases in Directed Stockpile Work (predominantly in Stockpile Systems and Stockpile Services) and the Science Campaigns (predominantly in Primary Assessments and Dynamic Material Properties) will enable us to improve our capabilities in support of current stockpile warheads (e.g., in improved material and component lifetime assessments and in addressing open Significant Findings), and continue the development of cost-aware LEP options. Benefits will include improved assessments of primary performance for aging, reconfigured, reused, and remanufactured pits; further exploration, development, and maturation of component technologies; and the development of more efficient methods for manufacturing.

The LLNL staff has shrunk by about 30 percent since fiscal year 2007 and nearly 15 percent over the last 2 years. This has stressed our depth of expertise in some areas as senior weapons experts have retired, and limited funding has constrained our ability to bring in and train the next generation of stockpile stewards. A stable program budget helps us ensure the succession of expertise necessary for long-term success in stockpile stewardship.

- It provides a predictable path forward for National Ignition Facility (NIF) activities. NIF is delivering data to support needed improvements in SSP predictive capabilities. Data from a range of experiments are being used to test and validate our simulation models and train our workforce. NIF has also recently achieved a key technical success on the path to ignition. Coupled with the progress we are making to improve the efficiency of NIF operations, level funding from fiscal year 2014, as proposed in the fiscal year 2015 President's budget request, for operations and experimental activities will allow researchers to effectively support the stockpile stewardship mission. At the requested funding level, we will continue providing essential data and make progress in fiscal year 2015 toward understanding the requirements for achieving ignition and energy gain, which is important to understanding thermonuclear processes in weapons.

However, we have continuing concerns:

- Work balance in stockpile stewardship—maintaining direct expertise in weapons development and engineering and supporting enhanced surveillance. With the proposed budget, our work on the ST&E underpinning stockpile stewardship will increase, which is an important and a positive trend. At the same time, with the postponement of the W78/88–1 LEP and the delay in the first production unit date for the LRSO LEP, the opportunity for LLNL to exercise capabilities necessary for weapons development and engineering are impacted. Maintaining expertise in these areas will continue to be a challenge. We are also concerned about the continued decrease in funding (both nationally and at LLNL) associated with enhanced surveillance. Enhanced surveillance (capabilities to predict and quantify potential future issues in stockpile warheads) is of growing importance to the Annual Assessment of the stockpile as current stockpile warheads continue to age.
- Laboratory infrastructure. LLNL's infrastructure requires continual reinvestment to enable Laboratory staff to perform their important work for the Nation efficiently, safely, and securely. LLNL successfully maintains required levels of readiness for its "mission critical" facilities and "mission dependent/not critical, enduring" facilities. However, the median age of facilities is 35 years and the most recent line-item facility construction project at LLNL was the Terascale Simulation Facility, begun in 2002. The deferred maintenance backlog is growing and three major mothballed facilities in deteriorating condition await funding for decontamination and demolition for proper risk reduction.

I am pleased to report that several of our proposed line-item investments are on the NNSA's list of high priority items, including an Electrical Infrastructure Upgrade Project that addresses our highest assessed risk to future operations, and a new emergency response center. We are pleased that

the fiscal year 2015 budget request funds the emergency response center, but remain concerned that the Electrical Infrastructure Upgrade Project has been deferred for a second year. We are working with NNSA to ensure the earliest possible start for this project.

GOVERNANCE OF THE NNSA NATIONAL SECURITY LABORATORIES

We have consistently stressed to many audiences the importance of partnership and shared responsibility with NNSA to the successful execution of our vital national security mission. We stand ready to work with DOE, NNSA, and Congress to turn ideas about a "more agile" relationship between NNSA and the national laboratories into actions. We have provided input to, and are actively listening, for the findings and recommendations of the Congressional Advisory Panel on the Governance of the Nuclear Enterprise, and the National Academy of Science Committee on Assessment of the Governance Structure of the NNSA National Security Laboratories, established by the National Defense Authorization Act for Fiscal Year 2013. The initial finding of the first panel that there has been a "loss of sustained national leadership focus" is strong motivation to quickly determine a path forward. We are eager to contribute constructively to the deliberations that will surely follow the issuance of the panel's recommendations.

STOCKPILE STEWARDSHIP PROGRAM ACCOMPLISHMENTS

Fiscal year 2013 and the beginning of fiscal year 2014 have seen many significant accomplishments in assessing and sustaining the Nation's nuclear weapons stockpile and applying and strengthening the underpinning ST&E. Our work was carried out through partnerships and at sites across the NNSA complex. Over the last year, we have:

- Completed Cycle 18 of the Annual Assessment of the stockpile. Continuing efforts at LLNL increased the rigor of the assessment process through extensive peer review that included the Independent Nuclear Weapon Assessment Process, and the application of improvements in predictive capabilities. During the last year, we also reduced surveillance backlogs and expeditiously addressed significant findings.
- Completed key LEP tasks. We identified a cost-informed preferred design concept and down-select of the pit and nuclear explosive package for the W78/W88–1 LEP (now on a 5-year hold). The selected design meets all military threshold requirements and enables achievement of enhanced surety. In addition, warhead options for further evaluation in Phase 6.1 were identified for the LRSO weapon.
- Attained important results at NIF to support the SSP. NIF high-energy-density physics shots are providing valuable data about the properties of materials at extreme conditions, the interaction of matter with intense radiation, and hydrodynamic turbulence and mixing of materials. Experiments to develop an improved understanding of the underlying physics for achieving ignition produced more energy through "self heating" from fusion reactions than was delivered into the fusion fuel. Altogether 158 shots were fired on NIF in fiscal year 2013 to support the SSP. Diagnostics and support capabilities have grown considerably to meet user demand, and the NIF team is continuously improving the efficiency of operations.
- Brought the 20-petaflops (quadrillion floating point operations per second) Sequoia supercomputer into classified operation. Operating as a tri-laboratory resource, Sequoia enables the use of higher-fidelity physics models in simulations and makes it possible to run large suites of simulations for estimating the sources of uncertainty that affect weapon safety and performance. In addition, NNSA reached a key step (Critical Decision-0) toward acquisition of the next major computer platform to be deployed at LLNL through CORAL (Collaboration of Oak Ridge, Argonne, and Lawrence Livermore). CORAL aims to achieve important technological advances needed by the SSP for predictive capability and 3D uncertainty quantification.
- Conducted a wide range of highly successful SSP experiments. Laboratory scientists designed and fielded experiments at facilities at Livermore, Los Alamos, Sandia, the University of Rochester, and the Nevada National Security Site and gathered data to improve our understanding of weapons physics and support LEPs. For example, we tested an innovative concept for pit reuse in a highly successful hydrodynamic test at LLNL's Contained Firing Facility.

• Engaged in developing new additive manufacturing (AM) processing technologies. Providing capabilities far beyond current state-of-the-art commercial tools, these new AM technologies are able to create features and architectures at the micro- and even nano-scale to make materials with previously unachievable properties (e.g., ultra-lightweight structural materials). Working with partners within the NNSA complex, we are exploring the potential role for this technology in support of the SSP.

MEETING BROADER NATONAL SECURITY NEEDS

Since the Laboratory's founding in 1952, Livermore researchers have applied their capabilities to develop innovative technical solutions to help meet pressing national and global security needs. The work has grown in importance as the country faces an expanding list of complex national security issues in the 21st century, for which solutions demand scientific and technology innovation. Research and development projects at LLNL support the U.S. military, counter chemical and biological threats, and enhance cyber, aviation, and infrastructure security. We help in areas that take full advantage of LLNL's unique research capabilities, special expertise, and our multidisciplinary teaming approach to problem solving.

Work for NNSA on nuclear nonproliferation and counterterrorism, for the DOE's Office of Science and energy technology offices, other Federal agencies, and other sponsors, not only meets their important needs but serves to sustain the long-term health and vitality of LLNL. These efforts extend existing core competencies and build new strengths in multidisciplinary ST&E, which in turn, benefit the stockpile stewardship mission and national security. Notable activities in fiscal year 2013–2014 include:

• Emergency response. LLNL's National Atmospheric Release Advisory Center (NARAC) provides predictions of the impacts of hazardous atmospheric releases to emergency managers and responders. Each year, NARAC typically responds to 10,000 airborne-plume simulation requests for emergency preparedness, participates in 100 major emergency response exercises, and responds to 25 incidents, including major events such as the Fukushima Dai-ichi nuclear power plant accident.
• Radiation detection. Customs and Border Patrol is piloting LLNL's new Enhanced Radiological Nuclear Inspection and Evaluation (ERNIE) software that will improve the sensitivity of radiation portal monitors to provide high levels of nuclear security while also reducing the high false alarm rate that can interfere with traffic volumes at monitoring stations.
• Foreign nuclear weapons analysis. LLNL provides accurate, comprehensive, and timely assessments of the nuclear weapon capabilities of countries of concern. Our analysis contributes to decision-making 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 is expanding the application of cyber security capabilities that are able to provide real-time situational awareness inside a large computer network by 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.
• Tracking space debris. The national security community is proposing to use nano-satellites with 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.
• Nuclear forensics. LLNL's Nuclear Forensics program is beginning to use the capabilities of NIF to produce fission products needed for more realistic forensic exercises. The samples are used in round-robin exercises that ensure the Nation's nuclear debris diagnostic capabilities are maintained in a constant state of readiness.
• Advanced conventional munitions. The BLU–129/B low-collateral-damage munition, developed from concept to delivery to the combatant commander in only 18 months, recently won the 18th annual William J. Perry Award, and we completed a highly successful hypersonic sled test of an advanced kinetic energy warhead in 2013.
• Support for the U.S. military. The Laboratory's Counterproliferation Analysis and Planning System (CAPS), a tool to assist in planning missions

against facilities that potentially support WMD production, was used scores of times in the past year to provide technical assistance to combatant commanders and to U.S. troops in the field. We also support DOD's mission to detect and defeat improvised explosive devices.

• Countering biological threats. LLNL developed and licensed a technology to safely validate the performance of biodetection systems designed to provide early warning of aerosol releases of biological agents. Our cutting-edge detection technologies support the needs of the recently released "National Strategy for Biosurveillance."

• Aviation security. To better protect against the threat of homemade explosives to commercial air transportation, LLNL provides the Department of Homeland Security with expertise and extensive facilities for explosive testing and evaluation.

WORKFORCE RECRUITMENT AND DEVELOPMENT

To sustain the Laboratory's expertise in nuclear weapon design and cultivate its spirit of innovation, LLNL endeavors to attract a world-class workforce by providing the opportunity to serve the Nation working on exciting projects, with outstanding colleagues, and state-of-the-art research capabilities. Many prospective career employees first come to the Laboratory as postdoctoral fellows to work on cutting-edge ST&E, often funded by Laboratory Directed Research and Development (LDRD). LDRD is exceedingly effective for workforce development, and, in many cases, it is the only means by which we explore innovative approaches to meet emerging national needs before they are sufficiently demonstrated to attract sponsor funding.

Recruitment and employee development at LLNL has been challenged in recent years as weapons-related funding has decreased. The program stability offered in the fiscal year 2015 budget request greatly helps the Laboratory in workforce planning and recruiting. Fortunately, we continue to attract outstanding young people. For example, in the 4 years of the program, the extremely competitive DOE Office of Science (SC) Early Career Research Program has made awards to 10 LLNL researchers. Only two DOE laboratories have more awards.

LLNL provides an extensive range of employee development, mentoring, and leadership training programs to foster career growth. Special attention is being devoted to identifying and meeting needs for critical skills and to succession planning. Succession plans are being developed across the Laboratory and used to inform nominations for advancement and leadership development programs.

CLOSING REMARKS

I thank the subcommittee for its continuing support of the SSP, and the dedicated men and women of LLNL, who are committed to making our Nation more secure through advances in ST&E. We greatly appreciate the attention the SSP is receiving, but the challenges confronting the program and its investment needs are substantial.

In the face of these challenges, LLNL remains focused on caring for the existing stockpile and modernizing or sustaining weapon systems consistent with national policy. The prospect for LLNL under the President's budget request for fiscal year 2015 is a modest increase in funding for weapons activities. This reverses the trend of recent years, and will help us strengthen the SSP's underpinning ST&E, maintain a responsive infrastructure, and develop cost-informed options for LEPs.

We must ensure that our workforce continues to have the training and skills necessary to meet current and future mission requirements. As long as there are nuclear dangers in the world, a cadre of talented scientists and engineers dedicated to national service and with the necessary skills, training, and tools, will be needed to sustain the nuclear stockpile without testing. In this regard, I am concerned about the delay of work on LEPs at LLNL, which limits opportunities to exercise weapons development and engineering expertise. In addition, as LEPs are prolonged or postponed, the pressure increases on SSP assessment tools and capabilities as they address a growing set of issues and protect against technical surprise.

With sustained support for the SSP—and for complementary work as a broad-based national security laboratory—LLNL will continue to help ensure a safe, secure, and effective nuclear weapons stockpile, and develop innovative solutions challenges in nuclear security, international and domestic security, and energy and environmental security.

Thank you for this opportunity to address the subcommittee.

Senator UDALL. Thank you, Dr. Goldstein.

Let me recognize myself and start the round of 7-minute blocks of time.

I want to start with Dr. McMillan. The NNSA has stated it still wants to move out of the old chemistry metallurgy research (CMR) facility by 2019, given its aged state. Is this target achievable? What has to be moved out to make it happen? What happens if you don't achieve the target date?—as a follow-on.

Dr. MCMILLAN. Senator, thank you for the question.

Yes, it is achievable, and the provisos really fall into three categories. First of all, the funding stream profile. In fiscal year 2014, we need to see $90 million available to do the work in those facilities. In 2015, we need to see $38 million. Second, in the out years, we need to see $85 million, relatively uniformly, out to 2019. Third, we're going to need to have a streamlined process, what DOE and NNSA call the 413 process, for being able to do the project. We need to be able to do that efficiently; and, if we do that, then I think that will work. With funding in the next 2 years, out-year funding, and then a streamlined process, I believe it's possible to do.

The pieces of the work that we need to move out of CMR are primarily analytical chemistry. There is some what we call material characterization work that happens there, but it's mostly analytical chemistry. That's what we need to be able to move out.

If we're unable to do that, we face choices such as extending beyond 2019, which I think is unadvisable. That building will be 70 years old at that point. The nuclear facility standards were very different in 1952, when the building came online. Either we do something like that or we have a gap in capabilities. But, it's probably early to really say what those consequences would be.

Senator UDALL. Dr. Hommert, let me turn to you and the B61 LEP. Your laboratory's performing the largest amount of work on that weapon. I think you're now in an engineering phase. Let me ask you three questions connected to that effort: What's your assessment of the largest remaining technical risk you have to buy down in this program? Second, assuming you enter into production in time, what is your assessment of the capacity of reduced components in this program combined with all the other activities at the Kansas City plan? Third, do you see any areas for cost savings once it enters production?

Dr. HOMMERT. Senator, thank you for the question. On the issue of technical risk, when we began the program 2 years ago, the highest technical risk we had was actually that radar module that you just saw. We've put that risk largely behind us, the green board there. As we stand here today, I would say there are a couple of areas of low- to moderate-risk that we continue to watch. It's important that we maintain effective work with our supplier base in a variety of different component areas—magnetics, et cetera. We have a small, relatively fragile supplier base, and it's important that we maintain strong relationships with them and ensure that they can meet our quality and schedule requirements.

There is also a longstanding issue with the program, which is to effectively integrate the Air Force component into the B61. We continue to work closely with the Air Force and with their contractor,

and we've made progress on that in the coming year, but that is a new technical component of the program that we'll have to continue to watch all the way through our design period.

I would say, in aggregate, technical risk posture is stronger and in a better place than where we were a year ago, retiring that risk element in large measure. I feel pretty good about that.

With respect to production, as we look at the production requirements through Kansas City, we think that the phasing of the programs, largely the 76–1, will complete its production by the time, in 2019/2020, when we begin the 61 production. I believe that that's effectively phased.

The other thing I think that's very valuable in our working relationship with Kansas City, I think we've honed that working relationship very effectively through the 76–1 process and production. We're doing that now. I think we'll have effectively, a more honed and working relationship with Kansas City when we enter that. Also, the sequencing with where we would go with the Mk21 program, which now we look at 2023. Actually, the phasing is pretty good through the throughput for Kansas City right now.

Finally, on cost savings in production itself, actually that has to begin well before production. We have a very active cost-control board with Kansas City. We're trying to make sure that there's a level of dialogue that we're factoring into our designs. The questions of manufacturability, we think we've made great progress on that, on the 61. We expect we'll see cost savings through the production period, as we've begun to see already in design phase.

Senator UDALL. The subcommittee certainly likes to hear that.

Dr. Goldstein, you talked about the NIF. It's a multibillion-dollar facility. It focuses on—192 laser beams on a small target to simulate the condition of a nuclear weapon. One of the milestones associated with the facility was to achieve ignition or a sustained burn of a small target containing an isotope of hydrogen. My understanding is, this milestone has not been achieved. Can you explain to us why it's important to achieve that milestone, where you are in the progress towards this milestone, and what other stockpile activities are you using the facility for?

Dr. GOLDSTEIN. Thank you for the question, Mr. Chairman. You're correct, that milestone was not achieved. Achieving ignition is important to the SSP because of the data that it will allow us to collect on physical properties important to understanding weapons performance, including the process referred to as "boost," which occurs in all of our current stockpile weapons.

This information is important in our assessment of the legacy stockpile and could help us develop options for future LEPs, and also to test the fidelity of our integrated multiphysics computer simulation codes. At the present time, we're making steady progress towards understanding the underlying physics associated with achieving ignition on NIF. As measures of progress, we've already set new records for the production of fusion neutrons and demonstrated a process known as bootstrapping, which is a prerequisite, a stepping stone, if you will, that's needed on the way to demonstrating fusion ignition. We've also demonstrated success in predicting the behavior of recent experiments using those large multiphysics codes that are used for weapons design.

It's important to bear in mind that our work on ignition is even now helping us to evaluate and improve the level of confidence we have in the physics models used in our weapons computer codes.

At the same time, both LLNL and LANL have been using NIF to collect data on materials properties under the very extreme conditions that are found in operating nuclear weapons, on the transport of radiation, in weapons geometries, and on the hydrodynamic behavior of weapons materials.

I'd also add that NIF has already provided important confirmatory data for a theory put forward by a Livermore designer that resolved a so-called "energy balance conundrum" that has bedeviled nuclear designers for decades. I mean, since the time of testing, we have not understood the nature of this process. It has been resolved recently, with the significant help from the experimental validation done on NIF.

Senator UDALL. Thank you, Doctor.

Let me recognize Senator Sessions.

Senator SESSIONS. Thank you.

I've been on this committee 17 years, it's hard to believe, but I've never been comfortable with where our money is spent and how we've managed it. It's given me some concern over time.

The first thing I want to draw your attention to—I don't know if you have a copy of this chart. Do you have that copy?

[The chart referred to follows:]

Comparing 1251/1043 Commitments to Appropriations and President's Budget Request for NNSA Weapons Activities
All Numbers ($ Billion)

	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23
Feb 2011 "1251 Report" NNSA Weapons Activities	7.6	7.9	8.4	8.7	8.9	8.9-9.0	9.2 - 9.3	9.4 - 9.6	9.4 - 9.8	9.5 - 10.1	N/A	N/A
Actual appropriations, budget request, FYNSP, and out-years in 1251/1043 report	7.215	6.953	7.719	8.31	8.907	9.261	9.477	9.702	10.558	11.110	11.177	10.767
Difference:	-0.39	-0.95	-0.68	-0.39	0.01	0.26	0.18	0.10	0.76	1.01		

Decrease of $2.0B over FY12 to FY14 (i.e., "real money")

Source: Mr. Rogers, Chairman, Strategic Forces Subcommittee, House Armed Services Committee

NNSA Delays

Program	Projection in 1251 Report	Status as of 2014
W76-1 LEP	Completed in FY2017	2 year delay: completed in FY2019; reduced number of warheads
B61-12 LEP	First Production Unit FY2017	3 year delay: FPU FY2020
W88 alt 370	No date specified	In development engineering phase; delay likely
IW-1 LEP	1251 report addressed intent to study a common W78-W88 warhead	Delayed at least 5 years
LRSO warhead	Low-rate initial production of LRSO to begin c. 2025; no mention of FPU of warhead	Delayed up to 3 years; FPU FY2025-FY2027 timeframe
CMRR-NF	Functionality attainable by FY2020; completion in FY2023	Project terminated; new modular concept under consideration, with perhaps some operational capability by 2027
UPF	Functionality attainable by FY2020; completion in FY2024	Delayed at least 4 years; reduced to 1/3 of original capability; Red Team investigating alternatives to UPF

Source: SASC Minority Staff with CRS & GAO *As of 24 March 2014*

Senator SESSIONS. Just see if we have this correct. The chart, across the top, is the commitment made by the President and Congress to secure New Strategic Arms Reduction Treaty ratification in 2010 with regard to modernizing our nuclear weaponry. It appears to me that we're about $2 billion below that promised amount. This top line being those numbers. For example, in 2012, the commitment was $7.6 billion, and we came in a little over $7.2 and $7.9 and $6.9, $8.4, $7.7 is where we're headed. This is some-

what of a dangerous trend, it seems to me. Then, if you take the results of these delays, I guess we can blame the results of this failure of money is that the W76 was to be completed in 2017 and it looks like we have a 2-year delay on that, with a reduced number of warheads. Would you agree or disagree with that?

Dr. HOMMERT. That is—fiscal year 2019 is the current schedule for the 76, yes.

Senator SESSIONS. All right. Then, in the B61, the first production unit (FPU) was to be in 2017, but it looks like we have a 3-year delay to 2020. Is that correct?

Dr. HOMMERT. Yes, Senator, that's the current schedule.

Senator SESSIONS. Dr. Hommert, are these formal decisions? Have they been adopted by the labs? Who has made these decisions?

Dr. HOMMERT. These FPU dates are the agreed position of the Nuclear Weapons Council (NWC) and then the NNSA and as requirements through to us.

Senator SESSIONS. All right. The NWC and the NNSA has said this is what we're going to have to do, based on the budgets that we have, I guess is the way to express it.

Dr. HOMMERT. Yes, Senator, that's correct.

Senator SESSIONS. Then, the W88, we don't have a date specified for that. It's in development engineering. Would you say a delay is likely on that?

Dr. HOMMERT. I don't think there'll be significant delay on the 88, as I currently see it right now.

Senator SESSIONS. The interoperable warhead (IW)–1, delayed at least 5 years?

Dr. HOMMERT. That's correct.

Senator SESSIONS. That's correct?

Dr. Goldstein, and then the LRSO weapon, initial low rate production, to begin in 2025, looks like it's delayed for 3 years.

Dr. GOLDSTEIN. That's correct.

Senator SESSIONS. CMRR, we're looking for functionally attainable by 2020, completion in 2023, and now looks like we're going to 2027. The Uranium Processing Facility (UPF)—that's the—what is that? That's the——

Dr. GOLDSTEIN. That's the UPF at——

Senator SESSIONS. Yes, okay. That's the building I've been asking questions about. So, that's delayed.

I guess I'm saying to you, those represent fairly serious delays in the important programs that we've focused on, would you not agree? I assume you think, in addition, I'd ask you, is that unfortunate? Would you have preferred to stay on track? Who would like to answer that? [Laughter.]

Dr. HOMMERT. I'll take a first crack. Let me just deal with the first three—the 76, the 61, and the 88—very quickly. I believe the schedules now are still schedules that provide effective margin against any issues in the stockpile. What is of paramount importance is to now hold them on schedule. The 61, for example, 2014, 2015, and 2016—are these the most important years? If we can hold the budgets at the requested levels, we will be able to execute that, and that timeframe is acceptable.

From my perspective, going back to my comments, the emphasis to now get these modernization efforts on a defined schedule, which you've gone through, Senator, I think has been effective, but it's had an associated effect of pressuring other elements of the program, which both Dr. McMillan and I have highlighted, in the infrastructure, surveillance, et cetera. I think that is where my current concern is most.

Senator SESSIONS. Let me, just briefly, tell you. Last year, our interest on the debt was $220 billion, which is a lot of money. But, the Congressional Budget Office (CBO) told us that in 10 years, the interest on the debt for 1 year would be $880 billion. So, this is going to crowd out a lot of things. I'm just saying it's going to take a heroic effort in the laboratories, I believe, to ask yourselves, "Can't we produce what we need for the Nation at a lower cost?"

Now, the NWC told Congress, on March 13th, that, while the fiscal year 2015/2019 budget request will meet nuclear stockpile requirements, as you've indicated, Dr. Hommert, quote, "The program is fragile, and any funding reductions at this point could pose unacceptable risk to the health of the nuclear enterprise." Would each of you agree, a yes or no, to that?

Dr. MCMILLAN. Yes.

Dr. HOMMERT. Yes.

Dr. GOLDSTEIN. Yes.

Senator SESSIONS. That's where we are. We're in a tight situation, for sure.

Let me ask one question—my time's about up—and give you a chance to ask this. The interim report of the Congressional Advisory Panel on Governance of the National Nuclear Security Enterprise concludes, "The existing governance, structures, and practices are most certainly inefficient and, in some instances, ineffective, putting the entire enterprise at risk over the long term. The NNSA experiment involving creation of a semi-autonomous organization has failed. This needs to be fixed as a matter of priority."

Briefly, I'll give you a chance to respond, maybe all three of you. Do you agree with that assessment? What's been your experience? What actions could you suggest? In 1 minute or less. [Laughter.]

Or you could supplement, of course. But, we are going to need to talk about their recommendations and what we're going to do.

Please, Dr. McMillan, do you want to start?

Dr. MCMILLAN. Sure, I'll start.

As I'm sure you know, Senator, I and my colleagues have interacted closely with the subcommittee, and I have not yet heard the report. I'm looking forward to their report, here in a few minutes. But, I certainly find a lot that I resonate with in the statement you made, particularly on the issues of efficiency, as I said in my prepared remarks.

Dr. HOMMERT. I would agree with that. I believe it's timely to reexamine the construct, because I think it's not as an efficient way to operate, and, as you just cited, there are significant pressures to control cost and meet schedule. I believe there's a relationship there, that it's, again, a good time to reexamine, and we look forward to the work of the Congressional Advisory Panel on that.

Dr. GOLDSTEIN. I would agree that there's much room for improvement; in particular, in the efficiency area. We have had the

opportunity to interact with the committee and to provide our input and our observations.

The one thing I would add, I think, is that the NNSA, together with its labs, have been tremendously successful over these years in executing the SSP, and I don't think we should lose sight of that fact as we go forward.

Senator SESSIONS. Thank you, and I agree. I wish Congress and the President would allow new weapons to be built. I think that'd be safer and cheaper and better. But, we have to refurbish, it appears, what we have, and we have to get it done, in my opinion. More delays are not acceptable.

Senator UDALL. Thank you, Senator Sessions.

Senator King.

Senator KING. Thank you, Mr. Chair.

Let me talk about your workforce for a few minutes. How do you fellows assess the morale and the state of your workforce? This is a time in our economy when high-tech scientific people are in great demand in the private sector. Are you able to recruit and retain the people that you need? Is that an issue?

Dr. HOMMERT. Senator, in order to meet the modernization programs that I just discussed, we've had a very significant recruiting requirement over the last 4 years. I'm actually pleased to reply that we've had a fair degree of success in that. We've brought something just under 1,000 advanced-degreed scientists and engineers. That's a new generation of stockpile stewards from the finest research universities in the country. We are under pressure to retain them because they do have other opportunities. You would expect that, given their talent. But, I'm reasonably optimistic we can do that, as long as we have the stability to execute the programs, because that's what keeps them. They believe they're doing something important, challenging, and, if we can convey to them that stability, I think we'll be effective in retaining that workforce.

Senator KING. Are they straight-up Federal employees? Are they subject to furloughs and all of the kinds of things that we've gone through?

Dr. HOMMERT. They're not Federal employees, but, as contractors to DOE, we certainly were subject to the impact of the shutdown of the government in October. That had a very dramatic effect, and it's not a point of stability. That did cause some retention issues for us. I think we've been able to push through that. But, yes, we were subject to that impact.

Senator KING. Do either of you want to comment on that?

Dr. GOLDSTEIN. I would just follow up on this issue of—we are not Federal employees, but we are subject to furlough when we run out of money. LLNL actually was the only DOE lab that, because of limited carryover, was actually in a position of having to close for several days in October. The morale impacts of that, the lack of security that that conveyed to our workforce—were significant. We can point to specific people who have left the laboratory because of their reaction to that kind of uncertainty.

Dr. MCMILLAN. Senator, if I could.

We do a lot of our recruiting at LANL through our postdoc program. We have continued to be able to recruit extremely high-quality postdocs, among the best in the world. However, we are seeing

increasing pressure on retention, and, in the last year, I've lost some of my very best mid-career people to universities, and I'm fighting off attempts on some of my people from companies such as Google, Apple, and Yahoo!.

What's the reason for their readiness to leave?

Dr. MCMILLAN. Exactly the issues that my colleagues have talked about: instability in funding, uncertainty about the future program. We need to be clear and stable for the employees.

Senator KING. We certainly agree. I hope we can achieve that.

We haven't conducted an underground nuclear test, or any kind of test for that matter, since 1992. What kind of problems does that raise? Because you're in charge of being sure that a weapon is ready to go if it's needed, God forbid, but you don't have the ability to test them. Are there ways to test, other than by testing the whole weapon, that can ameliorate that problem?

Dr. MCMILLAN. Yes, Senator. I would say two key areas, and they're parts of the SSP.

First, we do experiments in areas where we can. In the last year, I'm very proud of the people of LANL in having developed a very innovative new diagnostic for an experiment that we did in Nevada. It didn't produce any nuclear yield, but it was a way for us to gain information we had never had before.

Another example of that is what my colleague Dr. Goldstein mentioned of doing experiments on NIF. We're finding those to be very productive of information in domains of weapons performance that we haven't historically been able to touch.

The second broad area is modeling and simulation. Through the last 20 years of the SSP, we have all worked to develop not only the computing machines, but the codes that run on those machines, to help us bridge the gap to testing. As someone who helped develop that program 20 years ago, I'm not only proud of what we've done, I am amazed at how far we've been able to go. It's successful beyond my expectations.

Senator KING. You can do, in effect, partial testing. You can test the components——

Dr. MCMILLAN. Yes.

Senator KING.—the firing mechanism, all of that. You simply can't test the physics of the nuclear part, itself.

Dr. MCMILLAN. That's correct.

Senator KING. Last December, the CBO talked about the nuclear weapons complex and cost for the next decade, including $105 billion for nuclear weapons supporting the labs of the naval reactors. Within the CBO report was a chilling statement, "If they follow historical trends, efforts related to sustaining and modernizing the weapons stockpile are likely to be particularly susceptible to cost growth." That's a term we don't like to hear around here. Can you comment on that? Can we do the upgrades and the work that we need to do without necessarily being particularly susceptible to cost growth?

Dr. Hommert?

Dr. HOMMERT. I'm particularly sensitive to this because there's been a lot of dialogue in Washington about the cost of the modernization programs, and I believe we have a high degree of confidence that we can hold to the cost estimates that we submitted

on each of these programs. We have a process that's called a Weapon Development Cost Report. We're very committed to execute on that. We have, in that, appropriate contingency. As I indicated, on the largest of those programs, we've been able to actually realize savings in the first 2 years. So, that may have not—that may have been the historical characterization. I think we've gotten the message. We understand the pressures that you're under, and I'm confident we can execute to that.

But, I'll also emphasize something I said earlier, that if you look at our budgets today in constant dollars and what's on our plate, there's actually more on the plate, and less, overall. We got it, we're working on that, and I am confident that we can execute without significant cost growth if we hold the schedules.

Senator KING. I was just going to end with that. I think what I'm hearing is, you can do it if we can deliver some kind of certainty and predictability. Fair enough?

Dr. HOMMERT. Absolutely. The biggest risk to cost growth is a delay in appropriations that causes the schedule to slip.

Senator KING. Thank you.

Dr. HOMMERT. Then you'll inevitably have some cost growth. If we don't have that, I think we're—we can do it.

Senator KING. That's an important message for us.

Thank you very much, gentlemen.

Senator UDALL. Thank you, Senator King.

Senator Fischer.

Senator FISCHER. Thank you, Mr. Chairman.

Thank you all for being here today.

I apologize if I'm repeating any questions that you might have had. I was at a Commerce Committee markup, so my staff tells me that my questions are good to go. So, you can correct him if there is an issue here. [Laughter.]

Again, thank you.

Dr. McMillan, the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs, Andrew Weber, testified to me last year that DOD and DOE agreed on achieving a production rate of 30 pits per year by 2021, but this budget would delay that rate to 2026. What was the reason for the delay, please?

Dr. MCMILLAN. As you said, the——

Senator FISCHER. Has that requirement changed at all?

Dr. MCMILLAN. As we discussed in earlier conversations, both the immediate need for pits for systems such as the Adaptable Warhead 1 have moved out. The requirement for 30 pits per year has also moved out. However, I think it's important for this committee to understand that, with a capability like pits, it's important that we be making them. I would remind you that, following the closure of Rocky Flats in 1989, we lost the ability to make pits. It cost us nearly $1 billion in almost a decade to regain that capability. I don't think we should go there again.

Even if we're not making pits at the rate of 30 per year, we need to be continuing to practice that arc so that the people who do the work are able to do it for the country when it's needed.

Senator FISCHER. Is that going to have an impact on our current modernization plans, then——

Dr. MCMILLAN. Not after the delays——

Senator FISCHER.—if we're not able to——

Dr. MCMILLAN. Not after the delays that are in place. If we can do 30 by 2026, that will provide what we need.

Senator FISCHER. If we cannot do 30?

Dr. MCMILLAN. If we cannot, then it will, of course, have an impact.

Senator FISCHER. If we can do the 30 by 2026, are we going to meet the targets, then, by—I think it's 2030, that are 50 to 80?

Dr. MCMILLAN. That depends on the funding. As I've discussed, we've laid out a three-phase program for plutonium strategy. The first two steps of that, which are what we're working on most immediately, will get us to the level of about 30 per year. We should be able to do that by 2026. Then, if we make further investments, that will get us to the 50, and possibly beyond 50, per year.

Senator FISCHER. We're delaying a cruise missile warhead. Is that correct?

Dr. MCMILLAN. Yes.

Senator FISCHER. By how many years?

Dr. MCMILLAN. Three years?

Dr. HOMMERT. Roughly 3, yes.

Dr. MCMILLAN. Yes, My colleagues are better prepared for that one than I am.

Senator FISCHER. Are we going to be looking at delaying everything by 3 years, 5 years, 10 years? What are we looking at?

Dr. HOMMERT. Let's see, the three programs we're executing now—the 61, the 88, and the Mk21—the first two of those are—I believe the schedules are firm now, 2019 and 2020. There has been a change in the schedule on the Air Force Mk21, but I also believe that's now firm—2023, I believe. I think those are firm. I think the ones that are less firm right now because we haven't done 6–2—what we call our cost-estimate phase of 6–2—are the cruise missile system and the, what we call, IW–1 and –2. Those, I think, are still to be nailed down.

Senator FISCHER. Last year, Doctor, you were saying, that about the LEP schedule, and maybe seeing that slip, as well, and significantly slip—and you said, quote, "You then 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 50-—or, I'm sorry, the 78/88. There is sequencing and phasing here that is important to adhere to." Are we looking at a problem with that sequencing and phasing?

Dr. HOMMERT. I think we're in—we're not—a year ago, when we were here, we had a fair amount of uncertainty as to exactly what the 2014 budget would bring to execute those programs. The final numbers on 2014 were such that we are able to hold the current schedules of, particularly, the 61, the 76 production, and the 88, which would—if we can hold them through the 2015 and 2016 appropriations funding process, would avoid that stackup, which would have been clearly a possibility.

Senator FISCHER. Are you worried that some of these systems are going to age out, though, if we can't hold it?

Dr. HOMMERT. Certainly that's a concern. The 61 schedule needs to be held. I'll just leave it at that.

Senator FISCHER. Okay, thank you. I think I'll stop there.

Thank you, gentlemen.

Senator UDALL. Thank you, Senator Fischer.

Senator Donnelly.

Senator DONNELLY. Thank you, Mr. Chairman.

This is to follow, a little bit, up on my colleague Senator King's questions. In regards to keeping your talent, when we look at the folks that work there and we see some of the salary challenges of an Apple or a Google or those kind of things, what are the most important, I guess you'd call it, counter-weapons you have to try to keep people on the team?

Dr. MCMILLAN. Why don't I start with that one, Senator? I think, first of all, the importance of mission. People come to the laboratory because they believe that the mission we provide for the Nation is an important mission. To the degree that we, as a country, make sure they—that that commitment is reciprocated, that's an important tool.

Second, I think having the tools to be able to do the scientific work that no one else in the world can do. I remember, in the late 1990s, when Silicon Valley was drawing off my computer science people. Having the fastest computers in the world for them to work on to tackle those mission requirements would help to balance some of the differential.

I think, third, we need to constantly pay attention to the work environment, making an environment in which those people can work rather than one in which they're stymied. As our colleagues from the governance panel talk, I think that's one of the things I'm looking for is, are we able to govern the laboratories in our relationship to the government in ways that will make it possible for people to work rather than impossible for them to work?

Dr. GOLDSTEIN. Speaking from a laboratory that has Google and Netflix and assorted other giants right down the street——

Senator DONNELLY. Great neighborhood, huh? [Laughter.]

Dr. GOLDSTEIN. Absolutely—in many ways, yes. [Laughter.]

We're in a situation where people don't even have to move in order to take these jobs, and they are constantly pinged by these companies. When we lose somebody to one of these companies, the people who leave are offered—I don't know if I want to use the word "bounty," but——

Senator DONNELLY. Well, is——

Dr. GOLDSTEIN.—compensation. If they can go back to us and——

Senator DONNELLY. I've heard the salaries can be, like, triple the salary or more.

Dr. GOLDSTEIN. There are many things. The salaries can be larger, but also, the other parts of the compensation package—stock options, things like that—as well as a range of amenities that these companies can offer their employees.

I will just go through the things that I think distinguish us from them, and that we've found work very well in attracting and retaining talent:

First of all, it is, as my colleague said, the mission, the ability to make a difference on a national scale. That's one of the reasons it's so important for that mission to be strongly emphasized and reinforced all the time.

Second, it's the caliber of the people that they get to work with at the laboratory. That's kind of a circular thing. If we have good people there, we can keep good people there.

Third, it's the caliber of the facilities. This makes it absolutely essential that we find ways to reinvest in keeping our science, engineering, and technology facilities at the forefront. That's one of the things that our people come looking for, and it's one of the things that keep them there.

I'll just mention, also in this context, the importance of the Laboratory Directed Research and Development (LDRD) program at these laboratories, which is one of the important ways that we recruit people and also retain them. We keep our scientists at the forefront of their fields through this—among others, this mechanism. When there's pressure on this program at the lab, we feel it in our ability to attract and retain the nuclear force that we need.

Senator DONNELLY. Have you been able to stay as deep as you need to be, talent-wise? Are we as deep as we have ever been, or has it been more difficult to try to make sure that we're meeting all the goals we need to meet, in terms of having critical talent in our locations?

Dr. GOLDSTEIN. I would answer that by saying we have the critical talent we need right now for the program, but we are not deep in the areas that are critical. I believe that's primarily because we're making the best use of the budgets that we have, and that does lead to our being thin in areas where, if we lose the next person, it could become an issue.

Dr. HOMMERT. My colleague said this very well; I'll just try to summarize: importance of the mission, the stability with respect to the ability to execute the mission, the requisite infrastructure, and an environment conducive to the best in science and engineering. If we have those things, I mentioned earlier, we have brought some outstanding staff to the laboratory. They are fully capable of executing our mission, but we need those elements.

Senator DONNELLY. On a long list of things that we can do better here, if you had three top things that you looked at us and said, "We need you to do this and this and this," what would they be?

Dr. HOMMERT. Reinforce clarity on the expectations of our mission and its importance. In doing that, do it with a time horizon that gives us some confidence of the stability that we would execute on that mission. Then, I think, to your next panel, I do believe, to listen carefully to their recommendations about the nature of the environment in which we can operate in these institutions, because that's going to be very important to retain this new workforce we've brought through. Those would be the three things I would suggest.

Senator DONNELLY. Dr. McMillan?

Dr. MCMILLAN. I agree with my colleague.

Senator DONNELLY. Thank you, Mr. Chairman.

Senator UDALL. Senator King, did you have a——

Senator KING. Before this panel leaves, I hope you will take the message back to your people that they have one of the most important missions in this country, and it doesn't get recognized, because their mission is to provide the intellectual guts of our deterrent. If you look back at the sweep of history, I think the fact that we've

gone for 69 years without a use of nuclear weapon is a miracle. It's a miracle because of the credibility of the deterrent. Your people are an essential part of that. It's hard to recognize a negative, in effect, because what they've done through their work and their contributions, along with all those others in the nuclear enterprise, has enabled our deterrent to be a kind of umbrella for the world, which there is no more important work.

I just hope you'll convey that those of us here understand and appreciate that.

Dr. HOMMERT. Thank you, Senator.

We do provide our workforce the opportunity to Webcast and view this hearing, so hearing that from our political leadership is very, very important. They'll hear it directly.

Senator KING. Let the record show. [Laughter.]

Senator UDALL. Yes, let me thank Senator King, Senator Donnelly, Senator Sessions, and Senator Fischer, and hopefully I'm on that list, as well. But, I think what I hear everybody saying on the committee is that your people, and their intellectual capital, are part of our overall deterrent. Senator King put his finger on it.

We thank you for your service and for your time. I know we could spend easily another hour or 2 with you, but the day is getting on. I'm going to excuse all of you and ask our next panel to take their seats.

Thank you. Thank you.

Dr. Hommert, I'm tempted to keep this assembly here but I guess it's $1 million. I've never held $1 million in my hands.

Dr. HOMMERT. Probably even more than that.

Senator UDALL. The Doctor is saying "even more than that." I feel asset rich and cash poor.

Dr. HOMMERT. It's the best of American technology——

Senator UDALL. It's a work of art. [Pause.]

I want to welcome Mr. Norman R. Augustine and Admiral Richard W. Mies. They're the co-chairs of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise at the Institute for Defense Analyses.

If I might, I just wanted to set the stage for these two gentlemen. We just spoke to this with the previous panel. This is a part of my opening statement that I put in the record, but I think it's important, for those watching and here today, to understand what we face and what our opportunities are. By that, I mean, look, the heart and soul of our Nation's nuclear deterrents are the scientists and engineers working in our laboratories. Robert Oppenheimer—and Senator King's a great student of history——

Senator SESSIONS. Mr. Chairman——

Senator UDALL. Yes.

Senator SESSIONS.—we have to vote. I just see the first vote starting. Do you think we're going to try to come back and forth——

Senator UDALL. Yes, we're going to——

Senator SESSIONS.—between the votes?

Senator UDALL. Would you all like to—there's a series of votes. The first vote will most likely be about 20 minutes, so perhaps, Senator King——

Senator SESSIONS. Go early and come right back?

Senator UDALL.—if you go early, and then I'll hold the fort. Then when you return, whichever one of you arrives first will—this is a bipartisan subcommittee—will chair the subcommittee.

I want to highlight what Robert Oppenheimer said at the end of World War II. He looked back on the Manhattan Project, and he said to his fellow scientists at LANL, "If you're a scientist, you cannot stop such a thing. If you're a scientist, you believe that it is good to find out how the world works, that it is good to find out what the realities are, that it is good to turn over to mankind at large the greatest possible power to control the world and to deal with it according to its lights and its values."

Since Dr. Oppenheimer's leadership, the core mission of these laboratories has not changed on the nature of the scientific enterprise that served as the foundation of our deterrent. That scientific base is a fragile enterprise that needs constant oversight by the witnesses here today and by this subcommittee. We, as a Congress, need to ensure the resources are available to maintain this scientific enterprise so that our nuclear deterrent remains an effective one. I look forward to both of you providing us with your testimony, particularly with a focus on the relationship between the laboratories and the NNSA.

Both of you, Mr. Augustine and Admiral Mies, have a track record of being forthright, and I expect as much today in your testimony. Thank you for being here.

Mr. Augustine, perhaps we'd turn to you.

STATEMENT OF NORMAN R. AUGUSTINE, CO-CHAIR OF THE CONGRESSIONAL ADVISORY PANEL ON THE GOVERNANCE OF THE NUCLEAR SECURITY ENTERPRISE, INSTITUTE FOR DEFENSE ANALYSES; ACCOMPANIED BY ADM RICHARD W. MIES, USN (RET.), CO-CHAIR OF THE CONGRESSIONAL ADVISORY PANEL ON THE GOVERNMENT OF THE NUCLEAR SECURITY ENTERPRISE, INSTITUTE FOR DEFENSE ANALYSES

Mr. AUGUSTINE. Thank you, Mr. Chairman. I have about an 8-minute statement, which, with your permission, I'll proceed. Otherwise, I can submit it for the record and make it more brief.

Senator UDALL. If you could make it more brief, that would be well appreciated. I'll leave it to you.

Mr. AUGUSTINE. Thank you. Mr. Chairman, members of the subcommittee, and I will submit a longer statement for the record, and we appreciate this opportunity to share with you the findings to date of our panel on the Governance of the Nuclear Security Enterprise. Admiral Mies and I have the privilege of serving it as co-chairmen.

Congress asked our panel to broadly examine the performance of the Nuclear Security Enterprise and to consider alternatives and improvements. Let us state very clearly at the outset that the current viability of our nuclear deterrent is not in question. At the same time, the existing governance structure and operating practices are most certainly inefficient and, in some instances, actually ineffective, which does put the entire enterprise at risk over the long term.

During the past 5 months, the panel has focused attention on the NNSA, both in the headquarters and the field, including the lab-

oratories, the production plants, and the Nevada National Security Site. We've examined the current situation from the perspectives of the national leadership, from the users of the facilities, and also from the standpoint of the customers of the facilities and the employees.

We've benchmarked the NNSA against proven management approaches that have been used by high-performing enterprises both in the private sector and in the government. We've conducted onsite visits to virtually all the installations, and we've heard from dozens of expert witnesses. I should say that Admiral Mies and I appreciate the great support of our colleagues on the panel and certainly the candor of those people that we've interviewed.

Today, we are prepared to summarize our panel's findings on the current health of the NNSA and the root causes of its challenges, but we are only beginning to formulate our recommendations, and we'll look forward to presenting those to you. We believe we're on schedule for our final report.

Unfortunately, the unmistakable conclusion of our factfinding is that, as implemented, the NNSA experiment involving creation of a semi-autonomous organization has largely failed to achieve the system that Congress apparently intended. This does need to be fixed as a matter of priority.

Despite the flaws, we found examples of great success in NNSA's endeavors. To date, the science-based SSP has succeeded in sustaining confidence in our nuclear deterrent, unmatched technical innovation on the part of NNSA scientists and engineers has produced a dramatically increased understanding of the aging of our nuclear weapon stockpile, the labs and plants are providing solid support to the nonproliferation efforts and unique expertise to the Intelligence Community. NNSA's naval reactors organization continues to provide the world-class performance in developing and supporting the most advanced naval nuclear propulsion systems in the world.

On the other hand, NNSA, as a whole, continues to struggle to meet fundamental commitments. To that point, it's lost credibility among many of its customers and overseers. At the root of the challenge are complacency and the loss of focus on the nuclear mission by both the Nation's leadership and the public, following the end of the Cold War. Although the national leadership has provided strong policy and has provided substantial amounts of funds, it's evident that the followthrough has been insufficient, and Congress' present focus on this issue is certainly timely and welcome.

Fundamental reform will be required to shape the enterprise so that it can meet all the Nation's needs and rebuild the essential infrastructure that's required. While the technical work is rocket science, certainly the kind of management issues we've seen are not. That's not to say that they will not be difficult to rectify. Many have to do with culture. In my experience, there's nothing harder to change than culture.

The changes that we will recommend undoubtedly will be difficult to implement. They will require strong support from the higher levels of the government, including Congress and certainly the White House.

While organizational issues such as we have addressed are important, they are, frankly, the easy part and a necessary, but not sufficient, condition to achieve the improvements that Congress has pointed to.

The panel believes that the enterprise today benefits immensely from the political leadership of an engaged Secretary of Energy and the strong science and engineering of the National Laboratory system, but we have found five systemic disorders that have taken root that we believe are at the heart of the problem. With your permission, Mr. Chairman and members of the committee, Admiral Mies is prepared to describe, briefly, those five issues.

Senator UDALL. That's perfect.

Admiral Mies.

Admiral MIES. Chairman Udall and Ranking Member Sessions, let me add my thanks, as well, for being here today. My remarks are intended to provide some specifics on the panel's findings within the context of my co-chair's overall characterization of the health surrounding the enterprise.

As Norm indicated, our panel has identified five systemic disorders which result from the causes outlined in Norm's preceding testimony.

The causes and the disorders are really inseparable. Most, if not all, of these disorders can be traced back to national complacency, the lack of a compelling national narrative, and a widely accepted understanding regarding the role of the U.S. nuclear deterrent in this century.

Today, I would like to offer a brief synopsis of our panel's key findings, specifically focusing on the five systemic disorders we have identified:

First, a sustained loss of national leadership focus. Since the end of the Cold War, the United States has experienced significant erosion in its ability to sustain nuclear deterrent capabilities for the long term. The atrophy of these capabilities has been well-documented in numerous reports over the past decade. The fundamental underlying cause of this erosion has been a lack of attention to nuclear-weapon issues by senior leadership, both civilian and military, across both past and present administrations and Congresses. This lack of attention has resulted in public confusion, congressional distrust, and a serious erosion of advocacy, expertise, and proficiency in the sustainment of these capabilities. Absent strong national leadership, NNSA, as well as the whole Nuclear Security Enterprise, has been allowed to muddle through. First and foremost, we must consolidate and focus national-level support——

Senator UDALL. Admiral, if I might stop you there, we had hoped to phase in your testimony, like we're going to phase in the modernization of our weapons. I believe I need to go to the floor, so we'll temporarily recess, and when the first Senator——

Admiral MIES. Fine, sir.

Senator UDALL.—arrives, you can pick up at your second point. So——

Admiral MIES. Great.

Senator UDALL. We stand in recess. [Recess.]

Senator SESSIONS [presiding]. Colleagues, we are very apologetic from having our meeting interrupted when having good people like

yourselves testifying on important subjects. We are hearing it, we are reading the report, and we will consider very seriously your recommendations.

So, Admiral, I believe you were getting warmed up, so feel free to go ahead and——

Admiral MIES. Thank you, Senator Sessions.

I have already begun, and I am talking about five systemic disorders. I've already covered the first.

The second is a flawed DOE/NNSA governance model. The current NNSA governance model of semi-autonomy is fundamentally flawed. NNSA has not established effective leadership, policy, culture, or integrated decisionmaking. Indeed, the design and implementation of NNSA governance has led to numerous redundancies, confused authorities, and weakened accountability within DOE.

The third disorder is a lack of sound management principles and practices. NNSA and the associated policy-setting and oversight organizations within DOE reflect few of the characteristics of successful organizations. An entrenched risk-averse bureaucracy lacks a shared vision for, and a unified commitment to, mission accomplishment; and hence, they don't act as a team. Both DOE and NNSA lack clearly defined and disciplined exercise of roles, responsibilities, authorities, and accountability aligned to NNSA's mission deliverables. Too many people can stop mission-essential work, for a host of reasons; and those who are responsible for getting the work done often find their decisions ignored or overturned. Chains of command are not well defined, and resources are micromanaged. Personnel management and career development programs, issue resolution processes, and deliverable aligned budgets are deficient. Shortfalls in project management and cost estimating are well documented and acute.

Fourth, there is a dysfunctional relationship between the NNSA Federal workforce and their management and operations, the management and operating (M&O) partners. The trusted partnership that has historically existed between the laboratories and DOE/NNSA has—headquarters—has eroded over the past two decades to an arms-length customer-to-contractor adversarial relationship leading to a significant loss in the benefit of the Federally Funded Research and Development Centers (FFRDC) model. The trust factor essential to this model, underscored by a recent National Academy of Sciences study, results from unclear accountability for risk, a fee structure, and contract approach that invites detailed transactional compliance-based oversight rather than a more strategic approach with performance-based standards. Additionally, excessive fragmented budget and reporting lines also confound effective and efficient programmatic management and further erode any sense of trust. Furthermore, there is no enterprise-wide approach within NNSA. While there are examples where the relationship has improved, such as at the Kansas City plant, overall this government and M&O partnership remains highly inefficient and, in many cases, severely fractured.

Fifth and finally, there's a lack of close collaboration with selected customers. The issues the panel has identified are mainly with DOD weapon customers, and this is at once a culture—cultural and communications divide. There's no affordable, executable,

joint DOD/DOE vision, plan, or program for the future of nuclear-weapon capabilities. There's a lack of effective joint planning and budget coordination because of a fundamental lack of mechanisms to ensure requisite collaboration and consensus to address core mission requirements. As a consequence, DOD customers lack trust in NNSA's ability to modernize facilities and execute warhead LEPs. Although other customers appear to be satisfied, hereto a more strategic approach could strengthen capabilities in the services provided.

In conclusion, lasting reform requires aggressive action and sustained implementation in all five of these areas, but national leadership engagement is really the common theme. Improvement is possible, but it will demand strong leadership and proactive implementation of the panel's recommendations by the President, Congress, and an engaged Secretary of Energy.

Thank you for your time, and we look forward to answering your questions.

[The prepared statements of Mr. Augustine and Admiral Mies follow:]

PREPARED STATEMENT BY MR. NORMAN AUGUSTINE

Mr Chairman and Ranking Member Sessions, thank you for the opportunity to present the findings to date of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise. Admiral Rich Mies and I serve as its co-chairmen.[1]

Congress tasked our panel to broadly examine the performance of the Nuclear Security Enterprise and to consider alternatives.

Let us state at the outset: The current viability of the U.S. nuclear deterrent is not in question. At the same time, the existing governance structures and practices are most certainly inefficient and in some instances ineffective, putting the entire enterprise at risk over the long term.

During the past 5 months, the panel has focused attention on the National Nuclear Security Administration (NNSA)—both headquarters and field, including the laboratories, production plants, and Nevada National Security Site. We have also examined the current situation from the perspective of the national leadership in the Legislative and Executive branches and from the perspective of customers of the NNSA in the Department of Defense, Department of State, the Intelligence Community, and the Department of Homeland Security. We have benchmarked NNSA against proven management approaches used by other high-performing, high-technology organizations both in the private sector and in government.

The panel's work has relied on our 12 members' decades of experience of a broad scope dealing with nuclear enterprise issues; we have reviewed thousands of pages of previous studies; we have conducted on-site visits to numerous installations; and we have benefitted from the views of dozens of expert witnesses. We appreciate the Active engagement of our colleagues on the panel and the candor of those we have interviewed.

Today we will summarize our panel's findings on the current health of the NNSA and the root causes of its challenges. We are only now beginning to formulate the recommendations that we will provide in our final report.

Unfortunately, the unmistakable conclusion of our fact finding is that, as implemented, the "NNSA experiment" involving creation of a semi-autonomous organization has failed. The current DOE–NNSA structure has not established the effective operational system that Congress intended. This needs to be fixed as a matter of priority, and these fixes will not be simple or quick, and they need to recognize the systemic nature of the problem.

Despite the flaws, we have found examples of success in NNSA's endeavors. To date, Science-Based Stockpile Stewardship has succeeded in sustaining confidence

[1] The other Panel members are: Dr. Michael Anastasio, Admiral Kirkland Donald, U.S. Navy (ret.), Mr. T.J. Glauthier, The Honorable David Hobson, Dr. Gregory Jaczko, Dr. Franklin Miller, Dr. William Schneider, Jr., The Honorable John Spratt, Jr., The Honorable Ellen Tauscher, and The Honorable Heather Wilson.

in the U.S. nuclear deterrent. Unmatched technical innovation on the part of NNSA's scientists and engineers has produced dramatically increased understanding of the country's aging nuclear weapon stockpile. The labs and plants are providing solid support to non-proliferation efforts and unique expertise to the Intelligence Community. NNSA's Naval Reactors organization continues to provide world class performance in the development and support of the most advanced naval nuclear propulsion systems in the world.

But, NNSA as a whole continues to struggle to meet fundamental commitments. To the point: it has lost credibility and the trust of the national leadership and customers in DOD that it can deliver needed weapons and critical nuclear facilities on schedule and on budget. Simply stated, there is no plan for success with available resources. NNSA is on a trajectory towards crisis unless strong leadership arrests the current course and reorients its governance to better focus on mission priorities and deliverables.

At the root of the challenges are complacency and the loss of focus on the nuclear mission by the Nation and its leadership following the end of the Cold War. Although the national leadership has provided strong policy statements and substantial sums of money to the enterprise, it is evident that follow-through has been insufficient. Congress' current focus on the issue is a welcome development.

Over the decades this changed situation has translated into the absence of a widely accepted understanding of, and appreciation for, the role of nuclear weapons and nuclear technology in the 21st century, with the resultant well-documented and atrophied conditions of plans for the U.S. strategic deterrent's future—in DOD as well as in DOE. Within the Nuclear Enterprise this has been reflected as a lack of urgency and need for a compelling mission focus.

As earlier reviews have concluded, and this panel endorses: this is no time for complacency about the nuclear deterrent. America's deterrent forces remain of utmost importance; they provide the ultimate guarantee against major war and coercion. Further, our allies depend on these forces and capabilities for extended deterrence and could well pursue their own nuclear weapon capabilities if they perceive the U.S. commitment or competency to be weakening. Other countries carefully measure U.S. resolve and technological might in making their own decisions about proliferation and nuclear force sizing. U.S. leadership in nuclear science is something the country cannot afford to lose. The United States, along with its allies, are in a complex nuclear age; with several nuclear powers modernizing their arsenals, new nuclear technologies emerging, and potential new actors—as well as regional challenges—raising significant concerns. This would be a dangerous time to stumble.

Fundamental reform will be required to shape an enterprise that meets all of the Nation's needs and rebuilds the essential infrastructure that is required. But while the technical work is rocket science, the management and cultural issues are not as complex.albeit, in the case of the latter, not easily rectified. What is needed is to issue clear plans and provide sufficient resources for success; assign and align responsibility, along with the necessary authority; and provide strong, accountable leadership and management at all levels to execute the mission. The panel believes such reform is possible, but it will demand determined and sustained high-level leadership.

The changes the panel will recommend undoubtedly will be difficult to implement regardless of where the enterprise is located within the government's structure, since the fundamental problems are cultural more than organizational. Organizational change, while not unimportant, is only a small portion.the easy portion.of the revisions that must be made. Previous efforts to reform and previous studies calling for action have largely failed due to lack of leadership follow-through, a lack of accountability for enacting change, and, we might add, the lack of effective, sustained top-level demand for change from the national leadership.

The Department of Energy by itself would be challenged to oversee the radical steps that will be needed. Success is imaginable only with the strong and active engagement of a knowledgeable Secretary, supported by the White House and Congress, and a structure that removes impediments and that aligns to mission priority. The panel believes the enterprise today benefits immensely from the political leadership of an engaged Secretary of Energy and the strong science and engineering of the national laboratory system.

Each successive administration since that of President Eisenhower has reaffirmed the need to sustain a credible nuclear deterrent that is safe, secure and reliable. But sustained national commitment and focus on the entirety of the mission and the enterprise charged with its execution has been lacking since the end of the Cold War, as evidenced by the condition in which the enterprise finds itself today. DOE and the NNSA have failed to act with a sense of urgency at obvious signs of decline

in key areas. Five systemic disorders have taken root that we found to be at the heart of the problem. With your permission, Admiral Mies will briefly outline those issues.

Thank you.

PREPARED STATEMENT BY ADM RICHARD MIES, USN (RET.)

Mr Chairman and Ranking Member Sessions, let me add my thanks as well for being here today. My remarks are intended to provide some specifics on the panel's findings within the context of my Co-Chair's overall characterization of the health surrounding the Enterprise.

Our panel has identified five systemic disorders which result from the fundamental causes outlined in Norm Augustine's preceding testimony. The causes and the disorders are inseparable. Most, if not all, of these disorders can be traced back to national complacency.the lack of a compelling national narrative and a widely accepted understanding—regarding the role of the U.S. nuclear deterrent in this century.

Today I would like to offer a synopsis of our panel's key findings, specifically focusing on the five systemic disorders we have identified.

First, a loss of sustained national leadership focus. Since the end of the Cold War, the United States has experienced significant erosion in its abilities to sustain nuclear deterrent capabilities for the long term. The atrophy of these capabilities has been well documented in numerous reports over the past decade. The fundamental underlying cause of this erosion has been a lack of attention to nuclear weapon issues by senior leadership—both civilian and military—across both past and present administrations and Congresses. This lack of attention has resulted in public confusion, congressional distrust, and a serious erosion of advocacy, expertise, and proficiency in the sustainment of these capabilities. Absent strong national leadership, NNSA, as well as the whole Nuclear Security Enterprise, has been allowed to "muddle through." First and foremost, we must consolidate and focus national-level support.

Second, a flawed DOE/NNSA governance model. The current NNSA governance model of semi-autonomy is fundamentally flawed. NNSA has not established effective leadership, policy, culture, or integrated decisionmaking. Indeed, the design and implementation of NNSA governance has led to numerous redundancies, confused authorities, and weakened accountability.

Third, a lack of sound management principles and practices. NNSA, and the associated policy-setting and oversight organizations within DOE, reflect few of the characteristics of successful organizations. An entrenched, risk-averse bureaucracy lacks a shared vision for, and a unified commitment to mission accomplishment and hence they do not act as a team. Both DOE and NNSA lack clearly defined and disciplined exercise of roles, responsibilities, authorities, and accountability aligned to NNSA's mission deliverables. Too many people can stop mission essential work for a host of reasons and those who are responsible for getting the work done often find their decisions ignored or overturned. Chains of command are not well defined and resources are micromanaged. Personnel management and career development programs, issue resolution processes, and deliverable aligned budgets are deficient. Shortfalls in project management and cost-estimating are well-documented and acute.

Fourth, a dysfunctional relationship between the NNSA Federal workforce and their management and operations (M&O) partners. The trusted partnership that historically existed between the laboratories and DOE/NNSA headquarters has eroded over the past 2 decades to an arm's length, customer-to-contractor adversarial relationship, leading to a significant loss in the benefits of the federally funded research and development centers—the FFRDC model. The trust factor essential to this model—and underscored by a recent National Academy of Science study[2]—results from unclear accountability for risk, a fee structure and contract approach that invites detailed transactional compliance-based oversight rather than a more strategic approach with performance-based standards. Additionally, excessive, fragmented budget and reporting lines also confound effective and efficient programmatic management and further erode any sense of trust. Furthermore there is no enterprise-wide approach within NNSA. While there are examples where the re-

[2] Charles Shank and C. Kumar Patel, et al., Managing for High Quality Science and Engineering at the NNSA National Security Laboratories (The National Academies Press, 2013).

lationship has improved, such as at the Kansas City Plant, overall this government-M&O partnership remains highly inefficient and in many cases, severely fractured.

Fifth and finally, a lack of close collaboration with selected customers. The issues the panel has identified are mainly with the Department of Defense weapons customers. This is, at once, a cultural and communications divide. There is no affordable, executable joint DOD–DOE vision, plan, or program for the future of nuclear weapons capabilities. There is a lack of effective joint planning and budget coordination, because of a fundamental lack of mechanisms to ensure requisite collaboration and consensus to address core mission requirements. As a consequence DOD customers lack trust in NNSA's ability to modernize facilities and execute warhead life extension programs. Although other customers appear to be satisfied, here, too, a more strategic approach could strengthen capabilities and the services provided.

In conclusion, lasting reform requires aggressive action and sustained implementation in all five of these areas. But, national leadership engagement is really the common theme. Improvement is possible, but it will demand strong leadership and proactive implementation of the panel's recommendations by the President, Congress, and an engaged Secretary of Energy.

Thank you for your time and we look forward to your questions.

Senator SESSIONS. Thank you very much for the work you put in this. I do believe it's very important, and hopefully we'll be able to have a good discussion today and we'll be able to study your recommendations.

I would point out that we could be marking up near Memorial Day by that time. To the extent to which you have any specific recommendations that could become part of the National Defense Authorization Act, that if you could have those by that date, or as soon as you could—it may not be everything that you're fully prepared to recommend, but if there are some things that you're unified on, I would appreciate it if you could get that to us by that date.

Mr. AUGUSTINE. We could certainly do that.

Senator SESSIONS. Senator King, do you want to start?

Senator KING. Sure.

First, I don't know why you guys beat around the bush so much. [Laughter.]

I'd like to engage you to do a similar study of the entire U.S. Government, but——[Laughter.]

You keep talking about culture. In my experience, leading cultural change is probably the hardest thing in any organization. You can move the boxes around, and the only way to make cultural change is through leadership, in my experience. Would you give me some thoughts about how do we get to the cultural issues that are at the heart of a lot of your criticisms?

Admiral MIES. Again, I think the creation of NNSA was simply what you suggested, as moving the boxes around. It really didn't address the cultural issues, which, from my perspective, are DOE-wide, not just isolated to NNSA. There's a real need to attack a number of the cultural issues, and you're not going to do that in a short period of time. It will take a long time to make the changes you need. But, stability and continuity of leadership are key elements of it. Clearly defined roles, responsibilities, authority, and accountability are other key elements of having a well-understood, well-defined chain of command to make an organization responsive. I think career-development programs with rotational assignments are presently weak within DOE, and NNSA specifically, and there is a need to have stronger career development to develop greater technical competence, to give people who are in the headquarters

more field experience and vice versa, so there's an appreciation on both sides. I think project management expertise has been weak and inconsistent. You've had examples of very deficient cost-estimating processes. I would comment that the issue has not been cost growth, in many cases, of these projects as it has been poor cost-estimating upfront, which came in with very unrealistic estimates of the cost of some of these facilities and the LEPs, and that created unreasonable expectations.

Again, working on the cultural issues and trying to restore a sense of credibility and regaining the trust that has been lost over a period of time, I think is really critical to the success of the organization.

Senator KING. I should have asked, as a preliminary question, is the view that you all have represented in this interim report the consensus view of the 12 members of the Commission?

Mr. AUGUSTINE. It's an unanimous view, sir.

Senator KING. Okay. When do we expect your final report?

Mr. AUGUSTINE. The date we were given is late summer, and we are on schedule, and I think we have a good chance of having—perhaps not a bound, finished report by Memorial Day, but certainly having the essence of a report by then.

Senator KING. I think the sooner the better, because we want to get it within time to be able to incorporate your findings into the bill that we're going to be working on starting around Memorial Day. Don't worry about the binding, just give us the data. That would be very helpful.

Mr. AUGUSTINE. That's absolutely in our minds.

Senator KING. What came through to me was a general lack of attention to this subject. Has that been part of the problem, from Washington in general, from the administration, from Congress?

Mr. AUGUSTINE. Senator, I think that's true. I think, back in my own career, when I graduated from college, the most important job, if you were an engineer, to work on in the Nation was probably the nuclear deterrent. The place at the leading edge of technology at that time was in DOD. Today, the leading edge of technology is certainly not within DOD. The nuclear deterrent has certainly not been the highest priority issue among our Nation's leadership.

Senator KING. But, ironically, in large measure because it's worked.

Mr. AUGUSTINE. That's very ironic. We tend to take it for granted, and one day it may not work if we don't pay attention to it, of course. We visited so many of these laboratories, and some of the buildings go back to World War II. If you're a young scientist, and you go to work in a place where there are buildings around from World War II, where you're not sure if you're going to be put on furlough, you can't attend scientific meetings, that's not an attractive place to work. That should be a real concern of ours.

Senator KING. What are the immediate steps that you see? We're going to be talking about this, late spring and summer. What should be in our bill to make changes? I realize this is a little premature, you're not at your final recommendations, but, to the extent you can give us a preview.

Mr. AUGUSTINE. We are just beginning to formulate recommendations, and we have pretty good agreement about what the

problems are. That's the easy part. I would say that our recommendations will come in two categories. One will be organizational—do we have the right organization? It certainly appears that we don't. It's not clear what is the right organization. There are no silver bullets here. The second category will be dealing with some of these issues that the Admiral has described. I think that there are some things that just stand out. Much of it is Management 101. If I had to summarize one word of something that's lacking, the word would be accountability. We have to get accountability into this system. We're going to make a number of recommendations in that regard.

Senator KING. That's a challenge for all of government, because in business, accountability is whether you stay in business the next day. In government, it's not quite the same. We have to find an alternative to the profit motive to provide that kind of accountability. But it can be done. We've done it in wartime, certainly. We did it when the President said, "Let's get a train to New York in 3 hours," and it was accomplished. I've read about that case. That was a case where there was a clear goal and a clear deadline, clear accountability, and it happened. Maybe that's the kind of thing that we need here.

Mr. AUGUSTINE. I think the lack of emphasis by the Nation's leadership is clearly a part of the issue here. But, I've spent 10 years in the government, and the rest of my career, most of it, in the private sector. It is just very hard to imagine government—and part of it is the personnel system—that no company would survive with the government's personnel system. It would be gone in a year.

Admiral MIES. I think there are probably some recommendations that would be appropriate for your bill, but I think there are some broader congressional issues which aren't necessarily relevant to the bill itself. I think the importance of encouraging greater expertise and advocacy within Congress is important. A greater understanding of the role of the deterrent, as you've expressed, I think, is critical. Better collaboration between the authorizers and the appropriators on nuclear weapons programs would be beneficial. Conducting a joint program review between DOD and DOE on nuclear weapons programs would also be very helpful. Again, greater synchronization between the DOD and the DOE budget submissions and their synchronization, in terms of agreement, would be very important, as well. I think those are a number of issues.

Lastly, I would say timely confirmation of nominations to assume the leadership positions is really critical.

Senator KING. I think we heard, in the prior panel, that timeliness and predictability and certainty are something that we can help supply to this proposition.

Before you leave, gentlemen, I would commend to you one of my favorite books about Washington. It's out of print now, but you can get it on Alibris. It's called "The Institutional Imperative or How to Understand the U.S. Government and Other Bulky Objects," written by a fellow named Robert N. Kharasch. It's absolutely brilliant, and some of your writings read like chapter subheads. It's hilarious, brilliant, and insightful. I recommend it to you.

Admiral MIES. Thank you, Mr. Chairman.

Senator UDALL [presiding]. Thank you, Senator King.

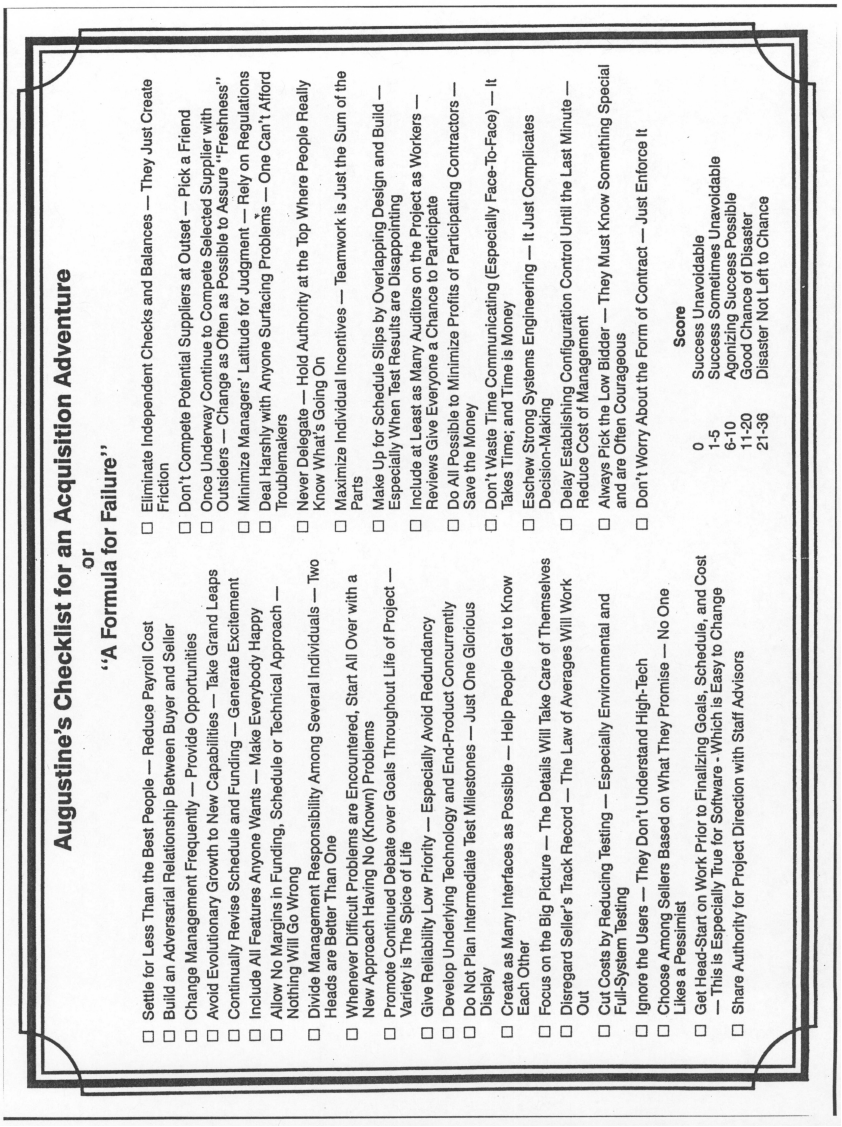
Let me thank Senator Sessions and Senator King for hurriedly making their way back so that we could continue this important hearing. I know we have another vote, I think, that's going to be underway soon, but, before we—was it just called? So, we have to—certainly, we could squeeze in another 10 minutes.

But, I thought, on the heels of what Senator King just shared with us, Mr. Augustine, you're famous for a number of things, but perhaps one thing that really stands out for me is a chart that you produced, "Augustine's Checklist for an Acquisition Adventure or 'A Formula for Failure'." I have a copy right here. I think my colleagues have copies. How did you produce this list? Relative to the NNSA, are there three or four things that stand out on this list that might be common to the NNSA and probably other agencies and other human institutions?

Mr. AUGUSTINE. Senator, transparency requires that I helped contribute to some of the problems on this list along my career. [Laughter.]

Senator UDALL. That's why you have even more legitimacy.

Mr. AUGUSTINE. I've been interested in acquisition and program management. I worked for David Packard when he was at DOD. He was one of my heroes. I've studied a lot of people, I've seen a lot of programs go badly, I've seen some go well, and I started putting together a list of what was the difference between the ones that went the way you'd hope and the ones that didn't. This is a brief version of that list.



Augustine's Checklist for an Acquisition Adventure
or
"A Formula for Failure"

- ☐ Settle for Less Than the Best People — Reduce Payroll Cost
- ☐ Build an Adversarial Relationship Between Buyer and Seller
- ☐ Change Management Frequently — Provide Opportunities
- ☐ Avoid Evolutionary Growth to New Capabilities — Take Grand Leaps
- ☐ Continually Revise Schedule and Funding — Generate Excitement
- ☐ Include All Features Anyone Wants — Make Everybody Happy
- ☐ Allow No Margins in Funding, Schedule or Technical Approach — Nothing Will Go Wrong
- ☐ Divide Management Responsibility Among Several Individuals — Two Heads are Better Than One
- ☐ Whenever Difficult Problems are Encountered, Start All Over with a New Approach Having No (Known) Problems
- ☐ Promote Continued Debate over Goals Throughout Life of Project — Variety is The Spice of Life
- ☐ Give Reliability Low Priority — Especially Avoid Redundancy
- ☐ Develop Underlying Technology and End-Product Concurrently
- ☐ Do Not Plan Intermediate Test Milestones — Just One Glorious Display
- ☐ Create as Many Interfaces as Possible — Help People Get to Know Each Other
- ☐ Focus on the Big Picture — The Details Will Take Care of Themselves
- ☐ Disregard Seller's Track Record — The Law of Averages Will Work Out
- ☐ Cut Costs by Reducing Testing — Especially Environmental and Full-System Testing
- ☐ Ignore the Users — They Don't Understand High-Tech
- ☐ Choose Among Sellers Based on What They Promise — No One Likes a Pessimist
- ☐ Get Head-Start on Work Prior to Finalizing Goals, Schedule, and Cost — This is Especially True for Software - Which is Easy to Change
- ☐ Share Authority for Project Direction with Staff Advisors
- ☐ Eliminate Independent Checks and Balances — They Just Create Friction
- ☐ Don't Compete Potential Suppliers at Outset — Pick a Friend
- ☐ Once Underway Continue to Compete Selected Supplier with Outsiders — Change as Often as Possible to Assure "Freshness"
- ☐ Minimize Managers' Latitude for Judgment — Rely on Regulations
- ☐ Deal Harshly with Anyone Surfacing Problems — One Can't Afford Troublemakers
- ☐ Never Delegate — Hold Authority at the Top Where People Really Know What's Going On
- ☐ Maximize Individual Incantives — Teamwork is Just the Sum of the Parts
- ☐ Make Up for Schedule Slips by Overlapping Design and Build — Especially When Test Results are Disappointing
- ☐ Include at Least as Many Auditors on the Project as Workers — Reviews Give Everyone a Chance to Participate
- ☐ Do All Possible to Minimize Profits of Participating Contractors — Save the Money
- ☐ Don't Waste Time Communicating (Especially Face-To-Face) — It Takes Time; and Time is Money
- ☐ Eschew Strong Systems Engineering — It Just Complicates Decision-Making
- ☐ Delay Establishing Configuration Control Until the Last Minute — Reduce Cost of Management
- ☐ Always Pick the Low Bidder — They Must Know Something Special and are Often Courageous
- ☐ Don't Worry About the Form of Contract — Just Enforce It

Score	
0	Success Unavoidable
1-5	Success Sometimes Unavoidable
6-10	Agonizing Success Possible
11-20	Good Chance of Disaster
21-36	Disaster Not Left to Chance

Mr. AUGUSTINE. To your specific question, there are several things I would——

Senator UDALL. I'd hate to see the entire list. [Laughter.]

Mr. AUGUSTINE. There are many things on the list that one could apply, but the ones that stand out to me, one is to continue—as you mentioned, if you do these things, you could be pretty sure a program will fail—one is to continually revise schedule and funding. Another is to divide management responsibility among several individuals. Get a headstart on work prior to finalizing goals, schedule, and cost. Share authority for project direction with staff advisors.

Eliminate independent checks and balances, particularly in the cost-estimating area. The last one I would really cite would be, minimize a manager's latitude for judgment and rely on regulations instead. I'm afraid we can check all six of those boxes.

Senator UDALL. Thank you for your frankness and for your insights.

I don't know if you were asked this earlier, if you have been——

Yes, let me recognize Senator Sessions. He has a comment.

Senator SESSIONS. I have to run and vote again, too, and I'm afraid I may not get back, which is a disappointment to me.

I believe you're exactly right. My general impression of this over the years is who holds this group accountable? One reason, I believe, it's psychological, it's like, "It's nuclear weapons." Whatever they say they need, we give. Then we've had political support from various people in various areas of the country, and things have built up over the years, and been protected over the years.

I believe that this report you've submitted to us is very valuable. I'll just ask you this one question, fundamentally. If we started over, it seems to me, and we decided we were going to refurbish our nuclear arsenal, wouldn't we just construct a building or so somewhere, or create something, and hire a lean group of people and get the job done? Now we have these places all over the country, that have been there for 50 to 60 years, with people that claim, "Well, I do this," and, "I do this." It all ends up costing a lot more.

My little joke, I guess it was, why don't we just hire France to do this? They wouldn't spend this much money. Nobody would spend this much money. We don't have money to waste. We're going broke. DOD is getting hammered. We're talking about losing 100,000 soldiers in a few years, so, we all have to work on it.

I want to thank you, Mr. Augustine. You're famous for doing reports. You've done another good job for your country. Admiral Mies, you want to call this one Augustine IV or something? [Laughter.] But, thank you, because you, both of you, all the committee members, have just done a fabulous job.

I do think, Mr. Chairman, that we won't be able to fix everything. I understand that. But, some of the recommendations you make, I hope that we can effectuate. I believe it can help us create a good nuclear program at less cost. That's what we're going to have to try to do.

Senator UDALL. Thank you, Senator Sessions.

I think we've reached the point where we could adjourn the hearing. I don't want to presuppose where your final recommendations land. I think we have a very good feeling for what you've observed and concluded. But, I want to thank both of you for taking the time. I know we compensate you handsomely in psychic rewards, but I would echo what Senator Sessions said, as well. I think the final conclusion, when it comes to what you do, is—I've never seen one of the reports in which you've been involved stay on the shelf—it's always in people's hands—because of the way you go about that important work.

Let me thank both of you. I will adjourn this hearing. I think we'll keep the record open for 3 more days, until the end of the week for any additional questions to be submitted for the record.

Again, we look forward to your conclusions and to hearing from you again.

This Strategic Forces Subcommittee hearing is now adjourned.

[Whereupon, at 4:05 p.m., the subcommittee adjourned.]

ANNEX 1

[The interim report titled: "Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise" follows:]

Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise

Interim Report

The Honorable Norman R. Augustine, Co-Chairman

Admiral Richard W. Mies, U.S. Navy (Retired), Co-Chairman

Dr. Michael Anastasio

Admiral Kirkland Donald, U.S. Navy (Retired)

The Honorable T.J. Glauthier

The Honorable David Hobson

The Honorable Gregory Jaczko

The Honorable Franklin Miller

Dr. William Schneider, Jr.

The Honorable John Spratt, Jr.

The Honorable Ellen Tauscher

The Honorable Heather Wilson

April 2014

Preface

Section 3166 of the Fiscal Year 2013 National Defense Authorization Act establishes the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise and tasks the panel to offer recommendations "...with respect to the most appropriate governance structure, mission, and management of the nuclear security enterprise." This interim report, required by Congress, summarizes the panel's initial findings on the current health of the enterprise and examines the root causes of its governance challenges. The panel is continuing to clarify and document the issues identified here. Recommendations to address the problems are being developed. The panel's findings and recommendations will be reported in depth in its final report, which is due to Congress in July, 2014.

Contents

Executive Summary

This interim report presents the findings to date of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise. Congress tasked the panel to examine the performance of this enterprise and to consider alternative governance models. The current viability of the U.S. nuclear deterrent is not in question. The panel finds, however, that the existing governance structures and practices are most certainly inefficient, and in some instances ineffective, putting the entire enterprise at risk over the long term.

This is no time for complacency about the nuclear deterrent. Each successive administration since that of President Eisenhower has reaffirmed the need to sustain a credible nuclear deterrent that is safe, secure and reliable. The panel endorses this commitment: America's deterrent forces remain of utmost importance, they provide the ultimate guarantee against major war and coercion, and our allies depend on these forces and capabilities for extended deterrence. Other countries carefully measure U.S. resolve and technological might in making their own decisions. The United States and its allies are in a complex nuclear age, with several nuclear powers modernizing their arsenals, new nuclear technologies emerging, and potential new actors—as well as regional challenges—raising significant concerns. Now would be a dangerous time to stumble.

This interim report summarizes the panel's findings on the current health of the enterprise and the root causes of its challenges. The panel is only now beginning to formulate the recommendations that will be provided in the final report. During the past six months, the panel has examined the entire enterprise, defined broadly to include the national leadership in Congress and the Executive branch, the components of the National Nuclear Security Administration (NNSA) and policy and oversight organizations within the Department of Energy (DOE), and NNSA's customers in the Department of Defense, Department of State, the Intelligence Community, and the Department of Homeland Security. Additionally, the panel benchmarked NNSA's management practices against proven management approaches used by other high-performing, high-technology organizations both in the private sector and in government. The panel has reviewed previous studies; conducted on-site visits to numerous installations; and benefitted from the views of dozens of expert witnesses.

One unmistakable conclusion of the panel's fact finding is that, as implemented, the "NNSA experiment" in governance has failed. The current DOE/NNSA structure of "semi-autonomy" within DOE has not established the effective operational system that Congress intended. This needs to be fixed as a matter of priority. These fixes will not be simple or quick, and they must address the systemic nature of the problem.

Despite the flaws in governance, the panel found noteworthy examples of success in NNSA's endeavors. To date, Science-Based Stockpile Stewardship has succeeded in sustaining confidence in the U.S. nuclear deterrent. Unmatched technical innovation on the part of NNSA's scientists and engineers has produced a dramatically increased understanding of the country's aging nuclear weapon stockpile. The labs and plants are providing solid support to non-proliferation efforts and unique expertise to the Intelligence Community. NNSA's Naval Reactors organization continues to provide world class performance in the development and support of the most advanced naval nuclear propulsion systems in the world.

But, NNSA as a whole continues to struggle to meet fundamental commitments. It has lost credibility and the trust of the national leadership and customers in DOD that it can deliver needed weapons and critical nuclear facilities on schedule and on budget. Simply stated, there is no plan for success with available resources. NNSA is on a trajectory towards crisis unless strong leadership arrests the current course and reorients its governance to better focus on mission priorities and deliverables.

At the root of the challenges are complacency and the loss of focus on the nuclear mission across the nation and within U.S. leadership following the end of the Cold War. Over the decades, this changed situation has translated into the absence of a widely accepted understanding of, and appreciation for, the role of nuclear weapons and nuclear technology in the 21st century. Within the nuclear enterprise this has been reflected in a lack of urgency and need for a compelling mission focus. Although the national leadership has provided strong policy statements and substantial sums of money to the enterprise, follow-through has been insufficient. Congress' current focus on the issue is a welcome development. But sustained national commitment and focus on the entirety of the mission and the enterprise charged with its execution is required.

Fundamental governance reform is needed to shape an enterprise that meets all of the nation's needs and establishes the essential infrastructure that is required for the coming decades. What is needed is a governance system that will:

- Issue clear plans and provide sufficient resources for success
- Assign and align responsibility, along with the necessary authority, and
- Provide strong, accountable leadership and management at all levels.

To achieve these conditions for success, five systemic disorders will need to be addressed.

Loss of Sustained National Leadership Focus

Since the early 1990s, the United States has experienced significant erosion in its abilities to sustain its nuclear deterrent capabilities for the long term. The atrophy of these capabilities has been well documented in numerous reports over the past decade. The fundamental underlying cause of this erosion has been a lack of attention to nuclear weapon issues by senior leadership—

both civilian and military—across both past and present Administrations and Congresses. This lack of attention has resulted in public confusion, Congressional distrust, and a serious erosion of advocacy, expertise, and proficiency in the sustainment of these capabilities. Absent strong national leadership, NNSA, as well as the whole Nuclear Security Enterprise, has been allowed to "muddle through." First and foremost, as mentioned previously, national-level support must be consolidated and focused.

A Flawed DOE/NNSA Governance Model

The current NNSA governance model of semi-autonomy within DOE is fundamentally flawed. NNSA has not established effective leadership, policy, culture, or decision making. As implemented, the Administrator of NNSA is not provided the autonomy from DOE headquarters staffs necessary to accomplish the mission, nor has this governance model created a sense of accountability for mission accomplishment within the involved DOE headquarters staffs. Indeed, contrary to Congress's intent, the design and implementation of NNSA governance has led to numerous redundancies, confused authorities, poor integration across the enterprise, and weakened accountability.

Absence of Sound Management Principles

NNSA, and the associated policy-setting and oversight organizations within DOE, reflect few of the characteristics of the successful organizations benchmarked for this study. An entrenched, risk-averse bureaucracy lacks a shared vision for, and a unified commitment to, mission accomplishment. Hence, teamwork is lacking. Both DOE and NNSA lack clearly defined and disciplined roles, responsibilities, authorities, and accountability aligned to NNSA's mission deliverables. Too many people can stop mission essential work for a host of reasons and those who are responsible for getting the work done often find their decisions ignored or overturned. Chains of command are not well defined and resources are micromanaged. Personnel management and career development programs, issue resolution processes, and deliverable-aligned budgets are deficient. Shortfalls in project management and cost estimating are well-documented and acute.

Dysfunctional Relationships between Government and Management and Operating (M&O) Partners

The trusted partnership that historically existed between the field and DOE/NNSA headquarters has eroded over the past two decades to an arm's length, customer-to-contractor, adversarial relationship. The changes in mission priorities from design and production to stewardship, and heightened regulatory oversight, overturned accepted priorities within the nuclear weapons program and radically altered the well-understood relationships between line managers and mission-support functions within the government as well as between the government and the M&O contractors. In the case of the laboratories, this has led to a significant

loss in the benefits of the federally funded research and development centers—the FFRDC model. The trust essential to this model—and underscored by a recent National Resource Council of the National Academies study[1]—has been eroded by unclear accountability for risk, and a fee structure and contract approach that invites detailed, tactical oversight rather than a more strategic approach with performance-based standards. Additionally, excessive, fragmented budget and reporting lines also confound effective and efficient programmatic management and further erode any sense of trust. Furthermore there is no enterprise-wide approach within NNSA. While there are examples where the relationship has improved, such as at the Kansas City Plant, government-M&O relationships remain highly inefficient and, in some cases, severely fractured.

Insufficient Collaboration with Customers

The collaboration issues identified by the panel are mainly with the Department of Defense weapons customers. This is, at once, a cultural and communications divide. There is no affordable, executable joint DOD-DOE vision, plan, or program for the future of nuclear weapons capabilities. There is a lack of effective joint planning and budget coordination because of a fundamental lack of mechanisms to ensure requisite collaboration and consensus to address core mission requirements. As a consequence, DOD customers lack trust in NNSA's ability to modernize facilities and execute warhead life extension programs. Although other customers appear to be satisfied, here, too, a more strategic approach would strengthen capabilities and the services provided.

In conclusion, lasting reform will require aggressive action and sustained implementation in all five of these areas. The changes needed undoubtedly will be difficult to implement regardless of where the enterprise is located within the government's structure, since the fundamental problems are cultural more than organizational. Organizational change, while not unimportant, is only a small portion—the easy portion—of the revisions that must be made to facilitate success. Previous efforts to reform and previous studies calling for action have largely failed due to lack of leadership follow-through, a lack of accountability for enacting change, and the lack of effective, sustained top-level demand for change from national leadership. The Department of Energy by itself would be challenged to oversee the radical steps that will be needed. Success is imaginable only with the strong and active engagement of a knowledgeable Secretary, supported by the White House and Congress, and a structure that removes impediments and that aligns to mission priorities.

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[1] National Research Council, *Quality of Science and Engineering at the NNSA National Security Laboratories* (Washington, DC: National Academies Press, 2013).

Introduction

Section 3166 of the Fiscal Year 2013 National Defense Authorization Act establishes the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, and tasks the panel to offer recommendations "...with respect to the most appropriate governance structure, mission, and management of the nuclear security enterprise." Over the past six months, the panel has performed fact finding in support of its task. The central focus has been on the National Nuclear Security Administration (NNSA), both headquarters and field, including the laboratories, production plants, and the Nevada National Security Site. The panel has also examined the other major elements of the overall national nuclear enterprise, to include the leadership in the Congress and the Executive Branch as well as NNSA's major customers in other Federal agencies. This report summarizes the panel's interim findings on the current health of the enterprise and examines the root causes of its governance challenges.

The NNSA was established in 1999. The Act creating the NNSA established the missions comprising six major elements as follows:[2]

- To enhance United States national security through the military application of nuclear energy
- To maintain and enhance the safety, reliability, and performance of the United States nuclear weapons stockpile, including the ability to design, produce, and test, in order to meet national security requirements
- To provide the United States Navy with safe, militarily effective nuclear propulsion plants and to ensure the safe and reliable operation of those plants
- To promote international nuclear safety and nonproliferation
- To reduce global danger from weapons of mass destruction
- To support United States leadership in science and technology

These statutory missions draw on a core set of science, engineering, and manufacturing capabilities that have been developed largely to address the needs of the nuclear weapon programs. The panel's evaluation has considered each mission, with the understanding that the NNSA is solely qualified to fulfill its mission to sustain the nuclear stockpile and provide naval nuclear power, while it is one of several contributors in the other mission areas.

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[2] NNSA Act (Title XXXII of the National Defense Authorization Act for Fiscal Year 2000, Public Law 106-65).

Recognizing that there has already been extensive examination of the enterprise, the panel reviewed thousands of pages produced by studies and reviews conducted both before and since the creation of the NNSA. The members heard from many experts, both inside and outside of the enterprise.[3] This included past and present senior leadership in the Department of Energy (DOE), NNSA, and Department of Defense (DOD), Field Office managers, Management and Operating (M&O) executives and a cross-section of personnel at each site, Laboratory Directors, chairmen of previous studies of the enterprise, Congressional staff, representatives from the customer communities (DOD, Intelligence Community, the Federal Bureau of Investigation, Department of State, Department of Homeland Security), the Defense Nuclear Facilities Safety Board (DNFSB), the Government Accountability Office, and the British nuclear weapons program.

The panel divided its field investigative work into four fact-finding groups as follows:

- The *National Leadership* group focused on the perspectives of the Executive branch (National Security Council Staff, Office of Management and Budget (OMB), and Office of Science and Technology Policy); the Legislative branch (both the Senate and the House of Representatives, and both the appropriations and authorization committees); Department of Energy headquarters; and the Nuclear Regulatory Commission, the DNFSB and other national-level stakeholders such as the Occupational Safety and Health Administration (OSHA) and the American Federation of Labor and Congress of Industrial Organizations (AFL-CIO).
- The *NNSA* group interviewed leadership personnel within NNSA headquarters and also conducted site visits to the three laboratories (Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), and Sandia National Laboratory (SNL)), the four production plants (Kansas City Plant, Pantex, Savannah River Site, and Y-12 National Security Complex), and the Nevada National Security Site (NNSS). These visits incorporated discussions with the Field Offices (including the Albuquerque Complex) and the M&O contractor leadership as well as tours of some of each site's important facilities.
- The *Customer* group obtained perspectives of the clients of the enterprise to include DOD, the Intelligence Community, Department of State, Department of Homeland Security, the Federal Bureau of Investigation, and the British nuclear weapons program.
- The *Benchmarking* group examined successful high-risk, high technology organizations to identify potential processes and structures that might be adopted by the enterprise. Among these organizations were Naval Reactors, Navy Strategic Systems Programs, National Aeronautics and Space Administration (NASA), representatives from the civil

[3] A full list of those who provided not-for-attribution testimony to the panel may be found in Appendix A.

nuclear power industry, DOE's Office of Science, the Centers for Disease Control, the Federal Aviation Administration, and the British nuclear weapons program.

The panel's findings and recommendations will be reported in depth in its final report, which is due to Congress in July, 2014. This interim assessment provides ample evidence of troubled enterprise governance. The telling symptoms of distress reported to the panel were confirmed through many sources and are consistent with the findings of numerous earlier studies. Notable among these

- Lack of agreed mission priorities for the enterprise as a whole
- Goals that are not matched to NNSA's budgets
- A loss of credibility and the trust of the national leadership and customers that NNSA can deliver needed weapons and critical nuclear facilities on schedule and on budget
- Inability of the NNSA to accurately estimate costs and schedules as the basis for planning
- Highly detailed, inefficient budgeting and reporting requirements imposed upon the NNSA by Congress and further complicated by the NNSA
- Lack of operational experience, stability, and continuity of NNSA leadership
- Absence of structured decision making and agreed-upon authority within the DOE and NNSA to resolve issues promptly
- Failure of NNSA to appropriately delegate responsibility and authority, monitor results, and enforce accountability at virtually all organizational levels
- A risk averse culture within NNSA headquarters and field offices that fosters mistrust and encourages onerous transactional oversight of M&O performance
- Excessive and often vague DOE rules, regulations, and procedures
- Weak risk management processes and execution within DOE headquarters, the NNSA headquarters, and the NNSA's national laboratories
- Multiple, redundant DOE and NNSA mission-support activities (overseeing such functions as environment, safety, and health), with relatively autonomous authorities
- Mismatch of skill needs and staff capabilities, especially for program management and cost estimation
- Inadequate investments for infrastructure maintenance at the NNSA laboratories and production facilities
- Ineffectual NNSA communications, externally, with customers, and internally, from leadership to staff and from staff to leadership

- Erosion of the NNSA-laboratory partnership, undermining the contributions of the labs as Federally Funded Research and Development Centers

Despite the governance shortcomings that are the focus of this report, it is important to recognize the achievements of the individuals and organizations working within the enterprise. Selected significant accomplishments in Science-Based Stockpile Stewardship, naval nuclear propulsion, non-proliferation, and intelligence are highlighted in Table 1. Many customers are satisfied with their working relationships with the laboratories and plants, as well as with the products and services they obtain from the enterprise. Unfortunately, these accomplishments are often overshadowed by the NNSA's management shortcomings, including failures to serve key weapons customers, prudently manage resources, maintain agreed-upon schedules, and effectively communicate with its customers and national leadership.

Table 1. Noteworthy Accomplishments of the Nuclear Security Enterprise

- Nuclear Stockpile Maintenance program has delivered W87 and W76 Life Extension Program (LEP) warheads
- Science-Based Stockpile Stewardship
  - Vigorous processes for two decades of successful annual certification of the stockpiles
  - Tri-lab competition and collaboration (W76 dual-revalidation, Reliable Replacement Warhead competition)
  - World-leading scientific advances: significantly improved understanding of weapons' physics, aging, and material properties
  - Leadership in high-performance computing
  - Successful completion of new manufacturing and experimental facilities
- Naval Reactors programs successfully sustain and advance technologies for ship propulsion
- Continued plaudits for support to Interagency programs in areas such as non-proliferation, counter-proliferation, and counter nuclear terrorism (e.g., Intelligence Community, Department of Homeland Security, State Department)

The panel is seeking to identify lasting solutions for the failings of the enterprise governance system. It is the panel's judgment, reinforced by a comparison of the NNSA with

high-performing benchmark organizations, that this will require addressing five systemic disorders touching every organization within the national nuclear enterprise:

- First, a loss of sustained national leadership focus starting with the end of the Cold War, which has undermined the foundation for nuclear enterprise governance and contributes to virtually all of the observed problems;
- Second, a flawed DOE/NNSA governance model, resulting from the flawed implementation of legislation establishing NNSA as a "separately organized" sub-element of DOE;
- Third, an absence of sound management principles within DOE/NNSA;
- Fourth, dysfunctional relationships between the government and its M&O partners;
- Fifth, insufficient collaboration with customers.

Solutions must address each of these disorders. Difficult steps will be necessary, and senior management will need strong external support to bring about the needed change.

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1. Loss of Sustained National Leadership Focus

Every aspect of the enterprise supporting the nuclear deterrent is colored by the fact that, since the end of the Cold War, nuclear weapons have become *orphaned* by senior officials in both the Executive and Legislative branches. The overall environment in which the enterprise operates across the U.S. government, in terms of interest, understanding, and advocacy, can be characterized as disparate, thin, and thinning.[4] Across the government, there remains a relatively small community of experts focused on nuclear deterrence matters, and they tend to be isolated in organizations with broad portfolios. To be sure, top-level guidance has been clearly articulated (e.g., the 2010 *Nuclear Posture Review*,[5] subsequent work leading to the Nuclear Weapons Employment Policy in June 2013,[6] Presidential speeches, the 2014 *Quadrennial Defense Review,*[7] and the annual *Nuclear Weapons Stockpile Memorandum*). Most recently, the President's FY15 Budget submission and the 2014 *Quadrennial Defense Review* emphasize the fundamental importance of nuclear deterrence and the commitment to invest in order to "retain an effective Triad."[8] In support of these policies, billions of dollars are provided every year. Nevertheless, the day-to-day operation of the enterprise suffers from a lack of follow-through in shaping plans and resources, and in overseeing mission execution, both from the Legislative and Executive branches.

Within Congress, there are multiple challenges. A dwindling number of Members of Congress advocate for the needs of the enterprise or fully appreciate the enterprise's mission and its importance. In both the Senate and the House of Representatives, the panel found varied and disparate perspectives, and uneven communication among committee Members and their staffs. Communication challenges are further compounded by multiple committee jurisdictions over various parts of the enterprise. Nevertheless, some committed legislators and staffs continue to bring focus to these issues, as evidenced by the charter for this review.

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4 Earlier studies, spanning more than a decade, have underscored this problem, including: Chiles Commission, *Report of the Commission on Maintaining United States Nuclear Weapons Expertise* (Washington, DC: DOE, 1999); Defense Science Board (DSB), *Report of the Defense Science Board Task Force on Nuclear Capabilities* (Washington, DC: Office of the Undersecretary of Defense for Acquisition Technology and Logistics, 2006); DSB, *Report of the Defense Science Board Task Force on Nuclear Deterrence Skills* (Washington, DC: Office of the Undersecretary of Defense for Acquisition Technology and Logistics, 2008).

5 DOD, *Nuclear Posture Review Report* (Washington, DC: DOD, April 6, 2010).

6 An overview of this policy is provided in Office of the Press Secretary, The White House, "Fact Sheet: Nuclear Weapons Employment Strategy of the United States," June 19, 2013, http://www.whitehouse.gov-the-press-office/2013/06/19, accessed April 30, 2014.

7 DOD, *2014 Quadrennial Defense Review* (Washington, DC: DOD, March 4, 2014).

8 Ibid., 32.

Some Congressional policies and practices hamper effective and efficient execution of the mission. First, Congress has increased the number of budget control points imposed on the enterprise. In 1998, there were nine control points; today, in contrast, there are eighty-two imposed on NNSA. This has restricted the ability of the enterprise to manage efficiently and adjust resources as needed to meet mission priorities. A second budget issue is one that applies to the entire U.S. Government: the impact of Continuing Resolutions and the Budget Control Act. As funding is issued incrementally (and often late in the year of execution), the ability to manage the array of interrelated activities and adhere to multi-year schedules is compromised, which ultimately results in both increased cost and delivery delays. In addition, the inability of Congress to confirm nominees to important leadership positions in a timely manner leaves key roles vacant, hinders others already working within the organization to effect necessary changes pending the arrival of new leadership, and ultimately risks reducing the number of well-qualified leaders who are willing to subject themselves to this process.

Leadership challenges within the Executive Branch are evident as well. DOE has a broad span of civilian responsibilities in addition to the nuclear security programs, and few principals in DOE headquarters, outside of NNSA, focus on nuclear weapon issues. As for DOD, several key senior staffs and analytical activities focused on deterrence strategy, operations, and programs have been eliminated or significantly reduced over the past two decades.[9] Executive Branch oversight is constrained by the limited staffs in both the National Security Council and the Office of Management and Budget. Studies and after action reviews of lapses in nuclear operations typically find that oversight mechanisms, leadership decisions, and workforce attitudes are shaped over time by the weakened top management focus on nuclear weapons. The most recent incident within DOE is the Y-12 security incursion. DOD examples during the past seven years include the unauthorized, inadvertent transfer of nuclear-armed Advanced Cruise Missiles from Minot Air Force Base (AFB) to Barksdale AFB, the mistaken shipment of Intercontinental Ballistic Missile (ICBM) warhead non-nuclear components to Taiwan, and recently-reported problems with personnel supporting U.S. ICBM operations.

In short, the governance of the enterprise has suffered from a lack of strong, focused political leadership at the department and national level. This is manifest in at least three ways.

A. Lack of a Unifying Narrative Clarifying Mission Priorities

Good governance begins with a clear understanding of mission priorities. Existing policy guidance supports each of NNSA's missions, but the guidance does not resolve and delineate program and resource priorities among those missions. Consequently, the panel has found there

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[9] DSB, *Report of the Defense Science Board Task Force on Nuclear Deterrence Skills*.

is no agreement across the government.[10] For many, the core mission is nuclear weapons stewardship. Others place non-proliferation programs as the top priority. Another view is that leadership in nuclear security science and engineering, not the nuclear force itself, is the core capability that underwrites deterrence. These views compete in setting programmatic and resource priorities; few interlocutors chose to name one mission as *core*, and each is able to cite higher-order guidance in support of the priorities they perceive. National leadership has the essential role in establishing the needed strategy, guidance, and resources.

B. Lack of an Executable Plan

Good governance also requires an implementable plan. Lacking strong leadership that unifies priorities, there has been no mechanism for the NNSA, its customers, and the national leadership to converge on a credible resource-loaded plan to chart the path ahead. The President's annual Nuclear Weapons Stockpile Memorandum and the Nuclear Weapons Council evolving "baseline" plan, for instance, provide important direction, but they do not provide programmatic guidance. As discussed in Section 5 on NNSA's collaboration with its customers, the Nuclear Weapons Council and the Mission Executive Council for interagency customer coordination continue to struggle in setting priorities, defining the enterprise's needs, and identifying resources to support those needs. And, of course, planning efforts have been seriously undermined by the turbulent national budget environment as well as by NNSA's inability to accurately estimate costs.

A rough estimate, based on assessments by DOD's Cost Assessment and Program Evaluation Office and the Congressional Budget Office, is that the aggregate NNSA program, as was structured in its 2014 Stockpile Stewardship and Management Plan, was at least $10 billion under-funded over the coming decade.[11] The recently released 2015 Stockpile Stewardship and Management Plan reduces projected funding over the next decade and proposes significant delays in the delivery of several major life extension programs and nuclear facilities.[12] Without commitment to an executable plan, NNSA has reacted and adjusted to funding as it is doled out year-to-year, or month-to-month. Large construction projects, Life Extension Programs (LEP),

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[10] The most wide-ranging and comprehensive recent document on the lack of consensus can be found in Stephanie Spies and John K. Warden, *Forging a Consensus for a Sustainable U.S. Nuclear Posture* (Washington, DC: Center for Strategic and International Studies, April 2013). See, in particular, pages 10 and 11 on the need for a unifying, lasting consensus amongst our national leadership. See also Strategic Posture Commission, *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States* (Washington, DC: United States Institute of Peace, 2009).

[11] OSD Office of Cost Assessment and Program Evaluation, "NNSA Governance Discussions: Briefing to the Advisory Panel" (Washington, DC: DOD, December, 2013); Congressional Budget Office (CBO), *Projected Cost of U.S. Nuclear Forces, 2014 to 2023* (Washington, DC: CBO, December 2013).

[12] U.S. Department of Energy (DOE), *FY2015 Stockpile Stewardship and Management Plan* (Washington, DC: DOE, April 2014).

and infrastructure modernization investments are managed with incremental funding. This creates significant inefficiency. In each area the enterprise routinely incurs program slips, delivery delays, program suspensions, and accumulations of deferred maintenance—all leading to increased long-term costs.

C. Absence of Follow-Through for Governance Reform

Governance has also been affected by another symptom reflecting unfocused leadership: the weakened ability of NNSA leaders to address controversial governance problems, including personnel reforms, Federal workforce initiatives, shifts in budget priorities, re-sizing or re-shaping of the complex's infrastructure, and the enforcement of accountability. Because the NNSA has lacked consistent, high-level political support, it has muddled through, adopting a reactive style and failing to make tough management choices, even though many NNSA leaders have seen the need to address the governance problems this report and others outline.[13] The difficult work in addressing the fundamental problems will fall on the shoulders of the NNSA leadership and the operating units of the enterprise. But, their efforts cannot succeed without the strong national level support for tough and sometimes politically difficult actions. To achieve this, it will be necessary to consolidate and focus available support to establish the nuclear weapons mission as a national priority in Congress and in the Executive Branch.

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[13] See, for example, DSB, *Report of the Defense Science Board Task Force on Nuclear Deterrence Skills*; and Spies and Warden, *Forging a Consensus for a Sustainable US Nuclear Posture*.

2. A Flawed Department of Energy/National Nuclear Security Administration (DOE/NNSA) Governance Model

Despite the intent of the NNSA Act to create a *separately organized* NNSA within DOE, the NNSA has not established autonomous leadership authorities, a policy framework, distinct culture, or integrated decision-making mechanisms.[14] The panel concludes that the relationships among NNSA, the Secretary of Energy, and the DOE headquarters staffs are fundamentally broken and must change.

Except for Naval Reactors, the NNSA Act does not provide a blanket exemption of NNSA from DOE orders and directives.[15] NNSA decisions and initiatives remain subject to DOE headquarters staffing processes prior to consideration for Secretarial approval. For instance, the department's directive program (DOE O 251.1C) requires policies, orders, notices, guides, and technical standards to be reviewed by a Directives Review Board chaired by the Director of theOffice of Management.[16] Senior representatives from the three Under Secretarial offices, the Office of General Counsel, and the Office of Health, Safety and Security all serve as members whose concurrence is needed before final issuance. Should the review board be unable to reach consensus, the Deputy Secretary decides whether to overturn the position of the directive's originating office.

DOE's implementation of the NNSA Act has produced parallel, intertwined NNSA and DOE headquarters staffs in many functional areas, rather than truly separate or independent DOE

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[14] "...NNSA and DOE have not fully agreed on how NNSA should function within the department as a separately organized agency. This lack of agreement has resulted in organizational conflicts that have inhibited effective operations." Government Accountability Office (GAO), *National Nuclear Security Administration: Additional Actions Needed to Improve Management of the Nation's Nuclear Programs* (Washington DC: GAO, 2007).

[15] DOE and NNSA define and govern their relationship based on legislation that does not unequivocally assign policy and risk acceptance authority. *§ 7144 of 42 U.S. Code Chapter 84* reads, "The Secretary shall be responsible for establishing policy for the National Nuclear Security Administration" and "The Secretary may direct officials of the Department...to review the programs and activities of the Administration and to make recommendations to the Secretary regarding administration of those programs and activities, including consistency with other similar programs and activities of the Department." *§ 7144(a)* further states that, "The Secretary shall be responsible for developing and promulgating the security, counterintelligence, and intelligence policies of the Department." These statutes conflict with *§ 2402(b) of 50 U.S. Code Chapter 41* which declares, "The Administrator has authority over, and is responsible for, all programs and activities of the Administration...including...(2) Policy development and guidance...(6) Safeguards and Security...(9) Environment, safety, and health operations" and *§ 2402(d)* which states "the Administrator can establish NNSA-specific policies unless disapproved by the Secretary."

[16] U.S. Department of Energy, *Departmental Directives Program*, DOE O 251.1C (Washington, DC: Office of Management, January 15, 2009).

and NNSA staff offices.[17] Parallel staffs exist in areas such as General Counsel, Human Capital Office, Public Affairs, Legislative Liaison, Chief Financial Officer, Environmental, Safety and Health (ES&H), Security, and Chief Information Office. Members of both the DOE headquarters and NNSA staffs point to the inefficiencies this creates. For example, NNSA has separate, non-integrated personnel systems and is not participating in an ongoing DOE effort to reduce support costs. The failure of a separately organized NNSA is further elucidated in the examples provided in sub-section C.

As implemented, the NNSA Act has actually been counter-productive. The problems fall into three main areas.

A. Overlapping DOE Headquarters and NNSA Staff Responsibilities

The parallel DOE headquarters and NNSA staff structures increase bureaucracy, cloud decision-making authority, and add to the number of people without clear authority and accountability who can stop or delay decisions. As one field representative put it, "We suffer in a regulatory framework where there are no clear lines of appeal or decision-making and no integrated place for the cost-benefit analysis to be done. For example, regarding facility safety and operational infrastructure, I get direction from the Office of Acquisition and Project Management, the Defense Programs leadership, the leadership for infrastructure management, DOE headquarters, and the Defense Nuclear Facilities Safety Board. How am I to do my job when getting direction from five different organizations?" Outcomes are determined by negotiations among the competing interests, which consume time and energy, and tend to yield ultra-conservative, minimal-risk approaches.

B. A Deepened Divide between Line Management and Mission-Support Responsibilities

Under the existing parallel staff structure, DOE headquarters staffs continue to exercise their mission-support oversight of NNSA, but they do not have the countervailing pressures to accomplish the mission. This structure skews incentives at the DOE headquarters level. These factors create strong and counter-productive incentives to eliminate all risks—large and small—rather than seeking to effectively manage the most important ones. Because many officials in the DOE headquarters have lacked a compelling interest in mission execution (as many outside observers have noted), the staff conservatism is not challenged by the department's leadership.

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[17] Earlier studies arrived at this conclusion as well. "Implementation of the NNSA Act failed to achieve the intended autonomy of NNSA within DOE." Elizabeth Turpen, *Leveraging Science for Security: A Strategy for the Nuclear Weapons Laboratories in the 21st Century* (Washington, DC: Stimson, 2009). "The governance structure of the NNSA is not delivering the needed results. NNSA has failed to meet the hopes of its founders. It lacks the needed autonomy." Strategic Posture Commission, *America's Strategic Posture.*

C. Ineffective and Inefficient DOE Orders, Directives, and Rulemaking Processes

Because of the diversity of DOE operations, orders are often written broadly to apply to both non-nuclear and nuclear activities even though the latter may demand special considerations. Consequently, DOE orders for ES&H and security often lack the precision, consistency, and clear implementing guidance necessary to translate the order's intent into practice. Not all sites have the same version of DOE orders for ES&H and security policy reflected in their contract. Indeed, there are sites that have both NNSA and DOE orders in their contract covering the exact same ES&H topic; although these orders may be similar, they can contain subtle, but crucial, differences.

The ambiguity in applicable standards compounds the problems of resolving issues among staffs who have unclear roles and authorities in DOE and NNSA headquarters and lack structured administrative procedures for decision making. In contrast, other regulatory bodies, such as the Nuclear Regulatory Commission or the Occupational Safety and Health Administration, have formal processes for clarifying the intent of their regulations and resolving issues as they arise, including disciplined risk analysis and risk acceptance procedures. Field participants see the lack of such processes for DOE or NNSA as a key impediment. As one laboratory participant stated, "Even if the lab has a rock-solid technical justification for its design, there is not a central point of contact in NNSA for adjudicating and getting a final decision on a safety-based design change." The frustration is evident: "This process takes a long time; it shouldn't be this hard. And, in this process, there is never any link to cost or mission."

The internal weaknesses in DOE's regulatory apparatus also have significantly weakened the DOE/NNSA's ability to engage effectively with the Defense Nuclear Facilities Safety Board. Congress chartered the DNFSB to provide independent oversight, by identifying safety concerns and raising issues with respect to the DOE's implementation of its own orders. At the same time Congress has recently stated that, "it is incumbent upon the Secretary to reject or request modifications to DNFSB recommendations if the costs of implementing the recommendations are not commensurate with the safety benefits gained."[18] Given the statutory role of the DNFSB as an independent oversight arm for public safety, and the lack of a DOE analytical capability to effectively evaluate options to respond to its recommendations, the DNFSB exerts a dominant influence over DOE's risk management in nuclear safety policies and programs, which at times leads to actions that do not reflect prudent risk management or safety concerns.

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[18] "Joint Explanatory Statement to Accompany the National Defense Authorization Act for Fiscal Year 2014," *Congressional Record* 159: 176 (December 12, 2013), H7968.

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3. Absence of Sound Management Principles

The panel's benchmarking activities identified a number of proven management characteristics common to successful high-risk, high technology operations. (See Table 2.) Prominent among these are a shared vision and mission priorities to chart the path ahead; the clear definition and disciplined exercise of roles, responsibilities, authorities, and accountability aligned to mission priorities; a technically competent workforce with the right skill mix and capabilities; clear plans with careful analysis of the resources needed to succeed; structured decision-making processes, with an emphasis on timely resolution of issues; and a structure and budget aligned to focus on customer deliverables.

Few of these requisites for success exist across the NNSA's management system--Naval Reactors is one exception. The observations here focus on ten areas where NNSA's management practices are inadequate. In their combined effect, these shortfalls undermine NNSA's leadership, impede accountability, and are corrosive to the culture. NNSA's inadequate resource management practices give rise to unreliable cost estimates and plans that have eroded NNSA's credibility and trust with DOD and Congress. Shortfalls internal to NNSA are compounded by the ill-defined relationships between NNSA and DOE headquarters staffs identified in the preceding section.

One senior NNSA official summed up the current situation for the panel as follows: "An effective management system is timely, accurate, and simple; our NNSA system is none of these." A major overhaul will be needed to align the structure, resources, and decision processes with mission priorities.

Table 2. Criteria for Success in High Reliability, High Tech Organizations

General	• Universally understood and accepted purpose • Effective culture developed over many years by transformative leadership and maintained by indoctrinating carefully selected personnel • Adequate visibility with external stakeholders
Structure	• Clearly established, codified, and reinforced lines of authority, responsibility, and accountability • Formal, inclusive, decisive, prompt, and documented decision-making processes • Deliberative body, such as a Board of Directors or Management Council, which obliges the organization to collectively engage in risk-based resource allocation decisions to accomplish mission • Separation of program/mission functions from institutional/support functions

Personnel	• Long-tenured director and/or senior leadership with extensive experience • Technically proficient and accomplished staff • Exceptional candidates recruited early to instill and sustain culture • Professional development programs emphasizing problem identification/solving, continuous learning, leadership, and the socialization of best practices
Communications	• Mission priorities aligned with purpose and frequently communicated by senior leadership • Information flows freely and quickly up and down the organization, and decisions are made at the appropriate levels • Few if any obstacles (people or processes) prevent bad news from moving up the chain of command • Mechanisms exist for field oversight offices and site managers to communicate regularly and directly with the head of the organization
Planning and Budget	• Single strategic planning reference document guides all decisions • Unwavering adherence to a disciplined planning and budget process, which is comprehensive and detailed
Program Management	• In a government operation, government program managers oversee efforts, but contractors execute the work within established policies • Lean and authoritative site offices have sufficient technical and operational expertise to effectively oversee the work • Stakeholders are included early in project life cycle and strive to understand all requirements and regulations upfront • Technical and financial elements of programs are scrutinized in order to validate efforts and control costs • The more hazardous the operation, the more safety is considered part and parcel of mission performance • Specialized ES&H and security standards are used only when more generally accepted standards (e.g., industrial standards, OSHA standards) are shown to be inadequate or unclear
Contracts	• Contracts focused and evaluated on costs and mission performance, not award fees related to aspects other than meeting the mission • Contracts consolidated where appropriate to achieve economies of scale • Contracts competed Cost Plus Fixed Fee (very low) with no incentive/bonus awards or Fixed Price Incentive (based on mission performance), depending on the work being done

A. Lack of a Shared NNSA Vision, Mission Priorities, and Plans

Accountability, organizational alignment, and operating culture all must flow from a common understanding of vision and mission priorities. During the Cold War, the weapons program was driven by an ambitious but relatively predictable product delivery cycle of design, test, and build—which at its peak, delivered up to a thousand new nuclear weapons each year.

Today, there is no agreed-upon national plan for NNSA's future path with identified resources. This lack of clear plans with associated resources and mission priorities to focus

execution is perhaps *the* fundamental flaw in NNSA governance. NNSA and its customers have critical roles in developing the needed strategy, guidance, and resources.

B. Absence of an Effective Operational Culture and Workforce

The NNSA has not taken the steps necessary to build a cohesive culture that instills accountability for customer deliverables, nor has it instituted the personnel programs needed to build a workforce with the necessary technical and managerial skills for operations. The purposeful development of leaders, managers, and staffs is essential to any governance system. The effective organizations benchmarked for this study focus on personnel management to create a reinforcing virtuous cycle: proven leaders emerge from careful selection and decades of experience involving careful development and screening. Such leaders make a system work well. They also attract and inspire other high-caliber people to join and stay in their organizations.[19] As one example, the current Director of Navy Strategic Systems Programs (SSP) started his career within that organization as a junior officer, and almost all of his subsequent assignments have been in the command. In addition to deep familiarity resulting from a long career with the same organization, long command tours provide needed continuity and allow the Director to promulgate and sustain the desired culture. Recently, the tenure of the SSP's Director was extended from about four years to eight years to strengthen this benefit.

A key staffing issue for the NNSA is the lack of operational experience in headquarters. In the peak years of the nuclear weapons program, the operational core of the nuclear enterprise was located in the Albuquerque Operations Office. Albuquerque synchronized the cycle of design-test-build throughout the Cold War, until 1992, when the production of new weapons was suspended. Albuquerque was officially disbanded ten years later, in 2002. NNSA headquarters assumed Albuquerque's operating functions (which were greatly diminished by then since the U.S. had ceased producing warheads), and decades of operational experience, knowledge, and technical expertise within the Albuquerque staff was lost in the reorganization.[20]

Now, as the United States embarks on an intensive series of warhead life extension programs covering the entire stockpile, a leadership team with deep experience and continuity (such as the team in the Albuquerque Operations Office) would be an enormously valuable asset

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[19] At benchmark organizations, the new entrants are carefully screened and selected, in part based on suitability for long-term careers within the organization. Employees tend to spend long careers within the organization. Promotion to the most senior levels (other than a political appointee) is usually from within, and these organizations favor those with broad-based career experience within the organization.

[20] NNSA's needs more professionals with proven project management capabilities for the Life Extension Programs and nuclear facilities construction and for individuals with skills in costing and resource management are addressed in Sub-sections G and H, below.

for governing the enterprise. Creating and sustaining a personnel management system to build the needed culture, skills, and experience is a vital component of governance reform.

C. An Unenforced Chain of Line Management Authority

DOE/NNSA roles, responsibilities, authority, and accountability are not clearly defined, aligned, or enforced. As an example, NNSA undertook to draft a Functions, Roles, and Authorities Manual to clarify how the NNSA management system should work, but this manual has never been completed. Experts decry the corrosive effects resulting from the lack of understanding of responsibilities within NNSA headquarters and the field offices. Some mission-support organizations view their role as a mission rather than support functions under which the mission is to be performed. As a consequence, some organizations responsible for mission-support functions often operate independently of line management. The problems within NNSA are further aggravated by the confusing governance relationships with DOE headquarters staffs, as discussed in the previous section.

The confusion in roles and responsibilities is compounded by several other flaws in NNSA's operating model: the lack of systematic processes for decision making; the absence of sufficient authorities for program managers to be accountable for major deliverables; and the high degree to which budgets are partitioned across the enterprise. These related issues are discussed in turn.

D. Lack of Mechanisms for Timely, Informed Decision Making

Effective organizations employ structured decision-making mechanisms to clarify roles and responsibilities and to integrate the performance of mission-support functions with line management responsibilities. Such processes not only expedite decision making, they also clarify who can say yes and who can say no when decisions need to be made. Effective organizations systematically track issues. They document decisions and follow up. They empower people to take decisions as far down the management chain as is reasonable, and they have procedures for elevating issues up the chain when necessary. They measure timeliness of decisions, and they study and improve the decision-making process itself.

Few, if any, such decision mechanisms exist in NNSA today; NNSA lacks structured processes that ensure information is shared, problems are surfaced, and timely decisions are made. This creates operational problems across the enterprise. Field operators find they sometimes must petition numerous headquarters staff offices for answers on policy or resource issues.

E. An Inflexible Budget Structure that Undermines Mission Execution

The problems with decision making are amplified today by NNSA's attempt to manage the operating sites with detailed budgets and milestones. Historically, the Albuquerque Operations

Office integrated the execution of programmatic work for the weapons within and among the sites. Sites were funded to provide a level of capability, the Operations Office coordinated the work within that capability, and there was considerable flexibility to adjust within fairly broad budget categories. Close coordination between operations and budgeting officials enabled this approach to work well when DOE was producing hundreds of new weapons per year, and this demanding but fairly predictable workload provided the momentum for driving a cycle of work on new designs, testing, and manufacturing.

Effectiveness and efficiency have been undermined as the budget structure has become more detailed and the control of the budget has been dispersed across many NNSA headquarters' organizations. No doubt this provides a degree of control for NNSA offices, but it also creates a high degree of complexity for managers at all levels. The result is increased delay and bureaucratic friction, and reduced programmatic and operational flexibility.[21] The combination of detailed budgeting, diffused responsibility, and poor communications practically guarantees wasteful execution. Today there are thirteen Deputy and Associate NNSA Administrators with mission and mission-support functions. These offices are responsible for eighty-two congressional budget items, and they issue hundreds of more detailed budget reporting lines to the sites. (LANL reported that NNSA funds are provided with over 500 budget reporting lines and associated milestones; Pantex reported its number is 225. Other sites have comparable numbers.) If one believes in the adage, "the government is what it funds," then the NNSA is a collection of hundreds of weakly integrated projects.[22] The overlay of confused roles and responsibilities, in combination with highly detailed budgets, begets inefficient and ineffective mission execution.

Those in the field report that they often must act to integrate funding across the resource owners in NNSA. In many cases, sites are unable to focus resources on the enterprise's priorities because the budget and reporting lines are too detailed and they do not have the ability to move resources to where they are needed to meet those priorities; headquarters program managers will penalize them if they try or it may require a Congressional reprogramming. For example, one site was provided all the funding needed for a task within Directed Stockpile Work, but the site received only 75 percent of the funding needed to meet that task's associated security requirements. Indeed, in the case of Directed Stockpile Work, NNSA has some 1,000 budget

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[21] National Academy of Public Administration, *Positioning DOE's Lab's for the Future: A Review of DOE's Management of Oversight of the National Laboratories* (Washington, DC: National Academy of Public Administration, 2013).

[22] The site-specific impact of this is highlighted by other sources. "The budgetary controls that have led to the creation of thousands of 'funding buckets' significantly reduce the labs' flexibility; creates excessive administrative costs and burdensome reporting requirements; and impedes mission accomplishment." *Ibid.*, 27; see also National Research Council, *Managing for High-Quality Science and Engineering at the NNSA National Security Laboratories* (Washington, DC: The National Academies Press, 2013), 4.

reporting lines. Budgetary inconsistencies such as this lead to substantial delays and undermine efficient mission execution.

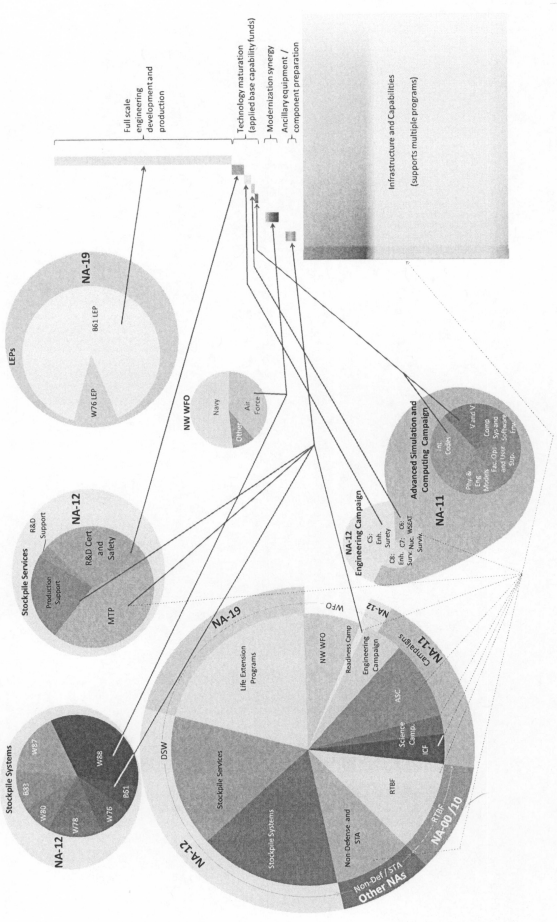
An example of the implications for program execution are illustrated in Figure 1. In FY13, B61-12 LEP work at Sandia was funded by more than twenty NNSA funding sources. Control of this funding is spread over numerous headquarters offices, and every budget category has several headquarters proponents involved in every decision related to that specific category. Managing funding at this level of detail creates major coordination demands: given the lead times associated with government budget cycles, the integration of resources across budget categories needs to be planned and allocated about a year in advance, and continual adjustments are necessary to integrate program needs and funding throughout program execution.

F. Insufficient Authorities for Warhead Life Extension Program Managers

In effective organizations, the program manager controls the funds and staffs necessary to deliver on program commitments safely, on-time, on-cost, and in an environmentally responsible fashion. The program manager is accountable. The role of the mission-support staffs is to provide the support to line managers needed to assure that this is done. This model is not in place today within the NNSA. Warhead life extension program managers lack authorities and resource control; they serve as weak coordinators with no direct authority over the resources or personnel necessary to execute their programs.

Consider, for example, the question of who *has responsibility for* the B61 Life Extension Program (LEP). At the technical level, there is a well-defined set of responsibilities and accountability for managing individual LEPs, and a well-defined process—the 6.X process—that guides LEP development and production:

- The director of the laboratory responsible for the B61 physics package, in this case Los Alamos, is responsible for managing activities to generate engineering design information for the nuclear explosive package. This involves close coordination with Y-12 for secondary design and subsequent delivery to Pantex.
- The Director of Sandia is responsible for managing the non-nuclear component design, development, and testing and for integrating the nuclear explosive package and non-nuclear components into the bomb. This involves close coordination with component production activity at Sandia and Kansas City, and delivery of data and products to Pantex for assembly. For the B61 LEP, Sandia is also responsible for technically integrating the bomb with the DOD-provided bomb tail-kit assembly.



Source: Sandia Briefing to the National Security Enterprise Panel.

Figure 1. NNSA Organizations Controlling Budgets for B61-12 Work at Sandia

The shortfall in the current system is that there is no overall program manager to synchronize the full range of needed work across all the involved sites. The program manager must have the authority, staff, and resources necessary not only to ensure the labs and plants engage productively on the technical work, but also to ensure needed facility investments and ES&H approvals and permits are in place; and to re-allocate resources across activities and sites to keep a program moving. Whereas in a program-driven budget structure, the bulk of funding would flow through the responsible program offices, in NNSA a high proportion of funding control rests in mission support areas, each with a set of responsible managers and proponents whose objectives may not be aligned with those of the program manager.[23] As a result of the detailed budget allocations and dispersed control, program managers lack needed authority and mission-support staffs have substantial influence over resource decisions, independent of the line program managers. Execution requires program managers and field personnel to spend an inordinate amount of time negotiating transfers among NNSA stakeholders or to seek reprogramming authority from Congress. Lacking an empowered and accountable program manager, customers cannot have confidence in proposed plans or the ability to execute according to the plan.

G. Absence of Trusted Cost and Resource Analysis

A capability for independent cost estimates for major acquisition programs, coupled with a disciplined cost reporting system, is essential to effective program scoping and initiation, resource planning, source selection, and contract oversight and management. NNSA lacks expertise, data, and tools for independent costing, requirements evaluation, and program planning. Initial cost estimates for major NNSA programs have been found to be off not by 20–30 percent but by factors of nearly two to six:

- B61 LEP: An initial estimate (2010) assumed that the cost would be comparable to that of the W76 LEP in the range of $4 billion. However, lab experts, when engaged by NNSA, concluded that the B61 LEP would be much more complex than the W76. When the final B61 LEP cost report was completed, the estimate rose to $8 billion. DOD's Cost Assessment and Program Evaluation (CAPE) reviewed the program; it estimates the cost at over $10 billion. This estimate reflects still-unresolved differences between CAPE and NNSA on the timeline for LEP completion.
- Los Alamos plutonium facility (the Chemistry and Metallurgy Research Replacement, or CMRR): An initial estimate (2005) placed the ceiling at $975 million; by 2010 this

[23] For example, in the 2015 Budget Request the bulk of weapons activities funding can be found in three major categories (Directed Stockpile Work ($2.7 billion), Campaigns ($1.7 billion), Readiness in Technical Base and Facilities ($2.4 billion)).

ceiling had risen to $5.8 billion, with a three to seven year delay. Now, the project is being deferred five years, and the design is being reconsidered.

- Y-12 highly enriched uranium processing facility (UPF): An initial estimate (2004) placed the maximum at $1.1 billion; this was raised to $3.5 billion (2007), and then to $6.5 billion (2010). An independent review by the Army Corps of Engineers placed the maximum cost at $7.5 billion (2011). Recently discovered design flaws (the ceiling is too low) add an additional $0.5 billion. Now, the project is being delayed and the design is being reconsidered.
- Savannah River plutonium disposition facility (the Mixed-Oxide Fuel Fabrication Facility, or MOX): DOE approved a cost estimate of $4.8 billion (2007) and start of operations in September 2016. Although construction began in August 2007, NNSA subsequently increased the estimate to $7.7 billion (2012) with the start of operations delayed to November 2019. Now the project is in a strategic pause as DOE evaluates other options for plutonium disposition.

NNSA's poor track record of planning for and estimating the costs of these and other major projects is a major source of dissatisfaction among the national leadership and customers, and further undermines NNSA's credibility. Both NNSA and DOE are engaged in initiatives to create needed independent cost estimating capabilities, including the development of the requisite staffs, tools, and data. Success with these initiatives will help repair its damaged credibility, and will be an essential precondition for NNSA to regain trust with its critics.

H. Absence of Proven Practices for Project Management

Proven practices for project management have not been adopted. Program and project management is not supported at the staffing and funding levels that the private sector and other agencies have demonstrated are necessary to assure success, especially in the field, for the duration of major projects. Funding levels for reserves and contingencies are not even close to levels that have been demonstrated as necessary for major projects, especially recognizing the unique technical nature of many of the NNSA's projects. When projects or programs proceed from *design* stages to *production* stages, there is not adequate configuration control of designs and too many unnecessary subsequent changes are allowed.

The management practices for infrastructure upgrades and major facilities construction are also problematic. DOE's guidance for such projects is contained in DOE Order 413, which aligns with the management practices prescribed in OMB Circular A-11 for Capital Acquisition projects.[24] However, Order 413 is offered and viewed as *guidance* and not as required practice,

[24] Office of Management and Budget (OMB), *Preparation, Submission, and Execution of the Budget*, Circular A-11 (Washington, DC: Executive Office of the President, July 2013)

so adherence and enforcement are weak. For instance, rigorous planning processes at the front end of a project, such as Analyses of Alternatives, are lacking. Circular A-11 covers everything from roles and functions to legal framework to the actual transmission of White House policy in the budgeting process. OMB requires agencies to establish a disciplined capital programming process that addresses project prioritization between new assets and maintenance of existing assets; risk management and cost estimating to improve the accuracy of cost, schedule and performance provided to management; and the other difficult challenges posed by asset management and acquisition. In establishing its Acquisition and Project Management Office, NNSA is trying to bring such discipline to NNSA project management.

I. Shortfalls in Facilities and Infrastructure Modernization

The enterprise is failing to plan for, fund, and execute required nuclear facilities and infrastructure modernization. Aside from the needed capital investments in major nuclear facilities, touched on in the preceding section, there is an ongoing need to maintain, upgrade, and modernize facilities across the operational sites. The enterprise comprises: 2,160 square miles (including 8,000,000 feet of fencing and 2,540 total lane miles of paved road)—roughly the size of Delaware. It includes approximately 3,800 facilities. About 54 percent are over forty years old, 29 percent are over sixty years old, and 12 percent are no longer in use.

While customers of the enterprise widely recognize the need to recapitalize the enterprise's equipment and facilities, investments in infrastructure do not receive the same priority as program work. The enterprise's deferred maintenance, along with long-delayed capital construction projects, are looming problems. Current estimates place immediate deferred maintenance requirements at $3.5 billion. Throughout the enterprise, the panel heard evidence of failing infrastructure, lack of sufficient funding, and no clear path forward. Examples include

- the Microelectronics Lab (tool failure leads to risks in the LEP/Alteration schedule and cost);
- Tonopah Test Range (equipment issues and potential failure pose a risk to the B61-12 schedule and cost);
- Weapons Evaluation Test Laboratory (centrifuge failure risks impact on surveillance program); and
- the Perimeter Intrusion Detection and Assessment System (PIDAS) at Pantex needs updating. (Effective security at Pantex is essential for all stockpile work.) [25]

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[25] The current plan is estimated to cost about $350 million, which would replace and modernize PIDAS in Zones 4 and 12. Pantex's original plan called for an option costing $1 billion or more, but they modified the design and substantially lowered the cost.

One root problem is a lack of a capital budgeting process for systematically planning and funding investments within NNSA. No successful U.S. private sector company would seek to operate without a capital budgeting process. A second problem is the unreliability of NNSA cost estimates, as discussed previously. One workaround used for modernizing infrastructure that DOE/NNSA might consider more often is private, third-party financing for new facilities that are operated under long-term leases. This approach was employed to acquire the new production facility for the Kansas City Plant and two new office buildings at the Y-12 site.

J. Poor Communications

NNSA's leadership is not communicating effectively—with national leaders, its customers, or internally. Among staffers and Members of Congress, NNSA has lost credibility, undermining efforts to provide a coherent enterprise-wide message. Staffers choose to,or are driven to, engage a number of sources throughout the enterprise to obtain accurate information about programs and issues; they have cited a need to always *pull*, because there is no effort by the NNSA to *push* requisite information. They also indicate that the story is often inconsistent from one source to the next. Staff members in the Executive Branch shared similar concerns. In addition, interlocutors on Capitol Hill and inside DOE indicated that leaders in the field, including M&O leadership, have engaged directly with Members of Congress, without coordination with headquarters. Staffers and Members also indicate they have been surprised during formal hearings with new information about cost projections and budget requirements.

Within the NNSA, there is clear evidence of communication gaps, both upward and (especially) downward. People in the field spoke of the length of time required to obtain an answer from headquarters. Headquarters staffs spoke of difficulties caused when field staff have not shared information or have circumvented headquarters with needed information. Such poor communication up and down the chain is contrary to benchmarking examples in which well-run organizations highlight the importance of quickly reporting bad news to higher authorities, without running the risk of retribution. High performing organizations enforce discipline in effective communications; if there is a penalty, it occurs when a subordinate fails to report bad news.

Customers spoke of needing to go directly to field staff to obtain answers on program status instead of hearing it from NNSA headquarters, and field personnel spoke of needing to hear about requirements directly from customers instead of from headquarters. Field staff also noted instances when headquarters reached down to the working level, circumventing the field managers, to provide instruction on what it wanted done, with little regard or appreciation for the implications that such direction would have for the overall program.

For the enterprise workforce, there is a need to clearly communicate mission and objectives, to include how enterprise missions are knit together around a central nexus of national security. A recent in-person visit by a key NNSA leader to a number of field sites was

described as the first time in many years any leader of such stature had made time to visit worksites and talk to rank-and-file workers.

4. Dysfunctional Relationship between Government and Management and Operating (M&O) Partners

Strong industrial and academic partners and a healthy working relationship are vital to the success of the nuclear security enterprise. There is concern across the NNSA complex that the needed relationships have eroded over the years, and have become more of an arm's length contracting relationship than the needed partnership.

In effective organizations, the government sponsor decides *what* is needed and the M&O partner, in particular the Federally Funded Research and Development Center, decides *how* to meet that need. This theory of respective roles and responsibilities is summarized in Table 3. Put in the simplest terms, the government should identify the work to be done; identify the best performer to do the work; provide adequate resources; and hold the performer accountable. Under this construct, a competent M&O partner is relied upon to provide the expertise, corporate culture and leadership sufficient to execute the work, and meet the government's operating standards.

Changes in mission priorities, performance expectations, and cultures have worked to erode the partnership between the government and its M&O contractors established during the Cold War. After the Berlin Wall fell on November 9, 1989, mission priorities underwent major transformation, while in parallel the nation's demands in the areas of environmental management, workplace health and safety, and security grew significantly.[26] Two actions that profoundly affected the nuclear enterprise were President George H.W. Bush's decisions in 1992 to stop producing new nuclear weapons and to suspend underground nuclear testing. These actions ceased the well-established weapons complex product delivery cycle of design-test-build that had organized work throughout the Cold War. In the early 1990s, the DOE identified Science Based Stockpile Stewardship as the strategy for sustaining the reliability and safety of the nuclear warheads, while simultaneously sustaining weapons research and development through investments in key stewardship capabilities, including advanced computing, fusion

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[26] In response to growing public concern over environmental hazards and nuclear safety (Three Mile Island occurred in March, 1979; Chernobyl occurred in April, 1986), significant actions were taken to tighten the regulation of weapons complex facilities and operations. Congress established the Defense Nuclear Facilities Safety Board (DNFSB) in 1988. The board was created to provide an independent observer and advisor on nuclear facilities safety. Admiral James Watkins became the Secretary of Energy in March 1989. In June of that year, Watkins announced the Ten-Point Plan to strengthen environmental protection and waste management activities at the U. S. Department of Energy's production, research, and testing facilities. Included in the plan was the creation of "Tiger Teams" to identify possible environment problems and violations across the DOE complex. Watkins also modified contracts to provide stronger incentives to address ES&H matters. On November 9, 1989, Watkins established the Office of Environmental Restoration and Waste Management. The joint FBI-EPA raid on the Rocky Flats plutonium facility in June of that year was perhaps the most publicly visible demonstration of the shift in focus.

research, materials properties research, and non-nuclear component testing. But the weapons production complex was allowed to deteriorate to the point where today's NNSA is carrying out warhead life extension work at facilities that were commissioned shortly after the Manhattan project.

Table 3. Roles and Responsibilities

Government	M&O Partner
• Selects M&Os • Assigns tasks; Sets standards – Mission deliverables – Operating standards for ES&H, Security, other functions • Provides resources • Accepts deliverables – Also, validates practices are consistent with operating standards • Holds M&O accountable – Incentives: fee, contract extension, future tasks and resources assigned • Acts as landlord – Provides for the weapons complex facilities and infrastructure – Holds permits and owns the associated facilities and infrastructure risks • Ultimately owns the overall risk	• Provides for management and capabilities for executing national security enterprise tasks • Advises government sponsors in the areas of its expertise • Applies corporate leadership, culture, processes, and discipline to ensure efficient operations – Validates that corporate management practices meet functional standards (ES&H, Security, Finance, Human Capital, etc.) • Executes tasks and delivers – Science, Engineering, Manufacturing • Stands accountable for performance and designated operational risks

The changes in mission priorities from design and production to stewardship, and heightened regulatory oversight, overturned accepted priorities within the nuclear weapons program and radically altered the well-understood relationships between line managers and mission-support functions within the government as well as between the government and the M&O contractors. In the view of one long-tenured laboratory leader: "Historically the job was to accomplish the mission safely and securely. Beginning with Secretary Watkins' Tiger Teams, the job began to change to 'Make sure nothing bad ever happens'—with little regard to the ability to accomplish NNSA's missions."

The resulting tension in defining the roles of the M&O contractors and the Federal mission-support officials has created significant friction in the government-M&O relationships, especially at the laboratories. This friction has been exacerbated by the more recent transition to for-profit M&O contractors at the laboratories, leading to a heightened, if incorrect, perception on the part of Federal personnel that the M&Os are driven by profit first and national service second. As a result, DOE/NNSA has increasingly moved toward detailed direction and regulation of the M&Os.

A 2012 National Resource Council of the National Academies study concluded there is little trust in the relationship between the laboratories and NNSA. NNSA has lost confidence in the ability of the laboratories to "maintain operation goals such as safety, security, environmental responsibility and fiscal integrity."[27] The panel finds that this lack of trust is manifested in three ways: NNSA's use of increasingly inflexible budgets and milestones to control work at the operating sites, the continued reliance on transactional regulation and oversight to enforce behavior, and the exclusion of M&O executives from NNSA headquarters deliberations in setting strategic direction. This management approach is costly, unwieldy, and counterproductive as further discussed in sub-section D. It creates a high degree of management complexity, puts detailed decisions in the hands of headquarters personnel who lack a complete understanding of field operations or technical requirements, undermines accountability, creates incentives to focus attention on administrative matters over program substance, and incurs excessive costs in administering the relationship.

A. Breakdown of the Federally Funded Research and Development Center (FFRDC) Model

The FFRDC model for the NNSA labs has been lost. Historically, the Federally Funded Research and Development Centers—the laboratories—have played a key strategic role as *trusted advisors* in informing the government regarding effective execution of the mission. The historic, statutorily-defined relationship between the FFRDC and its sponsor includes[28]

- Comprehensive knowledge of sponsor needs—the mission, culture, expertise, and institutional memory regarding issues of enduring concern to the sponsor
- Adaptability—the ability to respond to emerging needs of their sponsors and anticipate future critical issues
- Objectivity—the ability to produce thorough, independent analyses to address complex technical and analytical problems
- Freedom from conflicts of interest and dedication to the public interest—independence from commercial, shareholder, political, or other associations
- Long-term continuity—uninterrupted, consistent support based on a continuing relationship

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[27] National Research Council, *Managing for High-Quality Science and Engineering at the NNSA National Security Laboratories*, 5.

[28] Source: Defense Acquisition University.

- Broad access to sensitive government and commercial proprietary information—absence of institutional interests that could lead to misuse of information or cause contractor reluctance to provide such information
- Quick response capability—the ability to offer short-term assistance to help sponsors meet urgent and high-priority requirements

The benefit is that an FFRDC can function as an independent, trusted advisor and honest broker. The FFRDC is answerable only to the government customer and has no vested interest in particular technologies or solutions.

The transition to for-profit contractors, combined with laboratory competition to increase their work for other agencies, has called into question the assumptions regarding their objectivity and the primacy of the public interest in their operations. Consequently, the FFRDC role has increasingly been replaced by one whereby the laboratories are perceived as *contractors* rather than as *partners* who are relied upon to help resolve issues and successfully deliver the mission. Laboratory Directors expressed their central challenge as the lack of any forum for *strategic dialogue* between NNSA leadership and their labs.[29] Indeed, one executive reported that his team learned about the site's FY14 budget through the trade press, rather than from NNSA headquarters.

B. Blurred Responsibility for Risk

Ambiguous relationships blur the responsibility for risk at the operating sites. The panel finds that the respective roles and responsibilities of the government and M&O contractors are not consistently and clearly stated or understood. Rather, they are unique to each site and evidently have emerged over time from the cumulative interactions of government and M&O personnel. Indeed, the panel has been told many times that the relationships between the M&Os and government personnel can vary from site to site and from issue to issue, depending largely on the personalities involved. While a certain degree of difference across sites is understandable, there is a need for leadership to impose consistent policies and procedures across the enterprise. The panel recognizes that NNSA's new Infrastructure and Operations Office is trying to achieve greater consistency in procedures across the enterprise, but its integration with other policy and program offices remains unclear.

Ambiguity is pronounced when it comes to the fundamental question, "Who owns the risk?" In the case of the Kansas City Plant, for example, the Field Office and Plant manager

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[29] The laboratory leadership views were expressed in the "Tri-Lab Letter," which provides their characterization of the degraded relationship and recommended changes. See Penrose C Albright, Charles F. McMillan, and Paul J. Hommert, "The Model for the National Nuclear Security Administration and its Laboratories: Recommendations for Moving Forward" (April 17, 2012).

stated unequivocally that they co-owned the risk. At the Savannah River Site, the contractor has taken ownership of the risk and conducts routine internal management reviews to find the right balance in the operation of its activities. Generally, multiple individuals in the government and the M&O contractor will lay claim to owning the risk, but the sense of responsibility and explanations differ from site to site. Additionally, there is no mechanism for integrated decision making with respect to enterprise-wide risks.

C. Costly and Ineffective Transactional Oversight

Transactional oversight is expensive and counterproductive.[30] From the perspective of the field looking up at headquarters, the effect of NNSA's ever-changing organizational structure is layered oversight, created by the rise of unaligned and confusing mission-support staffs. The operating entities of the enterprise face a phalanx of oversight agencies, exacerbated in part by the flawed DOE/NNSA governance structure discussed earlier. The result is uncoordinated efforts to address the mission's safety and security and environmental stewardship without regard to effectiveness, cost, schedule, risk, or mission impact. In turn, the view from headquarters looking down to the field shows a complex, dispersed set of sites, each with its own constituencies and agendas. Its current configuration raises the inevitable question: what is the appropriate future organizational structure (to include infrastructure capacity) for the enterprise?

Excessive and uncoordinated inspections, audits and data calls fuel inefficiencies and generate little value added; in fact, they may detract from the desired safety or security outcome. Under the current system, elements in the field are subject to review of their programs by Federal Field Office staffs; NNSA functional staffs; DOE's Health, Safety, and Security office; the DOE Inspector General; the DNFSB; and OSHA. At Sandia in FY13, for example, there were seventy-eight external audits. There also were four Work for Others (WFO) external audits conducted with overlapping scopes. In FY12, there were eighteen reports by the Government Accountability Office or DOE Inspector General; in FY13 the number rose to twenty-nine. This is in addition to approximately thirty internal audits. At Y-12, the Uranium Processing Facility project averages three external reviews per month. These audits, reviews and assessments all consume time and energy to prepare for, conduct, and then follow up on any actions.

When asked why a person holding line responsibility can't say no to these external reviews, the reply was "many of these are mandated by Congress, so we cannot push back. There is no

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[30] As described by one former laboratory director, "Transactional oversight entails setting precise steps to be followed and examining implementation of each step with more than 100 Federal employees at each site and hundreds of external audits annually. By its very nature, this process is extremely conservative, risk-averse, and avoids appropriate cost-benefit considerations." George H. Miller, Director Emeritus, Lawrence Livermore National Laboratory, "Opening Remarks and Summary," Hearing of the Armed Services Committee Strategic Forces Subcommittee, U.S. House of Representatives (February 16, 2012), 2, accessed April 3, 2014, http://armedservices.house.gov/index.cfm/files/serve?File_id=619ff080-e877-43f6-918f-66be678ef721.

gatekeeper of these reviews." There are also multiple and duplicative inspections and data calls. This multiplicity of inspectors and overseers is not rationalized or synchronized. There is insufficient integration of findings to determine the overall impact on mission or risk acceptance.

Witnesses note that the focus on compliance checklists can actually divert attention from the substance of safe and secure mission performance. The Y-12 security incident illustrates this problem. In this case, the security contractor was highly rated by DOE just prior to the incident in which an octogenarian nun and several activists penetrated the security barrier. The contractor had met the compliance criteria, but that did not ensure the facility was secure, and long-standing complacency regarding false and nuisance security alarms along the perimeter fencing led to what can at best be described as a poor response. A major security review had been undertaken shortly before this incident, yielding a clean bill of health at the site. In the case of the Uranium Processing Facility (again at Y-12), none of the many external reviews uncovered a major design flaw (the building height is too low to accommodate needed equipment), which is now being fixed. Hence, multiple layers of process cannot ensure zero risk and high confidence in mission performance. Indeed, such activities can generate late changes in requirements that are costly and excessive. In another case, the panel was told of a requirement that LLNL purchase large safes to store small arms (22 caliber) ammunition, but these were then located within a vaulted space where tens of kilograms of high explosives were handled routinely, which would appear to be an illogical decision.

Evidence of the high costs of transactional regulation and oversight is provided by the gains achieved from the successful reform of regulation at the Kansas City Plant. Beginning in 2005, DOE exempted the Kansas City Plant from DOE orders in areas where there were relevant commercial or industrial standards. The reforms moved the Kansas City Plant under industrial best practice standards (e.g., International Organization for Standardization (ISO) standards) with validation from external expert bodies. Kansas City Plant officials estimate that this initiative reduced the DOE-specific regulatory requirements on the facility by about 55 percent. These changes, coupled with internal business process improvements, have generated steady increases in workplace performance along with reduced mission-support costs. The plant reports that its safety record has improved under the reformed regulatory regime, and is about six times better than U.S. industry averages.[31] A 2008 independent audit following the reforms estimated

[31] In 2012, the total reportable cases of workplace injuries for the Kansas City Plant were .4, for the weapons complex .9, and for U.S. industry 2.4. (Total reportable case rate = cases per 100 full-time employee work years (200,000 work hours)).

an overall personnel savings of about 12 percent.[32] In parallel, the NNSA site office was able to reduce its staff by 20 percent, from fifty to forty staff.

An internal NNSA Enterprise Re-Engineering Team concluded that the "Kansas City model" of relying on applicable industrial standards could be much more widely applied for non-nuclear functions within the enterprise, and targeted an initial expansion for Sandia and the Nevada National Security Site. However, initiatives to adopt elements of the "Kansas City model" at these sites have thus far been denied by DOE/NNSA headquarters staff. Nonetheless, this remains a significant governance reform opportunity.

D. Misguided Contract Incentives

Contract incentives reinforce the transactional nature of the relationship and undermine the FFRDC partnership with the NNSA laboratories. Significant award fees combined with mission-support-oriented performance evaluation criteria are troublesome in that they reinforce DOE/NNSA's emphasis both at headquarters and in the field on functional compliance and not mission performance.

Contractual arrangements also can limit the contributions of the M&O contractor parent organizations. At some sites, the parent organization is exerting a strong influence: the Kansas City Plant offers an example in which the parent company is aggressively driving a proven corporate culture into the workplace. However, several issues that have hindered the broader realization of these objectives need to be considered in clarifying future roles: First, in the limited liability corporation (LLC) model, the winning team brings an executive management team to the role of the M&O contract, but the existing workforce stays in place to perform the work while the senior executives come from and frequently rotate back to their parent companies after a few years. The LLC teaming approach can limit the influence of corporate culture if there is no dominant culture within the multi-company construct. Second, fully exploiting reach-back to the large parent companies that comprise the LLC, a purported benefit of the LLC contracting approach, frequently cannot be pursued due to conflicts of interest or restrictions embedded in the contract itself. At the same time, even without contract constraints, there is limited evidence of LLC partners exploiting their corporate reach-back potential to improve operations at the sites. Third, the ability of an LLC partner to contribute its culture and practices is contingent on how closely its core competencies parallel the needs of the laboratory or production plant. Industrial best practices and the *business* of large contractors often do not translate into the operations of a national weapons laboratory.

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[32] J.W. Bibler and Associates, "Kansas City Site Office Oversight Plan: Assessment of Implementation Cost Savings" (January 2008). More recently, the plant management reported to the panel that the headcount of ES&H specialists in the M&O was reduced by 81 percent (between 1995 and 2012)

Last, and most important, performance evaluation criteria that focus incentives on compliance do little to encourage building a strong M&O leadership team. The recent transition to Strategic Performance Evaluation Plans could help catalyze the shift away from transactional oversight, but this transition will require a sweeping cultural change at NNSA and its Field Offices and a redesign of the weighting of the performance objectives to better capture M&O contributions to mission priorities.

It is clear that the recent acting NNSA Administrator recognized the problems with the government-M&O relationships. He has been working to clarify roles and responsibilities, focusing on the relationships among the NNSA Administrator, the Field Office Managers, and the M&O executives. In the field, there is evidence of improved communication and collaboration between the M&Os and the NNSA Field Offices, especially at the plants. They have demonstrated a willingness to share information and otherwise communicate and collaborate, embracing the concept that they are a team ultimately working toward the same purpose. Much more attention to clarifying and managing these relationships will be needed.

5. Insufficient Collaboration with Customers

The panel examined the relationships between NNSA and weapons customers in DOD, as well as other customers in DOD, Department of State, Department of Homeland Security, and the Intelligence Community. The most serious collaboration issues are with the DOD weapons customers. On the whole, other customers who currently are working with the NNSA laboratories and plants say they are satisfied. Even here, however, detailed oversight of transactions impedes partnerships; a more strategic collaborative approach could strengthen capabilities and improve the services provided.

Collaboration between NNSA and the weapons customers in DOD occurs primarily through the Joint DOD-DOE/NNSA Nuclear Weapons Council, its subordinate Standing and Safety Committee and staff "action officer" working groups, as well as through the Project Officer Groups responsible for each type of nuclear weapon in the inventory.[33] These are deliberative or advisory bodies with no formal decision-making authority.

The DOE/NNSA-DOD relationship has been significantly stressed over the past several years, due largely to failed attempts to converge on a plan for modernizing nuclear weapons and nuclear facilities. Within the past two years, at the behest of the Chairman of the Nuclear Weapons Council and under the leadership of U.S. Strategic Command, the DOD has produced the "3+2 Strategy," outlining DOD's warhead and delivery platform needs over the next three decades and the NNSA infrastructure required to support DOD's needs.[34] The Nuclear Weapons Council has vetted and endorsed the conceptual underpinnings of this approach, but agreement on the details remains elusive within DOD as well as between NNSA and DOD. Furthermore, it is important to note that the agreement on the conceptual underpinnings does not dictate decisions in the budget processes of the two departments.

The stress in the DOE/NNSA-DOD relationship reflects the ongoing give-and-take in determining an affordable mix of programs for modernizing delivery platforms, nuclear weapons, and nuclear infrastructure and for synchronizing the delivery of these capabilities over

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[33] The USD(AT&L) is the chairman of the Nuclear Weapons Council. The other four members are: Vice Chairman, Joint Chiefs of Staff, Undersecretary of Defense (Policy), Commander, USSTRATCOM, and Under Secretary for Nuclear Security of the Department of Energy (Administrator, NNSA). The Services and other staffs are invited to participate as observers.

[34] "3+2" is a concept that outlines the types and timing for the warheads required in the stockpile over the next three decades, in accordance with current policy guidance. It seeks to synchronize the necessary life-extension programs with the planned delivery platform recapitalization efforts. It also seeks to describe the reduction of warhead types via consolidation and retirements thereby making the management of the stockpile more efficient. The concept, if and when it is fully realized, will narrow the number of warhead types to "3" for ballistic missile delivery systems and "2" for air-delivered delivery systems.

the coming decades. The efforts to converge on the needed plan will continue: statements in the DOD's FY15 budget submission and in the *Quadrennial Defense Review* describe the DOD commitment to invest in modernizing its delivery platforms, nuclear weapons, and supporting infrastructure "in collaboration with the Department of Energy."[35] Many DOD witnesses have expressed frustration with the lack of progress, and have suggested to the panel that the Nuclear Weapons Council mechanism should be strengthened to drive the needed convergence between DOD and DOE/NNSA on mission priorities and resource plans. Other witnesses have countered that these mechanisms work well for their intended purposes.

While there is commitment to progress among all parties, several specific issues remain to be addressed.

A. Lack of Effective Joint Planning and Budget Coordination

Although there is currently some agreement between DOD and DOE/NNSA on the long-term concept for modernizing the stockpile, they have not converged on a long-term resource plan, nor have they converged on near-term mission and budget priorities. There remain fundamental differences in views on the appropriate composition of the weapon life extension program and the timing of deliverables. Additionally, coordination suffers from the departments' differing resource management systems, the lack of joint program reviews, and the lack of coordination in the timing of their budget submissions. Lastly, their coordination mechanism—the Nuclear Weapons Council—lacks enforcement authority for the agreements reached within its deliberations.

There are also significant process issues that need to be addressed. The Nuclear Weapons Council process has been unable to achieve the integrated teamwork and staffing required before decisions are prepared for Council meetings, despite many attempts at establishing disciplined staff processes and follow up. Representatives of customer organizations designated to facilitate communication with the NNSA testify that they often are unable to obtain consistent answers from their NNSA counterparts, prior to briefings at the Nuclear Weapons Council.

B. Lack of Information-Sharing and Trust

NNSA's unreliable planning and cost estimating, combined with its lack of openness, has engendered significant distrust within the DOD. Beginning in 2010, the DOD has worked with DOE/NNSA to transfer funds from DOD's proposed budget to the NNSA account for weapons activities essential for sustaining deterrence capabilities—including LEPs, stockpile surveillance, Chemical and Metallurgy Research Replacement (CMRR), and UPF.

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[35] DOD, *2014 Quadrennial Defense Review, p. 32.*

NNSA and DOD staffs spent much of 2012 working to achieve a common resource plan for the enterprise that would be geared to meeting DOD's needs. This effort led to a tentative agreement in early 2013 on an NNSA program and budget that would be in line with the "3+2 Strategy," and DOD agreed to contribute additional funding to execute the program in FY14. In total, DOD has agreed to transfers of nearly $12 billion over multiple years in budget authority to DOE.

During this period, a series of NNSA budget shortfalls were reported. These resulted most significantly from significant cost growth in the DOE programs. Other contributing factors included reductions in the overall NNSA budget—due to Continuing Resolutions, congressional marks, the Budget Control Act, and the effects of sequestration.

DOD has been frustrated by these continuing shortfalls, delays in agreed-upon programs, and requests for additional funding. DOD officials also have been frustrated by the limited budget and cost information provided by DOE/NNSA, and they have pressed for information on budgeting and program management processes in order to track the execution of the transferred funds. A satisfactory degree of visibility has not been achieved. Although these transfers were included in the President's Budget, visibility of the funds was lost during the Congressional appropriations process. It appears the net effect of the *transfer* is that DOE budgets have increased by less than the amount by which DOD budgets have decreased.

The cycle of DOD-NNSA engagement continues through the Nuclear Weapons Council, with additional attempts to reach convergence on realistic program and infrastructure plans that can guide NNSA budgets. There remain significant procedural issues that will need to be resolved to repair this relationship. Considerable work remains to be done: the Nuclear Weapons Council has a central role to play in creating an executable plan for the future stockpile agreed on by the two departments. This responsibility will require an orderly process for the Nuclear Weapons Council's working groups to serve its principals and greater transparency between the two departments.

C. Unnecessarily Complex Processes for Interagency Work

Beyond DOD, the enterprise has many other customers from across the government, such as the Intelligence Community, Department of State, and the Department of Homeland Security, who make use of the organic science and technology (S&T) capabilities of the NNSA's national security laboratories. The customer provides the funds needed to accomplish a mutually agreed program of work on an agreed schedule. This program has been called Work for Others (WFO) and is transitioning to a new name, Interagency Work (IW). The growth in IW demonstrates that the three NNSA laboratories have transitioned from strictly nuclear weapons labs to nuclear national security labs, as reflected in the *Strategic Posture Commission Report*.

While the descriptions of Interagency Work convey the impression that this work is done on the margin, or is an ancillary duty for operational sites, this work in fact has become essential

to the enduring science and technology base that supports the weapons program. Conversely, this important work would not be possible without the long-standing and substantial investments of the nuclear weapons program. As the three lab directors argued in their April 2012 letter on governance issues, the IW is "an essential element" in sustaining the nuclear weapons mission because it helps attract high-quality personnel, keeps them scientifically sharp, and helps provide stability for the enterprise.[36] The IW efforts have yielded breakthrough developments in combatting improvised explosive devices, weapons of mass destruction (WMD) detection technologies, and advanced conventional munitions. IW has also served to nurture and hone capabilities synergistic to the weapons program in areas such as weapons design, materials science and radiation hardening technologies to enhance survivability. These contributions to national security technology are also important for hiring and developing needed talent.

In the main, these other customers are pleased with the quality of science and engineering, and the final product, they receive from the enterprise. The 2010 establishment of the Mission Executive Council (MEC), via four-party Governance Charter by the Secretaries of Energy, Defense, Homeland Security, and the Director of National Intelligence, is intended to facilitate interagency collaboration on long-term planning and investment in the enterprise's skillsets. The MEC provides a forum for coordinating shared, long-term planning for the critical, and often unique, capabilities resident in the DOE National Laboratories (not just NNSA laboratories) that are of cross-cutting strategic national security interest. The MEC, however, has not yet fulfilled its promise to (1) identify unique capabilities at the laboratories that are at risk as a result of reduced support to the weapons programs, and (2) formulate a multi-agency strategic plan to sustain those capabilities so that they are available when DOD and other agencies need them in advancing the nation's security.

Given the overall success of the interagency projects, the panel did not focus deeply on the enterprise's relationships with its interagency customers. Nevertheless, experts identified several issues for the panel's consideration. One is the tactical approach taken by many customers: much of this work for external sponsors is accomplished using annual task orders with no long-term commitment. There is also a range of areas where working relationships could be simplified and improved:

- Interagency tasks are typically quite small and each laboratory manages hundreds of such tasks. (For example, LLNL reported it manages about 800 interagency tasks, many providing a few tens of thousands of dollars in support.)

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[36] Albright, McMillen, and Hommert, "The Model for the National Nuclear Security Administration and its Laboratories: Recommendations for Moving Forward," p. 1.

- Approval processes are needlessly cumbersome. Tasks are reviewed and approved individually. Even small, routine contracts require multiple levels of approval and can take weeks.
- Delays are not uncommon in the movement of funds from sponsors to the labs. In some cases, technical efforts may be put on hold pending arrival of funds.
- Year-to-year uncertainty in funding makes it difficult to forecast demand and manage professional staffs.
- Recapitalization of scientific and other physical capital is not addressed. While external funding covers the overhead costs immediately associated with the work being accomplished, it does not cover the cost of refurbishing and replacing the unique lab capital equipment and facilities used in some tasks.

Some customers have found ways to resolve some of these challenges by employing interagency agreements with DOE/NNSA in which the external funding organization makes a standing commitment to funding support at a specified level of effort.[37] While necessarily subject to the availability of annual appropriations, this eliminates most of the uncertainty, enabling the nuclear weapon labs to better align and manage professional staffs and plan and conduct technical work. Capital investments to develop needed capabilities for interagency customers are a more difficult challenge, but they too have been overcome in limited cases. NNSA has had to approach this challenge on a facility-by-facility basis.

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[37] Homeland Security Act of 2002, Sec. 309, authorizes DHS use of DOE national laboratories and sites via joint sponsorship, direct contract, or "work for others." Labs and sites perform such work on an equal basis to other missions at the laboratory and not just on a noninterference basis. DHS does not pay costs of DOE or its contractors in excess of the amount that the DOE pays. DHS' position is that it strongly prefers using authorities given it in law to allow it to work across the DOE complex in response to proposals.

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6. Conclusion

This interim report summarizes the panel's observations on the governance of the nuclear security enterprise. The panel is continuing to clarify and document the issues identified here. Recommendations to address the problems are being developed. The panel's interim findings indicate that fundamental reform will be required to reshape an enterprise that is capable of meeting all of the nation's needs. The changes will be difficult regardless of where the enterprise is located within the government, since the fundamental problems are cultural more than organizational. Organizational change, while not unimportant, is only a small portion of the changes that must be made. The panel believes lasting improvements are possible, but they will demand strong and sustained leadership and proactive support from Congress, the White House, and engaged Departmental Secretaries.

Appendix A. Sources

Table A.1. Testimony to the Panel and Fact-Finding Interviews

Current Members of the Enterprise and Government Officials	Name	Organization
	Atkins-Duffin, Cindy	Office of Science and Technology Policy, Nuclear Matters
	Barton, Matthew	DHS, Domestic Nuclear Detection Office
	Beausoleil, Geoffrey	Sandia
	Benedict, Terry	US Navy, Strategic Systems Program (SSP)
	Cook, Donald	NNSA
	Creedon, Madelyn	OSD Policy (Global Strategic Affairs)
	Dearolph, Douglas	Savannah River
	Elliott, Michael	The Joint Staff
	Epstein, Jon	SASC Staff
	Erhart, Steven	Pantex and Y-12
	Gentile, Chris	Kansas City Plant
	Harencak, Garrett	US Air Force, Strategic Deterrence & Nuclear Integration
	Held, Bruce	DOE, NNSA
	Holecek, Mark	Kansas City Plant
	Hommert, Paul	Sandia
	Juzaitis, Ray	Nevada Nuclear Security Site

Current Members of the Enterprise and Government Officials	Name	Organization
	Kendall, Frank	OSD, Acquisition, Technology and Logistics
	Khol, Curl	OSD CAPE
	Knapp, Bret	Lawrence Livermore
	Kusnezov, Dimitri	DOE
	Lawrence, Steven	Nevada Nuclear Security Site
	Lebak, Kimberly	Lawrence Livermore
	Limage, Simon	DOS, Bureau of International Security & Nonproliferation
	McMillan, Charles	Los Alamos
	Moniz, Ernest	Secretary of Energy
	Moody, III David	Savannah River
	Morrison, Timothy	HASC Staff
	Poneman, Daniel	DOE
	Reis, Vic	DOE
	Soofer, Robert	SASC Staff
	Spencer, Chuck	Y-12
	Tomero, Leonor	HASC Staff
	Trautman, Steve	Naval Reactors
	Walter, Drew	HASC Staff
	White, William	Los Alamos
	Winokur, Peter	DNFSB
	Woolery, John	Pantex

Current Members of the Enterprise and Government Officials	Name	Organization
Former Members of the Enterprise and Former Government Officials	**Name**	**Organization**
	Beckner, Ervert	DOE
	Brooks, Linton	NNSA
	Browne, John	Laboratories
	D'Agostino, Thomas	NNSA
	Davis, Jay	DOD
	Deutch, John	DOD
	Guidice, Steve	NNSA
	Harvey, John	DOD-NNSA
	Hunter, Thomas	Laboratories
	John, Mim	Laboratories
	Kuckuck, Robert	DOE
	Lehman, Ronald	DOD-NNSA
	Miller, George	Laboratories
	Miller, Neile	NNSA
	Nanos, George	Laboratories
	Ostendorff, William	NNSA
	Przybylek, Charles	DOE
	Robinson, Paul	Laboratories
	Selden, Robert	DOD-NNSA

Current Members of the Enterprise and Government Officials	Name	Organization
	Smolen, Robert	DOD-NNSA, NSC staff
	Tegnelia, James	DOD
	Younger, Steven	Laboratories
Other Subject Matter Experts	**Name**	**Organization**
	Baker, Michael	British Defense Staff
	Chiles, Hank	Lead, Previous NSE studies
	Foster, John	Lead, Previous NSE studies
	Howanitz, John	Bechtel
	Johnson, Ray	Lockheed Martin
	Mackinder, Andy	British Defense Staff
	Madsen, Michael	Honeywell
	Mara, Glenn	University of California
	Overskei, David	Lead, Previous NSE studies
	Patel, C. Kumar	National Academy of Science
	Pinfield, Lynsey	British Defense Staff
	Schwitters, Roy	JASON
	Shank, Charles	National Academy of Science
	Taylor, Paul	British Defense Staff
	Welch, Larry	Lead, Previous NSE studies

Table A.2. Fact-Finding Interviews

Organization	Department/Section
AFL-CIO	
Civil nuclear power industry	Various (on non-attribution basis)
Congress	
Members:	Congressman James Cooper
	Congressman Michael Rogers
	Senator Jefferson Sessions
	Congressman Adam Smith
	Senator Mark Udall
Committees:	Appropriations
	Energy and Commerce
	Energy and Natural Resources
	Energy and Water subcommittee
	Oversight and Investigations
	Strategic Forces subcommittee
Defense Nuclear Facilities Safety Board (DNFSB)	
Department of Defense	Joint Chiefs of Staff
	OSD, Acquisition, Technology and Logistics
	OSD, Cost Assessment and Program Evaluation
	OSD, Global Strategic Affairs
	OSD, Nuclear, Chemical and Biological Defense Programs
	OSD, Nuclear Matters
	OSD, Policy
Department of Energy	Chief Financial Office

Organization	Department/Section
	Environmental Management
	Health, Safety and Security
	Human Capital
	IG
	International Affairs
	International Nuclear Energy Policy
	Health, Safety, and Security
	Human Capital
	Nuclear Energy
	Office of Management
	Office of Science
	S&T Advisor
Department of Homeland Security	Domestic Nuclear Detection Office
	Office of National Laboratories
	Science & Technology
Department of Health and Human Services	Centers for Disease Control and Prevention
Department of Justice/Federal Bureau of Investigation	Weapons of Mass Destruction Directorate
Department of State	Arms Control and International Security
	Arms Control, Verification and Compliance
Federal Aviation Administration	Air Traffic Organization
National Aeronautics and Space Administration (NASA)	
Navy	Naval Reactors (NR)

Organization	Department/Section
	Strategic Systems Programs (SSP)
NNSA – headquarters	Office of the Administrator
	NA-00
	NA-10
	NA-20
	NA-40
	NA-80
	NA-APM
NNSA – Field (Sites and Field offices)	Kansas City
	Lawrence Livermore
	Los Alamos
	Nevada National Security Site
	Oakridge Y-12
	Pantex
	Sandia
	Savannah River
Nuclear Regulatory Commission	
Office of the Director of National Intelligence	National Counterproliferation Center
Office of Management and Budget (OMB)	
Occupational Safety and Health Administration (OSHA)	
Office of Science and Technology Policy	

Appendix B Acronyms

AFL-CIO	American Federation of Labor and Congress of Industrial Organizations
CAPE	Cost Assessment and Program Evaluation
CMRR	Chemistry and Metallurgy Research Replacement
DHS	Department of Homeland Security
DNFSB	Defense Nuclear Facilities Safety Board
DOD	Department of Defense
DOE	Department of Energy
DP	Defense Programs
ES&H	Environment, Safety, and Health
FBI	Federal Bureau of Investigation
FFRDC	Federally Funded Research and Development Center
FY	Fiscal Year
HASC	House Armed Services Committee
HSS	Health, Safety and Security (DOE)
ICBM	Intercontinental Ballistic Missile
IDA	Institute for Defense Analyses
ISO	International Organization for Standardization
LANL	Los Alamos National Laboratory
LEP	Life Extension Program
LLC	Limited Liability Company
LLNL	Lawrence Livermore National Laboratory
LRSO	Long-Range Standoff
M&O	Management and Operating
MEC	Mission Executive Council

MOA	Memorandum of Agreement
NA-APM	NNSA - Acquisition & Project Management
NA-00	NNSA - Infrastructure & Operations
NA-10	NNSA - Defense Programs
NA-20	NNSA - Defense Nuclear Nonproliferation
NA-40	NNSA - Emergency Operations
NA-80	NNSA - Counterterrorism and Counterproliferation
NASA	National Aeronautics and Space Administration
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NR	Naval Reactor
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense
OSHA	Occupational Safety and Health Administration
PF-4	Plutonium Facility at Technical Area 55 (TA-55), LANL
PIDAS	Perimeter Intrusion Detection and Assessment System
R2A2	Roles, Responsibilities, Authorities, and Accountabilities
S&T	Science and Technology
SASC	Senate Armed Services Committee
SLBM	Submarine-Launched Ballistic Missile
SNL	Sandia National Laboratories
SSP	Strategic Systems Programs, U.S. Navy
START	Strategic Arms Reduction Treaty
UPF	Uranium Processing Facility
WFO	Work For Others
Y-12	Y-12 National Security Complex, Oak Ridge, Tennessee

ANNEX 2

[The final report due during the July/August 2014 timeframe was not yet available at time of printing]

DEPARTMENT OF DEFENSE AUTHORIZATION OF APPROPRIATIONS FOR FISCAL YEAR 2015 AND THE FUTURE YEARS DEFENSE PROGRAM

THURSDAY, APRIL 10, 2014

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

STRATEGIC FORCES PROGRAMS OF THE NATIONAL NUCLEAR SECURITY ADMINISTRATION AND THE OFFICE OF ENVIRONMENTAL MANAGEMENT OF THE DEPARTMENT OF ENERGY

The subcommittee met, pursuant to notice, at 2:35 p.m. in room SR–232A, Russell Senate Office Building, Senator Mark Udall (chairman of the subcommittee) presiding.

Committee members present: Senators Udall, Graham, and Vitter.

OPENING STATEMENT OF SENATOR MARK UDALL, CHAIRMAN

Senator UDALL. The Strategic Forces Subcommittee will come to order.

Senator Vitter will be joining us shortly. He is serving as the ranking member today, and we have Senator Graham here.

I am going to make a short statement. When Senator Vitter arrives, we will look to him for a short statement.

Then, as I've talked to Mr. Held, I am going to recognize Senator Graham for some questions. We all have busy schedules around here and we work with each other to make sure that we maximize our time.

With that, this afternoon we will receive testimony regarding the National Nuclear Security Administration (NNSA) and the Office of Environmental Management (EM) of the Department of Energy (DOE) for fiscal year 2015.

Let me thank all the witnesses here today for taking time to appear. I know your time is valuable, as well.

The purpose of this hearing is to examine the Nuclear Weapons Stockpile Program of the NNSA, as well as the cleanup programs associated with former defense production sites of the DOE.

We will have two panels today. The first panel will be Mr. Edward Bruce Held, the Acting Administrator of the NNSA, who will speak to the overall NNSA budget. The second panel will consist

of Dr. Donald L. Cook, the Deputy Administrator for Defense Programs; Admiral John M. Richardson, USN, the Deputy Administrator for Naval Reactors and the Director of the Naval Nuclear Propulsion Program; and Mr. James M. Owendoff, the Acting Principal Deputy Assistant Secretary of the Office of EM at the DOE.

Mr. Held, welcome to the subcommittee. I understand it's probably bittersweet for you. Just this Wednesday, Lieutenant General Frank G. Klotz, USAF, was confirmed for the position of Administrator of the NNSA. So, while I say welcome, I also want to thank you for your service in leading the NNSA while we waited on the Senate to act.

There is no shortage of work to go around in stopping the spread of nuclear material that can harm our country, yet we continue to see a decrease in funding for these programs. In my opinion, there is a fundamental flaw in the way the budget for nonproliferation programs is coordinated in the executive branch. In that vein, Mr. Held, I would like to hear from you regarding the underlying reasons for the funding decreases we've seen over the past several budget proposals. It is my intent to advocate strongly for solutions in the upcoming National Defense Authorization Act (NDAA) to help mitigate these cuts.

Dr. Cook, you are in charge of ensuring our nuclear stockpile meets military requirements. It is essential that these programs continue in the most cost-effective manner possible and meet the deadlines required by the Department of Defense (DOD). I understand DOD may be embracing a modular approach for the plutonium and uranium buildings at Los Alamos and Oak Ridge, respectively. I'd like to hear more details regarding these approaches, as it is my opinion that they assist in meeting requirements while saving time and taxpayers' money.

Admiral Richardson, you continue a long, distinguished line of military officers in the Navy's nuclear program. A facility in Idaho where we store and examine spent Navy nuclear fuel is also growing older, but it is not getting better with age. I understand we are now at a critical juncture to replace the spent fuel storage pool, and it will soon have impacts on the Navy's fleet. I need to understand what the problem is and how we can be of help here.

Mr. Owendoff, your office is in charge of cleaning up former defense sites used in the production of nuclear weapons. This is a daunting task. Colorado is home to Rocky Flats, one of those legacy sites, so this is an item of great interest to me in my State. There have been setbacks at the Waste Isolation Pilot Plant (WIPP). Those setbacks include a mine fire, and it recently underwent a complete shutdown due to the release of radiation in the mine. It's essential that we understand what transpired with both of these events, and with the fire, in particular. We ought to include the key takeaways from the recent accident report that was issued in efforts to address those takeaways.

With that, let me turn to Senator Vitter for his opening statement, and then, as I mentioned, Senator Vitter, I will turn to Senator Graham and give him some time to question Mr. Held, if that's acceptable to you.

Senator VITTER. Sure, absolutely.

STATEMENT OF SENATOR DAVID VITTER

Senator VITTER. Thank you very much, Senator Udall.

Despite the President's rhetoric of a world without nuclear weapons, the administration has announced its intention to maintain and modernize the nuclear triad and to preserve the important role of nuclear weapons to deter adversaries, including nuclear adversaries, and reassure allies. I think that's good, because I think that is a safer world, having this deterrence in the right way.

However, the President's prohibition on the development of new nuclear weapons remains in place even while other nations continue to develop and produce new nuclear weapons. I do question that. If we have nuclear weapons in the triad, for important strategic reasons, I think we should have them in the most effective, including cost-effective, way possible.

Unlike the United States, Russia, for instance, maintains a robust nuclear warhead production capability. Of additional concern, of course, is Russia's huge disparity in tactical nuclear weapons. Certainly, recent events in Crimea reinforce the enduring role for U.S. nuclear weapons, particularly with our NATO allies in mind.

I am also concerned about nuclear modernization shortfalls, and I would point to this chart, to my left, to your right.

Comparing 1251/1043 Commitments to Appropriations and President's Budget Request for NNSA Weapons Activities All Numbers ($ Billion)												
	FY12	**FY13**	**FY14**	**FY15**	**FY16**	**FY17**	**FY18**	**FY19**	**FY20**	**FY21**	**FY22**	**FY23**
Feb 2011 "1251 Report" NNSA Weapons Activities	7.6	7.9	8.4	8.7	8.9	8.9-9.0	9.2 - 9.3	9.4 - 9.6	9.4 - 9.8	9.5 - 10.1	N/A	N/A
Actual appropriations, budget request, FYNSP, and out-years in 1251/1043 report	7.215	6.953	7.719	8.31	8.907	9.261	9.477	9.702	10.558	11.110	11.177	10.767
Difference:	-0.39	-0.95	-0.68	-0.39	0.01	0.26	0.18	0.10	0.76	1.01		

Source: Mr. Rogers, Chairman, Strategic Forces Subcommittee, House Armed Services Committee

Decrease of $2.0B over FY12 to FY14 (i.e., "real money")

NNSA Delays		
Program	**Projection in 1251 Report**	**Status as of 2014**
W76-1 LEP	Completed in FY2017	2 year delay: completed in FY2019; reduced number of warheads
B61-12 LEP	First Production Unit FY2017	3 year delay: FPU FY2020
W88 alt 370	No date specified	In development engineering phase; delay likely
IW-1 LEP	1251 report addressed intent to study a common W78-W88 warhead	Delayed at least 5 years
LRSO warhead	Low-rate initial production of LRSO to begin c. 2025; no mention of FPU of warhead	Delayed up to 3 years; FPU FY2025-FY2027 timeframe
CMRR-NF	Functionality attainable by FY2020; completion in FY2023	Project terminated; new modular concept under consideration, with perhaps some operational capability by 2027
UPF	Functionality attainable by FY2020; completion in FY2024	Delayed at least 4 years; reduced to 1/3 of original capability; Red Team investigating alternatives to UPF

Source: SASC Minority Staff with CRS & GAO

As of 24 March 2014

Senator VITTER. Through a combination of funding shortfalls, virtually all of our modernization efforts are delayed or deferred. The table at the top of the chart demonstrates that funding for NNSA weapons activities is about $2 billion less than the commitment made by the President and Congress to secure New Strategic Arms Reduction Treaty (START) ratification. To me, this is really important.

New START ratification was 2010, just a few years ago. Part of the discussion that clearly led to that ratification were specific commitments about modernization, about funding. As you see, we have just not come close to those specific commitments ever since then. We're falling far behind. Even a half-billion-dollar increase in weapons activities for fiscal year 2015 will not close that gap.

The bottom of the chart illustrates what that means. It's not just dollars, it's not just numbers. It means a real impact and delay in five areas. The bottom of the chart goes down those five important areas.

That doesn't even indicate an additional 5-year delay, from 2021 to 2026, to the date when the United States will be able to produce 30 plutonium pits per year, and there is no indication when we are going to reach the 50 to 80 pits per year, which is the military requirement. That's our requirement, not 30.

The NNSA and the National Labs are responsible for maintaining the effectiveness of our nuclear stockpile. They do this through constant surveillance of the stockpile and by implementing life extension programs (LEP) for warheads and bombs that are well past their design life. To accomplish this, they really require modernization, including modern physical infrastructure, and, of course, a highly-trained workforce, which can only stay highly-trained, cutting-edge with that modernization activity.

While funding shortfalls don't make the job any easier, I would also note that an outside panel of experts has determined that governance structures and practices certainly account for inefficiency, as well.

Finally, I just want to note that some members suggest that funding for NNSA weapons activities has come at the expense of nonproliferation programs. But, again, I think this chart is crucial, as it indicates $500 million increase for weapons activities doesn't make up for a shortfall. We are still behind in a significant way. As the Nuclear Weapons Council (NWC) told Congress very recently, the 5-year budget proposal submitted by NNSA is, "fragile, and any funding reductions at this point could pose unacceptable risk to the health of the nuclear enterprise." I would go further and say, we started with these commitments that were the absolute minimum coming out of New START. We are now well behind those.

Those are my main concerns. I'll look forward to the testimony of the witnesses.

Senator UDALL. Thank you, Senator Vitter.

Again, Mr. Held agreed to field some questions from Senator Graham. We appreciate that, Mr. Held. You've always been flexible.

Senator Graham.

Senator GRAHAM. Thank you, Mr. Chairman and Senator Vitter.

Very quickly, the mixed oxide fuel (MOX) program, I know you're very familiar with it, in South Carolina. Senator Vitter was trying to indicate you have two jobs you have to do. One is to modernize our weapons program to make sure they're relevant for the needs of the Nation. The other is to rid the world of nuclear material, when possible.

One of the breakthroughs, I think, Mr. Chairman—over a decade ago now, there was an agreement between the United States and Russia to take 34 metric tons of weapons-grade plutonium off the market. Both countries would get rid of this excess weapons-grade plutonium.

Are you familiar with that agreement, Mr. Held?

Mr. HELD. Most certainly, sir.

Senator GRAHAM. Okay. In 2011, we basically agreed that the American disposition path would be MOX.

Mr. HELD. Right. I think we modified the agreement to—we would stick with MOX and the Russians would switch from MOX to a fast-reactor program.

Senator GRAHAM. Right. They are using a fast-reactor resolution. MOX, for those who may not be familiar with it—and I can understand why you would not be—is taking the weapons-grade material and blending it down so it can be burnt in commercial nuclear reactors. Is that correct?

Mr. HELD. Yes, sir.

Senator GRAHAM. How many warheads could be made from 34 metric tons of weapons-grade plutonium?

Mr. HELD. Thousands, sir.

Senator GRAHAM. Thousands.

Mr. HELD. The world will be a much safer place without those 34 metric tons.

Senator GRAHAM. Right. We're talking about thousands of nuclear weapons potentially made from this stockpile that we want to turn from a sword to a plowshare.

The MOX facilities in South Carolina are 60 percent complete. Do you agree with that?

Mr. HELD. In some aspects. We've sunk $5 billion into it. Yes, sir.

Senator GRAHAM. Right. To finish it out, the estimate is around $7 billion. Is that correct? $6 to $7 billion is what DOE testified to yesterday?

Mr. HELD. Yes, depending upon how you're looking at it.

Senator GRAHAM. Okay.

The administration has decided to put this program on cold standby, stopping construction. Is there an effort to layoff people at the Savannah River Site (SRS) who have been working on the MOX program? Or do you know?

Mr. HELD. Until we get a final decision that—no, we are not doing——

Senator GRAHAM. That is reassuring, because the workforce is essential. I am confident, Mr. Chairman, that Congress will restore funding that was cut from the President's budget, to keep this program on track, because the rationale for stopping it is that there is a cheaper, more effective disposition.

Would one of those routes be immobilization?

Mr. HELD. One of those routes would be immobilization, dilution in geographic repositories, fast reactors, or MOX.

Senator GRAHAM. Okay.

Mr. HELD. I think those are the four big ones, yes, sir.

Senator GRAHAM. If you did immobilization, what, very briefly, would be required to achieve immobilization?

Mr. HELD. We would have a lot more investment in the technology to——

Senator GRAHAM. You'd have to move material from Washington State to SRS.

Mr. HELD. Yes, sir.

Senator GRAHAM. Mr. Chairman, I am fairly familiar with this program. We've had problems with the Bush administration, every administration. Immobilization is not going to be faster and it's not going to be cheaper, and there is no technology that's going to work better than MOX. My commitment to this subcommittee is to try to reduce the cost of the MOX program.

What have the Russians said about changing course, on the part of the United States? Do you know?

Mr. HELD. There is a precedent in the 2010 renegotiation of the agreement, that the Russians, because of cost factors, they wanted to move to the fast-reactor approach rather than MOX.

Senator GRAHAM. Am I fair to say the Russians rejected immobilization because the material could one day potentially be reconstituted?

Mr. HELD. That was their position, yes, sir.

Senator GRAHAM. Yes. The Russians rejected that because they don't want to give up—now, I wouldn't agree to allow the Russians to immobilize, because somebody down the road could reconstitute.

You have a tough job. You're trying to do two things that are very important: modernize the nuclear deterrent force and try to honor agreements, in terms of disposition of excess weapons material.

The agreement with the Japanese, of 700 pounds of weapons-grade plutonium, do we know where that would go?

Mr. HELD. That has not been decided as of yet, sir.

Senator GRAHAM. I think it would be wonderful if we could receive that material and take it off the marketplace, but you're going to have a hard time getting anyone to do that, in light of stopping the program.

The one thing I worry about, Mr. Chairman, is that when a State makes a commitment to accept 34 metric tons of weapons-grade plutonium, with a pathway forward that would create jobs but would get the material from a sword to a plowshare. You stop after it's 60 percent complete, it is just not a good model to use, because this is very hard politically to convince people to take weapons-grade plutonium in your State and do something good for the Nation and the world.

Do you agree that if we could achieve the goal of taking the 34 metric tons, in Russia and the United States, off the market, we'll have done the world a great service?

Mr. HELD. I think most certainly the world will be a safer place. The question is the relative cost of doing it, and——

Senator GRAHAM. The relative cost of thousands of nuclear warheads taken off the market, what's that worth? You're 60 percent complete and you're stopping the project, coming up with a theory that's previously been rejected by the Russians. I just don't think this is very wise. I think we need to fix it before we get ourselves in a very bad way with the Russians.

I'll look forward to trying to restore funding and helping you with the other problems that Senator Vitter has tried to explain in great detail. Maybe some sequestration relief down the road would be helpful to both these projects.

Thank you, Mr. Chairman.

Senator UDALL. Thank you, Senator Graham. Thank you for taking the time to participate. We will see you at the markup for the NDAA as I know we will.

Senator GRAHAM. Okay.

Senator UDALL. Mr. Held, we look forward to your statement. Before you start, I might make note that we're going to, if at all possible, end the hearing by 4 p.m. We have four witnesses, so I think that's very doable. I am sure that Senator Vitter would agree to 7-minute rounds of questions once you've completed your testimony.

Mr. HELD. Okay. I'll be very brief, sir. Thank you.

Senator UDALL. Thank you.

STATEMENT OF EDWARD BRUCE HELD, ACTING ADMINISTRATOR AND ACTING UNDER SECRETARY FOR NUCLEAR SECURITY, NATIONAL NUCLEAR SECURITY ADMINISTRATION, DEPARTMENT OF ENERGY

Mr. HELD. Chairman Udall, Ranking Member Vitter, I am honored to be with you today.

The fiscal year 2015 budget request for the NNSA is a clear expression of President Obama's commitment to America's nuclear security. Within the fiscal constraints of the Bipartisan Budget Act (BBA), the President requests a 4 percent increase for NNSA, to $11.7 billion. This includes a 26 percent increase for naval nuclear reactors and a 7 percent increase for weapons activities.

The President's request for weapons activities funds the 3+2 strategy approved by the NWC in support of two enduring commitments to the American people. One, sustain a safe, secure, and effective nuclear deterrent for America that is, two, prudently based on a smaller, safer, and more cost-efficient stockpile of nuclear weapons.

To remain within BBA constraints, difficult decisions were unavoidable. The MOX project to dispose of excess weapons-grade plutonium will be significantly more expensive than anticipated. Although painful, DOE, for its part, believes that it would be in the best interest of the taxpayers to place the MOX project in reversible cold standby while we explore promising possibilities for a more cost-efficient path to fulfilling our plutonium disposition agreement with Russia.

NNSA has performance challenges ahead of us. The Secretary of Energy, Dr. Ernest J. Moniz, will always be straightforward with you about those challenges. At the same time, NNSA has significant successes to build on, and Secretary Moniz insists that we get

out of our defensive crouch and honestly tell our success stories in a way that is meaningful to the American people.

Regarding nuclear security, for example, our counterintelligence program was dysfunctional 10 years ago. Today, DOE counterintelligence is highly effective, respected, and trusted. Less than 10 months ago, NNSA communications with our colleagues on the NWC were strained. Today, those communications are healthy and transparent, and this improved atmosphere is helping us focus on the big strategic issues for which the NWC exists.

On nonproliferation, in just the last 4 years, 11 countries plus Taiwan have eliminated their caches of sensitive nuclear materials, and security has been hardened at scores of nuclear storage facilities around the world to prevent theft by potential terrorists. The world is a safer place as a result.

On project management, NNSA has been on the Government Accountability Office (GAO) high-risk list literally since the day it was born, in March 2000. Since February 2011, however, we have consistently been on schedule and on budget for large projects up to $750 million. As a result, GAO has taken us off its high-risk list for projects of this size for the first time in NNSA's history.

We still have issues with the multi-billion dollar mega-projects, but, thanks to the greater discipline and more agile strategy that Secretary Moniz has brought with him, we are making progress there, as well.

That leads me to our first and foremost responsibility, which is nuclear safety. For nuclear safety reasons, we simply must modernize the aged infrastructure for enriched uranium processing in Oak Ridge, we must modernize the aged infrastructure for plutonium processing in Los Alamos, and, wherever we can reliably do so, we should replace conventional high explosives in our nuclear stockpile with much safer insensitive high explosives. If we take a commonsense approach that emphasizes better/sooner rather than perfect/later, all of these are doable within reasonable cost. But, if, heaven forbid, we have a nuclear safety accident because we have not done so, then, Mr. Chairman, NNSA will have truly failed and we will forever forfeit the trust and confidence of the American people in all things nuclear.

Thank you, sir.

[The prepared statement of Mr. Held follows:]

PREPARED STATEMENT BY MR. EDWARD BRUCE HELD

Chairman Udall, Ranking Member Sessions, and members of the subcommittee, I come before you today to present the President's fiscal year 2015 budget request for the Department of Energy's (DOE) National Nuclear Security Administration (NNSA). I have been honored to serve the Department as the acting Administrator for the past 9 months, but as a fellow citizen ask for your support to get our nominees confirmed as expeditiously as possible. NNSA is a critically important national security element of the U.S. Government that deserves a permanent leadership team. Retired Air Force Lieutenant General Frank Klotz and current Assistant Secretary of Defense Madelyn Creedon are deeply experienced and wise people who would make a great team as NNSA Administrator and Principal Deputy Administrator.

The fiscal year 2015 budget request for the DOE is up 2.6 percent to $27.9 billion. The NNSA, which comprises over 40 percent of the DOE's budget, is up $451 million or 4 percent, to $11.7 billion. In today's fiscal climate, this increase is an indication of the President's unwavering commitment to nuclear security, as outlined nearly 4 years ago in Prague, and reaffirmed last June in Berlin. Support in this year's

budget request is also due to an unprecedented level of transparency and discussion within the interagency on how the NNSA can best support implementation of the two key goals of the Nuclear Posture Review (NPR): to prevent nuclear proliferation and terrorism and to maintain a safe, secure and effective deterrent while we reduce the number of nuclear weapons in the stockpile. This budget request also supports the major initiatives of Naval Reactors, makes investments in physical and cyber security, and funds critical infrastructure recapitalization to support effective operations across the nuclear security enterprise.

Within that context, the Secretary and NNSA Leadership understand that we have an enduring responsibility to steward the taxpayers' dollar effectively and efficiently, and we simply must do better. Therefore, NNSA is looking at ways to improve our governance through a public interest model that will incentivize mission effective and cost efficient solutions to the highest risk nuclear security challenges facing our country. We look forward to seeing the interim recommendations of the Congressional Advisory Panel on the Governance of the NNSA, as well as to reviewing recommendations from other panels focused on governance, including the Secretary of Energy's Advisory Board and the independent commission to study the DOE Laboratories as directed in the fiscal year 2014 Consolidated Appropriations Act.

Another primary area of focus to support effective and efficient implementation of our mission will continue to be project management and improving our cost assessment and estimation capabilities. The Secretary has reorganized the Department to elevate Management and Performance to one of three Under Secretary positions. Within this framework, the NNSA is committed to effectively managing its major projects and has been driving continued enhancements to contract and project management practices through a reorganized Office of Acquisition and Project Management (APM). In 2013 GAO recognized progress at DOE in execution of nonmajor projects under $750 million, and narrowed the focus of its High Risk List for DOE to mega-scale, unique nuclear construction projects costing more than $750 million. APM is leading the NNSA's effort to deliver results by strengthening rigorous and well-justified alternative assessments and evaluations, providing clear lines of authority and accountability for Federal and contractor personnel, and improving cost and schedule performance. NNSA is also applying lessons learned from the Office of Science project management methods and is collaborating across the DOE. At its core, DOE/NNSA's ultimate project management goal is to deliver every project on schedule, within budget, and fully capable of meeting mission performance, safeguards and security, quality assurance, sustainability, and environmental, safety, and health requirements.

The Department has just released its new Strategic Plan for 2014–2018, with the goal to "Secure our Nation" and the strategic objective to "enhance national security by maintaining and modernizing the nuclear stockpile and nuclear security infrastructure, reducing global nuclear threats, providing for nuclear propulsion, improving physical and cyber security, and strengthening key science, technology, and engineering capabilities." The Bipartisan Budget Agreement (BBA) sets firm caps on national security spending in fiscal year 2015, and the President's budget request adheres to them so tough choices had to be made across the NNSA. While Weapons Activities is up 6.9 percent from fiscal year 2014 enacted levels, and the Defense Nuclear Nonproliferation (DNN) account is down 20.4 percent, the administration and DOE/NNSA remain firmly committed to our nonproliferation efforts and to implementing a robust program following the end of the 4-year effort to secure nuclear material. In addition, modernization of the nuclear security enterprise and sustaining the science and technological base directly supports our nonproliferation and counterterrorism missions, so there is great synergy between the Weapons and Nonproliferation programs that we will continue to leverage. Details of the fiscal year 2015 President's budget request for the NNSA follow.

WEAPONS ACTIVITIES

The Weapons Activities account request for fiscal year 2015 is $8.3 billion, an increase of $534 million or 6.9 percent over fiscal year 2014 enacted levels. It is comprised not only of the Defense Programs portfolio, which is responsible for all aspects of stockpile management, but also our physical and cyber security activities, our emergency response and counterterrorism and counterproliferation capabilities, and enterprise-wide infrastructure sustainment. Each element is addressed in detail below.

Defense Programs

The Defense Programs portion of the Weapons Activities account is up $499.5 million, or 7.8 percent from fiscal year 2014, to $6.9 billion. It funds the Nuclear Weap-

ons Council (NWC) approved "3+2" strategy with some schedule adjustments, which aims to implement NPR guidance to reduce the number and types of weapons in the stockpile while maintaining a safe, secure and effective deterrent. The request also continues to invest in the scientific and engineering foundation and in critical infrastructure. Building on last year's jointly conducted planning process for nuclear weapons modernization activities, DOE/NNSA and DOD agreed on a prioritized plan to meet requirements within current fiscal constraints of the Bipartisan Budget Act. Specifically, the fiscal year 2015–2019 budget proposal requests funding for the following modernization activities:

- Complete production of the W76–1 warhead by fiscal year 2019;
- Achieve the B61–12 life extension program (LEP) First Production Unit (FPU) by second quarter fiscal year 2020;
- Achieve the W88 ALT 370 FPU by first quarter fiscal year 2020;
- Defer the interoperable warhead (W78/88–1) LEP FPU by 5 years to fiscal year 2030;
- Delay the Long-Range Standoff warhead FPU by 1 to 3 years to fiscal year 2025–2027;
- Continue funding engineering design and to study alternative approaches to deliver the Uranium Processing Facility by 2025.

The Directed Stockpile Work request at $2.7 billion supports transitioning to a smaller, modernized nuclear stockpile while continuing sustainment efforts. The requested increase reflects the ramp up of Phase 6.3 activities for the B61 LEP and an increase for Stockpile Systems, including maintenance, surveillance, plutonium sustainment, and tritium program requirements.

In support of the Research, Development, Test, and Evaluation (RDT&E) program, the Campaigns request is $1.8 billion to provide increased technical resources needed for the certification of the existing stockpile and qualification of LEP options and components. For example, within the Inertial Confinement Fusion and High Yield Campaign, the National Ignition Facility (NIF) has achieved recent success with a stockpile stewardship experiment that exhibited significant "self heating," which is an important step essential to achieving ignition on the NIF. This platform will be used for years to come in studying a multitude of physical processes of relevance to nuclear weapons. Today, these physics environments are only accessible on laboratory-based high energy density facilities, such as the NIF, since the U.S. has been under a unilateral testing moratorium since 1992. The fiscal year 2015 request for the NIF is $328.5 million.

Another area of significant investment by the DOE is in exascale computing. NNSA's Advanced Simulation and Computing Campaign (ASC) provide leading edge, high-end modeling, and simulation capabilities that capture and allow us to apply all that we know about weapons physics and engineering. The fiscal year 2015 ASC budget request includes $50 million for the Advanced Technology Development and Mitigation subprogram, established in fiscal year 2014, which funds projects that pursue long-term simulation and computing goals relevant to both exascale computing and the broad national security missions of the NNSA. Both the NNSA and DOE's Office of Science continue to collaborate in this area of advanced computing systems, with the Office of Science request providing $91 million towards the development of capable exascale systems.

Two decades after its beginning, the Stockpile Stewardship Program continues to deliver tangible results from the combined use of our leading edge computation and experimental tools. Specifically our level of understanding of how nuclear weapons work is far greater today than when we were testing. A core mission of the DOE remains to certify the safety, security and effectiveness of the nuclear deterrent; this is done each year by the Lab Directors and STRATCOM Commander, which continues to support our unilateral testing moratorium consistent with the Comprehensive Test Ban Treaty.

Infrastructure

The Readiness in Technical Base and Facilities (RTBF) request at $2.1 billion supports the underlying physical infrastructure and operational readiness for the nuclear security enterprise. The request includes funds to upgrade nuclear safety systems, improve the workplace environment for plant and laboratory employees, and reduce safety and mission risks across the enterprise in support of operational readiness. The Site Stewardship request of $82.4 million also ensures the overall health and viability of the enterprise.

Specifically, RTBF construction supports continued design activities for the Uranium Processing Facility (UPF) Project at $335.0 million, an increase of $26 million from fiscal year 2014, while assessing whether there are alternative designs to accomplish the mission incrementally and at an affordable pace. NNSA remains con-

cerned about the cost growth and sequestration impacts facing the UPF Project. In January 2014, NNSA chartered Oak Ridge National Laboratory Director Thom Mason to lead a team to develop and recommend an alternative approach to the UPF Project. NNSA is committed to our build to budget strategy to deliver the UPF Project by 2025, with Building 9212 capabilities, for not more than $4.2–6.5 billion.

The NNSA continues to pursue steps to maintain continuity of plutonium capabilities at Los Alamos National Laboratory (LANL)—to include analytical chemistry (AC) and materials characterization (MC) capabilities—with a commitment to cease programmatic operations in the 62-year old Chemistry and Metallurgy Research (CMR) facility by 2019. NNSA has developed a three-step Plutonium Infrastructure Strategy, to include: (1) Maximizing the use of the Radiological Laboratory Utility Office Building; (2) Reusing laboratory space in Plutonium Facility (PF)-4; and (3) Evaluating options for modular additions to PF–4. The first two steps allow the NNSA to move programmatic operations from the CMR facility; the third addresses the PF–4 lifetime while enabling production capability and analytical support enhancements to meet requirements. NNSA also continues to pursue investments in upgrading safety system in PF–4 as part of the overall approach to maintaining plutonium capability.

NNSA's request reflects the partnership between NNSA and DOD to modernize the nuclear deterrent, and as in last year's budget, DOD is carrying a separate account for the outyears that contains funds for NNSA's Weapons Activities and Naval Reactors. These funds are transferred to NNSA during budget development and underscore the close link between these activities and DOD nuclear requirements and missions. We urge your subcommittee's support for alignment of the appropriations process and allocations, including the 302(b) allocation, with the President's budget. The requested allocation, within the spending caps set by the Bipartisan Budget Act, support these NNSA and DOD priorities. If not achieved, it could place modernization funding and implementation of our long-term stockpile sustainment strategy at risk.

Physical and Cyber Security

Improving the effectiveness and efficiency of departmental operations is a top priority. Shortly after beginning his tenure, the Secretary of Energy directed the Department to undertake a thorough review of our security management. It became clear that DOE's approach to securing the Department's assets, including the special nuclear materials, could be strengthened by establishing greater accountability and clearer lines of authority.

Therefore, in February, the Secretary announced his new vision for enhancing the Department's health, safety, security and independent assessments. First, we have put in place a Chief Security Officer (CSO) under each of the three Under Secretaries, each empowered and held accountable for managing all security operations within their organizations. The CSOs will form the nucleus of a new DOE Security Committee, chaired by the Associate Deputy Secretary, which will develop unified security strategies across the DOE complex and raise the focus on protecting our people and DOE physical and information assets. Second, we are moving the Department's key support functions for security, health and safety under the leadership of the Under Secretary for Management and Performance in order to improve the effectiveness and efficiency of Departmental operations. Third, we are establishing a new Office of Independent Enterprise Assessments (IEA), reporting directly to the Office of the Secretary. This reorganization will set us on a stronger course to achieving our goals and mission more effectively, efficiently and safely.

In light of these reforms, the primary mission of NNSA's Office of Defense Nuclear Security and the Chief Security Office is to develop and implement sound security programs to protect Special Nuclear Material, people, information, and facilities throughout the nuclear security enterprise. The NNSA's Defense Nuclear Security request is $618 million to provide protection from a full spectrum of threats for NNSA personnel, facilities, nuclear weapons, and information.

The Information Technology and Cybersecurity (renamed from "NNSA CIO Activities") request is substantially increased to $179.6 million to provide protection against increasing cyber security threats. Information Technology and Cybersecurity supports the national nuclear security enterprise by providing information technology and cybersecurity solutions such as enterprise wireless capabilities and continuous monitoring technologies to help meet security and proliferation resistance objectives. The increase reflects expenses for items such as improvement to the cyber infrastructure at the NNSA sites, requirements for classified computing, and Identity Credential and Access Management.

Emergency Response and Counterterrorism

The Nuclear Counterterrorism Incident Response (NCTIR) request of $173.4 million applies technical assets from the nuclear security enterprise to resolve and manage nuclear and radiological incidents, especially those involving terrorism. It addresses this threat by maintaining and using response teams to manage the consequences domestically or internationally should an attack or incident result in radiation exposure to the public. NCTIR conducts training programs to train and equip response organizations and uses strategies that integrate NNSA expertise with law enforcement or military capabilities to locate, identify, and disable a terrorist nuclear device.

The Counterterrorism and Counterproliferation program request is $76.9 million to provide the foundation for the U.S. Government's capability to understand and counter nuclear terrorism and nuclear threat devices. The program also provides a technical understanding of foreign nuclear weapons outside of state control. Based on this expertise, the program informs national policies and international guidelines, as well as enabling domestic and international nuclear counterterrorism engagements.

DEFENSE NUCLEAR NONPROLIFERATION

The DNN request is $1.6 billion, a decrease of $398.8 million, or about 20.4 percent, from the fiscal year 2014 level. The programs under DNN have been accurately described as "defense by other means." The majority of the decrease is due to the decision to place the Mixed Oxide (MOX) Fuel Fabrication Facility construction project at the Savannah River Site in cold stand-by to allow further study of more efficient options for plutonium disposition. Other decreases reflect the conclusion of the President's 4-year effort to secure nuclear materials worldwide and bring the fiscal year 2015 request in line with funding levels before the acceleration needed to implement the 4-year effort.

We have met—and in some cases exceeded—the goals set in April 2009 following the President's Prague speech by:

- removing or confirming disposition of 5,113 kilograms of highly enriched uranium (HEU) and separated plutonium from 41 countries and Taiwan (enough material for more than 200 nuclear weapons and in excess of the target of 4,353 kilograms);
- completing material protection, control and accounting (MPC&A) upgrades at 32 buildings containing metric tons of weapons-usable material in Russia (for a cumulative total of 218 buildings secured in the former Soviet Union since 1994); and
- working with Russia and former FSU countries to establish effective and sustainable MPC&A capabilities at the national level.

Going forward in fiscal year 2015, the administration remains firmly committed to disposing of surplus weapon-grade plutonium. Over the past year, we have been working closely with the MOX project contractor and others to determine if there are opportunities to make the current MOX fuel approach for plutonium disposition more efficient. During the same time that we were analyzing the current MOX fuel approach, we have been analyzing alternatives to accomplish the plutonium disposition mission, including reactor and non-reactor based approaches. DOE expects to complete the options analysis and an external independent review in the next 12–18 months. It is now clear that the MOX approach will be significantly more expensive than anticipated—at a $30 billion lifecycle cost estimate—even with potential contract restructuring and other improvements that have been made to the MOX project. As a result, the MOX project will be placed in cold stand-by, meaning we will cease all construction activities in order to minimize costs. The Fissile Materials Disposition request is $311 million, including $221 million to put the MOX project in cold stand-by, while assessing more cost effective options. NNSA must immediately take prudent actions to commence lay-up to preserve our investment while minimizing costs. The remaining funding will continue to support activities for disposition of plutonium and highly enriched uranium.

While much was accomplished under the 4-year effort, serious threats still remain. Significant stockpiles of HEU still exist in too many places, and global inventories of plutonium are steadily rising. DNN programs, working closely with a wide range of international partners, key U.S. Federal agencies, U.S. national laboratories, and the private sector will continue to remove and/or dispose of the dangerous nuclear materials that are still very much a part of our world today. The fiscal year 2015 budget request for other DNN programs provides funding to continue remaining high-priority nuclear and radiological threat reduction efforts, following completion of the accelerated 4-year effort activities. This includes $333 mil-

lion for the Global Threat Reduction Initiative and $305 million for the International Material Protection and Control program. Fiscal year 2015 priority efforts include the removal of an additional 125 kilograms of HEU and plutonium from high priority countries; the protection of an additional 105 buildings with high-activity radioactive sources; the consolidation of all category I/II material into a new high security zone at a nuclear material site in Russia; preventing illicit trafficking by closing key gaps in the radiation detection architecture through the provision of fixed and mobile detection equipment; and the initiation of new nuclear security activities in the Middle East.

Another core program is DNN Research and Development (R&D) program, at $361 million in the fiscal year 2015 budget request. DNN R&D develops new technologies and methods that advance national and international capabilities to detect and characterize foreign nuclear weapons production activities and detonation events and the movement of special nuclear material (SNM). DNN R&D is a national-level program providing applied research and development in nuclear security and treaty verification technology leveraged by interagency partners at the Departments of Homeland Security, Defense, and State, and the throughout broader U.S. Government.

Finally, the Nonproliferation and International Security program request is $141 million, which supports activities that prevent and counter WMD proliferation, including continued support of U.S. efforts to address proliferation by Iran, North Korea, and proliferation networks; implementation of statutory export control requirements; support for treaty verification and transparency; implementation of the Next Generation Safeguards Initiative to strengthen International Atomic Energy Agency safeguards; and efforts to reduce proliferation risks associated with the expansion of nuclear power.

These activities are carried out in support of an interagency strategy for nuclear threat reduction and in close coordination with related programs in the Department of Defense, Department of State, and other agencies. Though difficult choices are inevitable in the current budget environment, NNSA continues to strongly support the nuclear nonproliferation mission. We are proud that the Office of Defense Nuclear Nonproliferation is responsible for delivering the majority of the pledges made by the United States under the Nuclear Security Summit process. The President and Energy Secretary recently represented the United States at the third such Summit in The Hague, where they highlighted additional commitments the United States intends to meet by the 2016 Summit, which will be hosted in the United States, and continued to encourage international commitment to and investment in meeting these critical nonproliferation challenges.

NAVAL REACTORS

The budget request for Naval Reactors is $1.4 billion, an increase of $282.1 million, about 25.8 percent from the fiscal year 2014 level. The request includes the base funding required to safely maintain, operate and oversee the Navy's 83 nuclear-powered warships. The Naval Reactors budget request includes three high priority programs: *Ohio*-class Replacement submarine; refueling of the Land-Based Prototype reactor plant; and the Spent Fuel Handling Recapitalization Project. These new projects are essential to maintaining a credible sea-based strategic deterrent, to maintain the research and training capabilities of the Land-based Prototype, and to maintain the capability to safely inspect, store and package naval spent nuclear fuel.

NNSA PROGRAM DIRECTION—FEDERAL SALARIES AND EXPENSES

NNSA Federal Salaries and Expenses (FSE), formerly "Office of the Administrator," request is $411 million, an increase of $34 million or 9 percent from the fiscal year 2014 level. The increase reflects two requirements: a $20 million one-time cost to fund the move of the NNSA Albuquerque Complex to a different leased facility, and a $12 million increase associated with the transfer of Corporate Project Management from the Weapons Activities account, consistent with congressional direction in the fiscal year 2014 Consolidated Appropriations Act. The fiscal year 2015 budget request provides support for 1,710 Federal full-time equivalents—a 9.3 percent reduction relative to fiscal year 2012 enacted levels—in response to today' constrained budget environment. FSE remains critical to supporting the NNSA mission and workforce.

Separately in the fiscal year 2015 budget request, the administration has proposed an additional $56 billion in funding across the Government through the Opportunity, Growth and Security Initiative (OGSI). The OGSI supports the President's broad vision for investing in growth, opportunity, and national security and

advancing important Presidential goals while respecting the budgetary consensus developed under the Bipartisan Budget Agreement of December 2013. The OGSI allocates around $600 million to further support NNSA's critical mission and infrastructure investments.

CONCLUSION

The NNSA implements a vital mission, responsible for nuclear security at home and abroad, and delivering the technology, capabilities and infrastructure essential to a 21st century organization. An emphasis on mission effective and cost efficient nuclear security solutions will be critical for the NNSA to succeed in today's fiscal climate where difficult choices must be made but where our workforce continues to rise to the challenge and deliver.

Senator UDALL. Thank you, Mr. Held.

Let me recognize myself for 7 minutes.

Let me move to the fact that, 2 years ago, the NNSA deferred, for at least 5 years, a replacement of the aging plutonium facility at Los Alamos. I think we'd spent up to about $500 million on that design. This year, you're looking at a redesign of the uranium facility at Oak Ridge at the Y–12 plant, to be clear, as its design may increase to as much as $10 billion. This is a huge amount of taxpayers' money, either lost or about to be lost. Can you please tell the subcommittee what you're doing to rein in the cost of these facilities, in terms of simpler designs?

Mr. HELD. Yes, sir.

We're doing two things. First, we are applying the same discipline and rigor on these mega-projects that we have been doing so on the projects up to $750 million since February 2011. Second, and maybe more importantly, or even more importantly, we're switching our strategy from a big-box strategy to a more agile, modular strategy. If you look at this, this change in strategy was a mother—or, necessity was the mother of invention in the plutonium side. What we've done is break down this big project into three phases. The first phase is driven by nuclear safety concerns. We must get out of the old Chemistry and Metallurgy Research (CMR) building by 2019. We can do that by moving much of that work into the brand-new radiological laboratory that we brought in on schedule and on budget. Second, we need to get up to the 30-pit-per-year target. We can do that by repurposing existing facilities in the plutonium facility number 4 in a much more cost effective way. Then, third, to get to the DOD target and military requirement of 50- to 80-pit-per-year, then we will need additional modular facilities there that we will build as the mission timing and budget requires.

Senator UDALL. Let me turn, Mr. Held, to the NNSA nonproliferation budget. It went down 20 percent compared to last year's enacted level of roughly $2 billion, and 30 percent relative to the fiscal year 2013 level of $2.2 billion. Now, the majority of that decrease is related to the MOX program that Senator Graham explored with you. Can you explain to the subcommittee, besides the MOX program, what's going on here?

Mr. HELD. Secretary Moniz, since becoming Secretary, has been very rigorous looking at budgets across-the-board. That rigor has been applied both to nuclear weapons, to infrastructure, and to nonproliferation. We have adjusted our weapons program, as well. But, a large share of this did, in fact, hit the nonproliferation. That is a matter of deep concern to us. We have made tremendous

progress over the past 4 years, the 13 countries who eliminated their stockpile or their special nuclear material caches. There's a lot more work we have to do in the next several years, and $1.6 billion of American taxpayers' money is still an awful lot of money to do that with. The Secretary is asking us if we can take a look at: In these budgetary tight periods, is there a better way, a more agile, more mission-effective way that we can get a higher return on our investment in nonproliferation? We are not walking away from the nonproliferation issue.

NNSA is the National Nuclear Security Administration. That means both nonproliferation and weapons. We are not the Nuclear Weapons Administration. We need a coherent narrative to tie both of those together. The Secretary is working to do that.

I believe the 3+2 strategy is actually a good example of how we are tying those to the reduced size of the stockpile with the continuing safe, secure, and effective stockpile.

Senator UDALL. Let me further pursue a couple of questions tied to the SRS.

Mr. HELD. Yes, sir.

Senator UDALL. I think this site is estimated to cost as much as $10 billion, with an estimated $30 billion lifecycle cost.

Mr. HELD. For the MOX project, sir?

Senator UDALL. Yes MOX. At SRS, I know there are other things that are happening there, but I think you all have proposed that you'd put the facility in cold storage in fiscal year 2015. The NDAA for Fiscal Year 2014 authorized DOE to conduct a strategic review of the program, to include, but not be limited to, MOX, and to take into account the investments made to date in the MOX program. It did not, however, authorize cold storage. What are the plans for the $343 million appropriated in fiscal year 2014? On the same topic, what does the fiscal year 2015 budget mean by "cold storage"?

Mr. HELD. Okay. Sir, you can absolutely trust that we will obey the law of the land. You can absolutely trust on that.

What the strategic study has laid out for us is a good-government problem. We have invested $5 billion in the facility at SRS. The remaining full lifecycle cost for the whole mission is another $25 billion. The question is, is there an alternative that can achieve that mission that costs less than $25 billion? If there is, then it would be a wise use of the taxpayers' money to pursue that. If there is not, then what we should be doing is trying to drive down the cost of the MOX project as much as possible. That is where we are at, at this point. There has been a very thorough, clear-eyed study of these options, done by John MacWilliams, the senior advisor to Secretary Moniz. We really need to get that study to you as soon as possible so that we can all make a good-government decision, sir.

Senator UDALL. I have one final question.

Mr. HELD. Yes, sir.

Senator UDALL. NNSA's nonproliferation program seems to be wrapping up a number of efforts, but proposing little, if any, new ones. In my opinion, there's no shortage of activities to help stem the use of hostile use of nuclear material. You all are experts when it comes to responding to nuclear incidents. Wouldn't it be a wise

investment of the funds we've spent developing this capability to train first responders and law enforcement officials in other nations in some of the capabilities we've developed to date? It seems to me like that would strengthen an overall international capacity to detect and respond to nuclear incidents. We have a national capacity, but how about applying that to the international scene?

Mr. HELD. Yes, sir. Instinctively, I am totally in agreement, sir. I think what we need to do across the nonproliferation accounts is look and take a step back—because we made a lot of progress over the last 40 years. Now we're in different budgetary environment, and I think we need to step back. Do we need to tweak the strategy a little bit to get the higher return for the taxpayers' dollar? Can we get greater synergies between nonproliferation and civil nuclear energy? This leads to the small modular reactor issue. Can we get greater synergies between the weapons program and the nonproliferation program and to get greater return for the taxpayers' dollar? That is what we are trying to do. GAO is going to be looking at this. One of the committees has asked GAO to do this. Let's step back and take another look. The Secretary has asked the Advisory Board to do that same thing, to give us some outside help. In a period of tight budgets, is there a better way we can achieve this mission with more effective use of the taxpayers' dollar?

Senator UDALL. Thank you, Mr. Held.

Let me recognize Senator Vitter.

Senator VITTER. Thank you, Mr. Chairman.

Thank you, Mr. Held.

Mr. HELD. Sure.

Senator VITTER. Mr. Held, I want to refer to this chart again. The top of the chart, under the light blue, is fiscal year numbers that were committed to by all the parties as part of the discussion of the New START treaty. Particularly for fiscal years 2012, 2013, and 2014, would you say these numbers started out being inflated or having a lot of cushion or being fake in any way?

Mr. HELD. No, sir. I think what we're all trying to do together is fit into a tighter—a changed budgetary environment, and do that in the most rational, good-government possible way.

Senator VITTER. Right. Under the top line, which were the commitments made, we have the actual appropriations. Of course, these first 3 years, they fall well short, which is the third line, in red, the difference, so almost $.4 billion the first year, almost $1 billion the second year, short; two-thirds of $1 billion short, fiscal year 2014, the third year. Just those first 3 years, that adds up to a $2-billion shortfall. I assume you'd agree, that's significant shortfall from the initial goals.

Mr. HELD. You combine that, you combine——

Senator UDALL. If I could interrupt for just 1 minute.

Mr. HELD. Yes, sir.

Senator UDALL. There's been a vote called. I am going to ask Senator Vitter if he would stay in place and continue his questioning. I will hurry and vote and be back.

Senator VITTER. Okay.

Senator UDALL. I will trust you to keep the subcommittee on the straight and narrow. [Laughter.]

Senator VITTER. Okay. I'll take care of some legislation and do some other business and——[Laughter.]

Senator VITTER [presiding].—await your return.

Again, I just want to underscore, these numbers were part of a lot of discussion that was in the middle of passing New START. Those commitments were absolutely at the middle of passing New START, and very much a part of the reason some folks voted yes. I voted no. But, they were certainly at the heart of the reason many folks voted yes. I just want to underscore, we're falling well short, already.

Now, you talked about a significantly tougher budget environment. I would just suggest this wasn't the 19th century when we talked about this; it was a few years ago. We knew the budget environment was tough. Nothing has fundamentally changed. We knew this was a very tough environment, so I don't think there has been any fundamental shift.

Mr. Held, in a recent letter to Congress, Frank Kendall, Chair of the NWC, noted, "As you are aware, several risks have been identified that may affect realization of this strategy and NNSA's ability to execute the Stockpile Stewardship and Management (SSMP), as written, including a shortfall in out-year funding and the failure to achieve assumed savings through management efficiencies and workforce prioritization actions."

Would you agree with that cautionary warning? Could you identify some of the risks to executing your mission if these shortfalls were to continue?

Mr. HELD. Yes, sir. I think, in the fiscal year 2015 SSMP, which has just been delivered to Capitol Hill, on the first page you get a graphic showing the modifications in our weapons, the implementation of the 3+2 strategy. We are still with the 3+2 strategy, but we've flattened it out, for budgetary reasons.

If more budgetary tightening constraints are applied, we will break the 3+2 strategy. We will break the 3+2 strategy. That will have implications for our nuclear deterrent, and it will also have implications for our ability to reduce the size of the stockpile. The 3+2 actually knits those two missions together. We have a safe, secure, and reliable deterrent based on a smaller number of nuclear weapons. We have more budgetary tightness, that program is at risk. Yes, sir.

Senator VITTER. Let's say, just for the sake of discussion, this first 3-year experience, $2 billion short, let's say we did that again in the next 3 years. I assume that would certainly cross the line you're talking about.

Mr. HELD. That will put the Nation in a very difficult position, yes, sir.

Senator VITTER. Even if we did half of the shortfall—let's say, $1 billion short in the next 3 years—and I would note that, in contrast to that, fiscal years 2016 and 2017, we're supposed to be ahead, trying to make up ground—ahead of the original commitments, trying to make up for the last few years. But, let's say 2015, 2016, 2017, we're $1 billion short of the original commitments, the top line. I assume that would be serious.

Mr. HELD. It would be serious, my close colleagues in DOD will focus first on the weapons side. Most certainly we will do that, as

well. An area of increasing concern for me is nuclear safety. Our infrastructure, our—enriched uranium in Oak Ridge is 70 years old. We can't wait until 2038 to get new facilities. The same thing with plutonium. So, nuclear safety is an increasing concern of NNSA, sir.

Senator VITTER. Okay. Again, I want to underscore the second half, the lower half of the chart is the results of these number shortfalls, funding shortfalls, specific delays, which are already here because of the first 3-year experience; but I assume you'd agree, going beyond those five delays to further delays, further shortfalls would be very serious.

Mr. HELD. The implementation plan that's in the current SSMP is referred to as the Deputy Managers Action Group (DMAG) option 1. Both DOD and DOE are quite firm that DMAG option 1 that's articulated in the fiscal year 2015 SSMP is really pretty rockbottom for us.

Senator VITTER. Okay.

Mr. HELD. It still meets the mission, our mission requirements, but we're rockbottom at this point.

Senator VITTER. Right.

Final thought, Mr. Held. In terms of nuclear modernization, the President has pretty much drawn a red line, said "No development of new nuclear weapons." If that were not a policy and we were just setting about to achieve our deterrent and strategic objectives in the best, safest, most cost-effective manner possible, would we only talk about modernizing existing nuclear weapons, or would we possibly talk about developing new, safer, more technologically advanced nuclear weapons to achieve those objectives?

Mr. HELD. The plans that we have in the 3+2 strategy meet our nuclear deterrent requirements and meet our safety and security requirements. So, the 3+2 strategy will——

Senator VITTER. I am glad they do, but that's not answering my question.

Mr. HELD. Right.

Senator VITTER. My question is, if we didn't have this doctrine, "No new weapons," would we try to meet those requirements potentially in a different way?

Mr. HELD. I think, under the Nuclear Posture Review, it's very important to make sure that we link the nuclear weapons mission with the nonproliferation mission. That's been one of the tradeoffs that—or the compromises that we've made to make sure that there is a nuclear security mission that we are achieving, which we think we're doing. The 3+2 strategy, we sincerely believe meets our weapons commitments as well as our nonproliferation and arms-control commitments.

Senator VITTER. Okay. Great. A second different way of not answering the question, but I'll move on.

I am concerned that we have a requirement, which I think is still the military requirement, of 50 to 80 plutonium pits per year, but now we're basically talking about 30, with no plan in sight to go beyond that. What are we sacrificing at 30, and when might we have a plan in sight to go from 30 to 50 to 80, which is the requirement?

Mr. HELD. We are not sacrificing anything in nuclear deterrence, actually. The very good scientific and technical work has—a high level of confidence tells us that the—some of our existing systems are aging quite gracefully, more gracefully than we thought, actually. So that the delay of the interoperable number 1 for 5 years does not have a mission impact, in terms of——

Senator VITTER. I don't want to interrupt, and I'll give you plenty of time, but wasn't part of the idea behind the requirement—50 to 80 requirement, flexibility and potential to surge, if that was ever necessary, with changing circumstances?

Mr. HELD. Correct. Yes, sir.

Senator VITTER. Don't you think we're sacrificing something there?

Mr. HELD. It comes down to the timing of the various mission requirements. The pit production capacity is really tightly linked to the Interoperable Warhead (IW)–1 needs. The IW–1, from purely a deterrent strategy—and this is a NWC decision, this is not mine or NNSA, specifically—but, because of the graceful aging of the weapons, the urgency of the IW–1 is urgent, and the reduced urgency of the IW–1 reduces the urgency of the 50 to 80 requirement. It doesn't eliminate the 50 to 80 requirement, but we have a little bit more time to get there.

Senator VITTER. Okay, thanks. I am going to have to run to go vote, but I would still suggest we have less cushion, less ability to surge, less ability to react to changes around the world.

Mr. HELD. I would agree with that.

Senator VITTER. I would suggest recent events with Russia, for instance, suggest that changes around the world may be more the norm than the exception.

Mr. HELD. I hear you, sir, and I would instinctively agree. I think we need to be careful about these things.

Senator VITTER. Thank you.

Mr. HELD. Thank you, sir.

Senator UDALL [presiding]. Thank you, Senator Vitter.

Mr. Held, thank you for your professionalism and for your thorough responses.

Mr. HELD. Thank you, sir.

Senator UDALL. I am going to dismiss you and we wish you all the best of luck.

Mr. HELD. Thank you, sir.

Senator UDALL. We'll call the second panel. [Pause.]

Gentlemen, good afternoon. We just had a vote on the floor. There may be subsequent votes. In that spirit, I am going to ask each of you to be as concise as you could be. Of course, we'll put your entire statement in the record. The reason I asked for you to consider short statements is so we can turn to some questions and give-and-take between the subcommittee and the three of you.

So with that, let me start by recognizing Admiral Richardson. Welcome to the subcommittee.

STATEMENT OF ADM JOHN M. RICHARDSON, USN, DIRECTOR, NAVAL NUCLEAR PROPULSION PROGRAM, AND DEPUTY ADMINISTRATOR, OFFICE OF NAVAL REACTORS, NATIONAL NUCLEAR SECURITY ADMINISTRATION, DEPARTMENT OF ENERGY

Admiral RICHARDSON. Thank you, Mr. Chairman.

It's a privilege to testify before you and the subcommittee once again. I am very grateful for the consistent and strong support of this subcommittee for Naval Reactors. I look forward to the discussion of our fiscal year 2015 budget request.

My 2015 budget request, at $1.4 billion, enables me to meet my primary responsibility to ensure safe and reliable operation of the Nation's nuclear-powered fleet. My fiscal year 2015 request is $282 million higher than my 2014 appropriation. This increase directly supports our increased workload, including three discrete national priority projects and sustaining the program's technical support base. The three projects include designing a new reactor plant for the *Ohio*-class ballistic missile submarine replacement, refueling a research and training reactor in New York, and replacing the spent-fuel handling facility in Idaho. The funding for the program's technical base, about $950 million, is absolutely essential, providing for resolution of emergent fleet issues, spent nuclear fuel management, technology development, and operation of the prototype research and training reactors. It also provides my foundational capabilities, such as security, environmental stewardship, and laboratory facilities. In short, my technical base at my laboratories is the intellectual engine that drives safe, reliable, and responsible operation of the nuclear-powered fleet, past, present, and future.

$156 million of my fiscal year 2015 request funds the new reactor plant for the *Ohio*-class replacement submarine. This new propulsion plant includes a reactor core designed to last the entire lifetime of that ship, 42 years, without needing to be refueled, and will save the Navy over $40 billion in lifecycle costs.

The request for refueling and overhaul of our land-based prototype is essential to providing the technologies for the life-of-ship core, as well as training about 1,000 nuclear operators per year for the next 20 years.

The fiscal year 2015 request for the spent-fuel handling recapitalization project, about $145 million, is required to refuel aircraft carriers and submarines, providing a safe and effective means of processing and putting their spent fuel into dry storage. The existing expended-core facility is close to 60 years old, is the oldest spent-fuel pool of its type in the country. It's showing its age, including leaking walls and cracked floors. While operated safely and responsibly, that's getting harder every year. The new project has already been delayed by 4 years, requiring that I purchase $350 million of temporary storage containers that I do not otherwise need. Without funding a New START authority in fiscal year 2015, I fear this project will be delayed indefinitely, incurring further unnecessary costs of at least $100 to $150 million a year for further temporary storage.

Mr. Chairman, at the fiscal year 2015 requested funding level, Naval Reactors can safely maintain and oversee the nuclear-pow-

ered fleet. We can be good stewards of the health of our people and the environment. We can make critical progress on the Nation's future strategic deterrent. We can continue to deliver trained operators to the fleet. We can renew progress on the spent-fuel handling facility and keep our submarines and carriers at sea. Most importantly, we'll be able to attract and retain the incredible people that design, operate, and maintain the Nation's nuclear-powered fleet. Without them, we can do nothing meaningful. With them, the possibilities are endless.

With the sustained support of this subcommittee to our work, I will continue to lead my team to execute our work on time and on budget, and will search tirelessly for the safest and most cost-effective way to support the Nation's nuclear-powered fleet.

I thank you again. I am ready to respond to questions.

[The prepared statement of Admiral Richardson follows:]

PREPARED STATEMENT BY ADM JOHN M. RICHARDSON, USN

Naval Reactors' request for fiscal year 2015 is $1.377 billion, an increase of $282 million (26 percent) over the fiscal year 2014 enacted funding level. The requested funding permits Naval Reactors to support the design, construction, operation, maintenance and disposal of the U.S. Navy's nuclear-powered fleet. This Fleet includes 55 attack submarines, 14 ballistic missile submarines, 4 guided missile submarines, and 10 aircraft carriers, or over 40 percent of the U.S. Navy's major combatants. The program also operates 2 nuclear powered land-based prototypes to conduct research and development, and when coupled with 2 Moored Training Ships, train over 3,000 sailors per year for entry into the nuclear fleet. Over 15,000 nuclear-trained Navy sailors safely maintain and operate the propulsion plants in nuclear powered warships, which operate in support of U.S. national interests.

The fiscal year 2015 budget request supports three national priority projects and the technical support base. The projects are:

- Designing a new reactor plant for the *Ohio*-class SSBN Replacement
- Refueling the Research and Training Reactor in New York
- Recapitalizing the spent fuel handling infrastructure in Idaho

Naval Reactors has requested an increase in funding in fiscal year 2015 to support these projects, and to fund necessary maintenance, equipment, construction, and reactor technology development in the technical support base that have been delayed or deferred due to appropriation shortfalls over the last 5 years.

Supporting the nuclear-powered fleet to safely and reliably protect our national interests while forward deployed requires that Naval Reactors maintain a substantial technical base—laboratories, training reactors and spent fuel handling capability—to anticipate and immediately respond to fleet problems before they become operationally limiting. This technical base thoroughly and quickly evaluates all fleet technical issues that arise while also supporting design, manufacture, operation, maintenance, and development of improved technologies. Ultimately, this technical base and laboratory infrastructure ensures the safety of the crew and the public without impacting the mission of our nuclear-powered fleet. Uncompromising and timely support for safe nuclear fleet operation continues to be the highest priority for Naval Reactors.

Over the last 5 years, Naval Reactors' appropriation has been below requirements by over $450 million. For example, in fiscal year 2014, Naval Reactors was funded $151 million below the request. As a result, Naval Reactors will be required to shut down one of the two prototype reactor plants in up-State New York during the second quarter of fiscal year 2015 due to insufficient maintenance funding. This shutdown results in 450 sailors that will not be trained and will not be sent to the Fleet next year. This directly translates to more work at sea and in port for our nuclear-trained sailors further stressing them and their families. This reactor will remain shut down until this maintenance can be performed. The funding shortage has also made impossible the purchase of vital capital equipment and postponed infrastructure improvements, most notably defunding High Performance Computing capacity that is needed to deliver the *Ohio*-class Replacement reactor design on time and to support the existing fleet. Cancelling this computer purchase in fiscal year 2014 has resulted in at least a 6-month delay to reactor core manufacturing, impacting the *Ohio*-class replacement lead-ship construction schedule.

Another portion of the requested increase in funding is required to support an increased level of effort for designing a new reactor plant for the *Ohio*-class SSBN Replacement. Activity this year includes reactor plant design and component development to support procurement of long lead components starting in fiscal year 2019. Progress in these areas in fiscal year 2015 will ensure the cost of those components is controlled as the program moves forward to construction beginning in fiscal year 2021.

Related to *Ohio*-class Replacement, the fiscal year 2015 request continues to progress the Land-based Prototype Refueling Overhaul in up-State New York. In fiscal year 2014 and fiscal year 2015, Naval Reactors continues the core manufacturing development work needed for the Refueling Overhaul which also enables timely construction of the life-of-ship core for *Ohio*-class Replacement and reduces cost and schedule risk. Further plant service life engineering design will be completed in fiscal year 2015 to ensure that the Land-based Prototype plant overhaul, performed concurrently with refueling (that starts in fiscal year 2018), supports 20 additional years of research, development and training in up-State New York.

In addition to underfunding operations and infrastructure activities described above, the fiscal year 2014 appropriation again provided no funds to initiate preliminary design for the Spent Fuel Handling Recapitalization Project (SFHP). This project, already delayed by 2 years, is needed to replace the aging facility in Idaho that processes our spent naval nuclear fuel from aircraft carriers and submarines. This processing includes receipt, preparation, temporary storage, and packaging of naval spent nuclear fuel for dry storage and disposal. The new SFHP is urgently required for three primary reasons:

1. The existing Expended Core Facility (ECF) is more than 55 years old and the water pool that stores naval spent nuclear fuel is the oldest pool of its type in the Nation. This old facility is showing accelerating signs of deterioration, including leaking water pool walls and cracked floors. While the ECF continues to be maintained and operated in a safe and environmentally responsible manner, repair and refurbishment actions required to sustain operations in the ECF are costly and becoming more expensive each year. The risk associated with the degrading condition of the ECF is exacerbated, not only by the delay in bringing on the new SFHP facility, but also because the fiscal year 2014 shortfall in operations and infrastructure reduced funding for maintenance on the existing ECF. Any disruption to operations in processing naval spent nuclear fuel at the ECF would require costly and timeconsuming emergent measures, and would directly impact Naval Reactors' ability to support the Navy's nuclear-powered fleet refueling and defueling schedules.
2. The new SFHP facility is required to receive, prepare, temporarily store, and package full-length aircraft carrier spent nuclear fuel. The current ECF facility cannot handle this fuel. In order to prevent impact to the operating fleet due to the delay in bringing SFHP on line, the Navy must procure extra, otherwise unnecessary, M–290 shipping containers that will be used to temporarily store naval spent nuclear fuel, to return aircraft carriers to sea until the new SFHP can be built. In addition to inherent cost increases associated with delaying the SFHP by 2 years these extra containers will cost $200 million.
3. The SFHP is required to ensure Naval Reactors meets its commitments to the State of Idaho for processing spent naval nuclear fuel. Without this new facility, Naval Reactors' ability to process fuel in the timeframe directed by agreements with the State will be jeopardized.

The fiscal year 2015 request for the SFHP—$145 million—is essential to the operational availability of aircraft carriers and submarines. Without new start authority and funding in fiscal year 2015, the project will be further delayed, requiring extended operation of an aging facility and incurring additional unnecessary shipping container costs of approximately $100 million–$150 million for each year of delay.

At the requested funding level, Naval Reactors can safely maintain and oversee the nuclear-powered fleet. Naval Reactors can also continue to progress the *Ohio*-class Replacement and Land-based Prototype Refueling Overhaul, renew progress on the Spent Fuel Handling Recapitalization Project, and maintain its environmental responsibilities.

Naval Reactors has a history of fiscal responsibility in its day-to-day operations, and continues to look for cost saving initiatives to further drive financial efficiencies at its laboratories. For example, Naval Reactors consolidated its laboratory and procurement prime contractors into single contracts, resulting in savings of $24 million per year. Naval Reactors developed a more efficient assembly process for the USS *Gerald R Ford* reactor core, saving $50 million in ship construction. Careful maintenance of refueling equipment has enabled Naval Reactors to save $19 million in re-

purchases that would have been required for the upcoming prototype refueling. Aggressive management has enabled Naval Reactors to save $6 million over the life of a Major Construction Project in Idaho, and we look forward to similar successes in other construction projects. Finally, the new life-of-ship core that will fuel the *Ohio*-class Replacement will enable the Navy to save an estimated $40 billion over the life of that class of ships. The continued cost performance and cost reduction is greatly enhanced by stability and sustained commitment to these long-term, multi-year efforts. The uncertainty and instability of the past years has resulted in significant disruption, distraction, and increased costs. Full funding in fiscal year 2015 would send a strong signal about the commitment to the critical work Naval Reactors is planning to perform.

With the help of Congress, Naval Reactors is committed to executing our projects on time and on budget, and to continue to search for the safest and most cost effective way to support the nuclear fleet.

Senator UDALL. Thank you, Admiral Richardson.

Dr. Cook.

STATEMENT OF HON. DONALD L. COOK, DEPUTY ADMINISTRATOR FOR DEFENSE PROGRAMS, NATIONAL NUCLEAR SECURITY ADMINISTRATION, DEPARTMENT OF ENERGY

Dr. COOK. Chairman Udall, in respect to the time, I am going to sharply abbreviate my remarks.

I'd like to point out, it is worth noting the President's budget request of $6.9 billion for Defense Programs' portion of the weapons activities account includes an increase of $500 million, or 7.8 percent over fiscal year 2014 enacted levels, despite the fiscal constraints of the BBA. I'd like to very quickly emphasize where we're going with the 3+2 plan that Mr. Held laid out, supported by U.S. Strategic Command, the NWC, and all of its entities.

Today, we're continuing our work on production of the W76 life extended warheads. We will complete that work by the end of fiscal year 2019. The B61–12—mod 12 SLEP—is on track. It's now in the third year of full-scale engineering, and it is proving to be very highly successful, to date. In the budget request, the budget that we have will now begin to ramp up initial production at the NNSA production plants, preparing for preproduction engineering activities in fiscal year 2016, leading to a first production unit in March 2020.

Finally, the W88 alt 370, an alteration that updates the Army fuzing and firing unit, is also progressing well for the Navy.

While I could go further, I'll say we have clear actions undertaken in infrastructure and development. I'd like only to highlight that, although we talk about responsive infrastructure, what we are most interested in moving is a responsive enterprise that includes the human element as well as the infrastructure.

With that, I am happy to take questions.

Senator UDALL. Dr. Cook, thank you so much.

Mr. Owendoff.

STATEMENT OF JAMES M. OWENDOFF, ACTING PRINCIPAL DEPUTY ASSISTANT SECRETARY, OFFICE OF ENVIRONMENTAL MANAGEMENT, DEPARTMENT OF ENERGY

Mr. OWENDOFF. Good afternoon, Chairman Udall. I want to thank the subcommittee for their support for the EM cleanup program. I, too, will be short, sir.

Our request is for $5.3 billion for defense-funded activities. It will allow the EM program to continue the safe cleanup of the environmental legacy brought about from 5 decades of nuclear weapons development and government-sponsored nuclear energy research.

The President's budget request will provide for treatment of 900,000 gallons of liquid waste at our Idaho facility; continue construction of the Waste Treatment Plant at the Hanford site; at Oak Ridge, it will allow us to begin design on mercury cleanup; and, at the SRS, we will immobilize and dispose of 1 million gallons of liquid tank waste and bring the site's high-level waste mission to approximately 50 percent completion.

EM continues to pursue the cleanup on three overarching principles. Safety is first, then our commitment to our regulatory commitments, as well as good stewards of the financial resources.

I want to give you just a quick update on the situation at the WIPP. As you mentioned, Mr. Chairman, there have been two recent safety events at the plant. The first occurred on February 5, when the flammable residues on the surface of a salt truck caught fire; a second, which occurred late on the night of February 14, was a radioactive contamination event in which some contamination became airborne underground. Although no one has been harmed by either event, we take both very seriously and are committed to identifying, acknowledging, and fixing any underlying shortfalls in our policies and processes.

In the meantime, the contamination event has the potential to affect other DOE sites that are preparing their transuranic waste for disposal at WIPP. We are working to assess the potential impacts and make contingency plans to mitigate those impacts, if necessary.

For a status, we are fulfilling our commitment to the State of New Mexico to ship transuranic waste from the mesa to the staging storage facility in Texas. We have also made several entries into the underground to begin assessment of the contamination levels. We are proceeding in a disciplined manner to ensure the health and safety of the public and the workers.

In closing, I want to thank the subcommittee for their time. I want to acknowledge, certainly, the significant progress that we've made in the last quarter century in the cleanup program.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Owendoff follows:]

PREPARED STATEMENT BY MR. JAMES M. OWENDOFF

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 you with an overview of the EM program, key accomplishments during the past year and what we plan to accomplish under the President's $5.62 billion fiscal year 2015 budget request.

OVERVIEW OF THE ENVIRONMENTAL MANAGEMENT MISSION

EM's mission is to complete the safe cleanup of the environmental legacy resulting from 5 decades of nuclear weapons development and government-sponsored nuclear energy research. This year is an important milestone year for EM. Fiscal year 2014 marks 25 years of solving the legacy environmental problems from the Manhattan Project and Cold War. This environmental legacy includes over 90 million gallons of radioactive wastes stored in aging tanks, thousands of tons of spent (used) 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. EM was originally charged with the responsibility of cleaning up 107 sites across the country with a total area equal to Rhode Island and Delaware combined.

In the 25 years since it was created, EM has made significant progress in this cleanup mission, completing 91 sites and significant portions of the remaining 16. Since 1989, EM has completed almost $144 billion worth of cleanup work. Sites like Fernald in Ohio and Rocky Flats in Colorado, both of which once housed large industrial complexes, are now wildlife preserves that are also available for recreational use. At the Idaho National Laboratory, we have decommissioned and demolished more than 2 million square feet of excess facilities, and removed all EM special nuclear material (e.g., enriched uranium) from the State. At Savannah River, we have produced over 3,700 canisters of vitrified high-level waste and closed 6 of the site's underground storage tanks.

Across the EM complex, our progress in footprint reduction is significant. Since EM began tracking this performance goal in 2009, we have achieved a footprint reduction of roughly 74 percent. We began tracking with approximately 931 square miles. Now, we are down to less than 300 square miles. Progress continues. These are just a few examples of our significant achievements over the past quarter century.

ENVIRONMENTAL MANAGEMENT CLEANUP OBJECTIVES AND PRIORITIES

EM continues to pursue its cleanup objectives guided by three overarching principles. Most importantly, EM will continue to discharge its responsibilities by conducting cleanup within a "Safety First" culture that integrates environmental, safety, and health requirements and controls into all work activities. We are proud of our safety record, which shows injury rates that are significantly lower than the averages in comparable industries; these rates continue to fall thanks to ongoing efforts to strengthen our organizational safety culture.

After safety, we are guided by a commitment to comply with our regulatory and other legal obligations, and to be good stewards of the financial resources entrusted to us. We manage these priorities within a framework of nuclear safety orders, legally binding cleanup agreements, and best business practices. We focus the majority of our resources on the materials that contain the highest concentrations of radionuclides and other hazardous materials and wastes. In addition to these priorities, EM is committed to investing in the development and deployment of sound technology as a way to reduce costs and fulfill our critical mission.

Before discussing key recent and planned accomplishments, I want to update you on the situation at the Waste Isolation Pilot Plant (WIPP) in New Mexico. As I am sure you know, we have had two recent safety events at WIPP. The first occurred February 5 when flammable residues on the surface of a salt truck came into contact with a heat source and ignited. The second, which occurred late on the night of February 14, was a radioactive release event at WIPP, in which some contamination, primarily americium, became airborne underground. The facility is equipped with a continuous air monitor, which detected the contamination and triggered the underground ventilation system to begin filtering air before it left the underground facility. The filters are performing as designed.

To date, preliminary sampling results taken from on and around the site indicate the underground contamination event has not created any health risks for workers or the public. This includes those workers who tested positive for contamination, which was slightly above normal background levels. On April 2, we sent two successive teams into the WIPP underground to conduct preliminary investigations in a portion of the non-disposal area. As anticipated, the teams found no contamination in the immediate area. This was an important step toward additional entries into the mine to allow for further exploration. In the meantime, the event has the potential to affect other DOE sites that were preparing transuranic wastes for disposal at WIPP. We are working to assess potential impacts and make contingency plans to mitigate those impacts to the extent possible.

We take both events very seriously and are committed to identifying, acknowledging and fixing any underlying shortfalls in our policies and processes. I am proud of the way the DOE team is responding to these events. In the wake of the radioactive release event, everyone has been working together to assess the situation, develop solutions and identify the lessons that can be learned.

KEY RECENT AND NEAR-TERM ACCOMPLISHMENTS

I would like to take this opportunity to highlight a number of EM's most recent accomplishments, as well as those we plan to accomplish in the remainder of fiscal year 2014.

Cleanup Activities

We continue to make significant progress in our transuranic waste disposal program. For instance, in 2013 we shipped approximately 2,500 cubic meters of transuranic waste to WIPP from the Idaho National Laboratory's Advanced Mixed Waste Treatment Project, which has logged more than 15.1 million work hours since the last injury or illness resulting in time away from work. WIPP has now received more than 11,000 shipments and permanently disposed of more than 89,000 cubic meters of transuranic waste. At the Savannah River Site, we have produced over 3,700 canisters of vitrified high-level waste, converting it to a solid-glass form safe for long-term storage and permanent disposal. We have now completed over 45 percent of the site's high-level-waste mission, and recently closed two more underground storage tanks a year ahead of schedule, bringing the total number of closed tanks to six.

Contract and Project Management

Our cleanup progress depends in large part on a broad array of contractors, as well as the successful planning, construction and operation of large, often first-of-a-kind, projects and facilities. We continue to emphasize continuous improvement in our contract and project management by, for example, requiring more upfront planning, ensuring Federal project directors and contracting officers are well trained, improving our cost-estimating capabilities, conducting more frequent project reviews, selecting proper contract types, and tying fees to final outcomes. Our efforts continue to generate significant, positive results. For instance, we negotiated a contract modification for the Salt Waste Processing Facility at the Savannah River Site that includes a cap on completion costs, provides incentives for cost savings, and gives DOE a share of any savings achieved. In a separate project at the Savannah River Site, we recently completed two additional low-level salt-waste disposal units 7 months ahead of schedule and for $8 million less (about 10 percent) than the anticipated total cost of $76.5 million. We are improving our management of the Waste Treatment and Immobilization Plant (WTP) project at Hanford, including holding the contractor accountable for self-identification of issues to help ensure resolution as early as possible.

HIGHLIGHTS OF THE FISCAL YEAR 2015 BUDGET REQUEST

The fiscal year 2015 budget request for EM is a net $5.62 billion. The request includes the proposed reauthorization of the Uranium Enrichment Decontamination & Decommissioning Fund and the defense deposit of $463 million. The budget request for EM is comprised of $4.86 billion for defense environmental cleanup activities (not including the fund deposit of $463 million), $226 million for non-defense environmental cleanup activities, and $531 million for Uranium Enrichment Decontamination and Decommissioning Fund cleanup activities. With the requested funding, the EM program will continue making progress in the radioactive liquid waste treatment program, approach a successful end to the legacy transuranic waste mission, and continue to make significant progress in the decontamination and demolition of the thousands of buildings and supporting infrastructure that occupy our remaining cleanup sites.

To provide just a few specific highlights, under the President's fiscal year 2015 budget request the EM program will complete the treatment of 900,000 gallons of liquid radioactive waste at Idaho, emptying the last 4 of the site's aging waste storage tanks. The fiscal year 2015 budget request supports the ongoing construction of the Waste Treatment and Immobilization Plant (WTP) to process and immobilize the Hanford tank waste in a solid glass form safe for permanent disposal. Consistent with the Department's objective to immobilize waste as soon as practicable while resolution of technical issues continues, the fiscal year 2015 budget includes support for analysis and preliminary design of a Low Activity Waste Pretreatment System.

At Hanford, we will complete cleanup of the bulk of the River Corridor's more than 500 facilities, leaving the 324 Facility, as well as the 618–11 Burial Ground and 300–296 Waste Site, as the primary remaining cleanup projects to be addressed after fiscal year 2015. Depending on our ability to restore full operations at WIPP quickly or institute other mitigation measures, we will also achieve significant milestones in the legacy transuranic waste program, pursuing 100 percent completion

at Savannah River and reaching 90 percent completion at Idaho, 88 percent completion at Oak Ridge, and 77 percent completion at Los Alamos.

Budget Authority and Planned Accomplishments by Site

Idaho National Laboratory, ID

[In thousands of dollars]

Fiscal Year 2014 Enacted	Fiscal Year 2015 Request
$391,993	$372,103

Key Accomplishments Planned for Fiscal Year 2015

• Complete the treatment of 900,000 gallons of sodium-bearing radioactive waste, the last of the radioactive liquid waste at the Idaho site
• Initiate activities to clean and close the last four of the site's radioactive liquid waste tanks
• Complete the exhumation of transuranic waste in the seventh of nine areas in the subsurface disposal area and ship the waste to the Waste Isolation Pilot Plant, achieving a completion rate equal to about 58 percent of the project's total land area
• Continue processing contact-handled transuranic (CH–TRU) waste at the Advanced Mixed Waste Treatment Project, bringing total CH–TRU prepared in fiscal year 2015 for offsite disposal to 4,500 cubic meters
• Continue groundwater monitoring and subsurface investigations, analyzing contaminants and transport mechanisms to the Snake River Aquifer
• Continue retrieval and onsite transfer of Experimental Breeder Reactor II fuel and receipt of Domestic Research Reactor and Foreign Research Reactor Fuel

Oak Ridge Site, TN

[In thousands of dollars]

Fiscal Year 2014 Enacted	Fiscal Year 2015 Request
$429,541	$384,975

Key Accomplishments Planned for Fiscal Year 2015

• Continue shipments expected to begin later this fiscal year to Nevada of Consolidated Edison Uranium Solidification Project material from the uranium-233 inventory in Building 3019
• Reach approximately 90 percent completion in the site's transuranic waste disposition mission
• Complete the preliminary design for the Outfall 200 Mercury Treatment Facility, while continuing to develop the techniques and technologies needed to characterize and remediate mercury in the environment
• Continue design and prepare for construction of the Sludge Buildout project at the Transuranic Waste Processing Center

Savannah River Site, SC

[In thousands of dollars]

Fiscal Year 2014 Enacted	Fiscal Year 2015 Request
$1,255,430	$1,282,302

Key Accomplishments Planned for Fiscal Year 2015

• Immobilize and dispose of 1,000,000 gallons of liquid tank waste
• Produce 120 to 130 additional canisters of vitrified high-level waste at the site's Defense Waste Processing Facility, bringing cumulative production to over 50 percent completion of the site's high-level waste mission
• Continue packaging and shipping surplus plutonium offsite
• Continue processing aluminum-clad spent (used) nuclear fuel in H–Canyon and begin processing Canadian Highly-Enriched Uranium Liquid
• Continue to receive non-U.S. origin material from foreign countries in support of the Global Threat Reduction Initiative program

• Continue receipt of Foreign Research Reactor/Domestic Research Reactor spent (used) nuclear fuel

Richland Operations Office, WA

[In thousands of dollars]

Fiscal Year 2014 Enacted	Fiscal Year 2015 Request
$1,012,620	$914,301

Key Accomplishments Planned for Fiscal Year 2015

• Complete the cleanup of the bulk of the River Corridor's more than 500 facilities, leaving the 324 Building, 618–11 Burial Ground and 300–296 Waste Site as the primary projects to be addressed after fiscal year 2015
• Continue progress toward Plutonium Finishing Plant cleanout and demolition to slab-on-grade
• Continue to conduct, integrate, and optimize site-wide groundwater and soil cleanup activities
• Continue operation of the Canister Storage Building and Waste Storage Encapsulation Facility
• Continue progress toward removal of contaminated sludge from the K West Fuel Storage Basin, including continued progress on the K West Basin Sludge Treatment Project line-item construction project
• Complete disposition of surplus facilities in the 300 Area (excluding 324 Building and ancillary buildings)

Office of River Protection, WA

[In thousands of dollars]

Fiscal Year 2014 Enacted	Fiscal Year 2015 Request
$1,210,216	$1,235,000

Key Accomplishments Planned for Fiscal Year 2015

• Continue construction of the Waste Treatment and Immobilization Plant (WTP) to immobilize waste as soon as practicable while resolution of technical issues continues
• Maintain planned construction of WTP's Low Activity Waste facility, Analytical Laboratory, and Balance of Facilities, and initiate design of the infrastructure required to feed tank waste directly to the facility
• Support analysis and preliminary design of a Low Activity Waste Pretreatment System
• Complete waste retrievals in the C Tank Farm

Los Alamos National Laboratory, NM

[In thousands of dollars]

Fiscal Year 2014 Enacted	Fiscal Year 2015 Request
$224,789	$224,617

Key Accomplishments Planned for Fiscal Year 2015

• Complete design of the hexavalent chromium pump-and-treat remedy project and begin Phase 1 operations
• Complete cleanup activities on public and Los Alamos County lands
• Obtain regulatory approval to start remedial projects in at least three on-site Material Disposal Areas (A, C and T) and complete remedial design for Material Disposal Area C
• Complete demolition of the balance of plant facilities at Technical Area 21
• Continue retrieving and processing transuranic waste from below-grade retrievable storage

Nevada National Security Site, NV

[In thousands of dollars]

Fiscal Year 2014 Enacted	Fiscal Year 2015 Request
$61,897	$64,851

Key Accomplishments Planned for Fiscal Year 2015

• Complete closure activities for 21 contaminated-soil sites
• Complete characterization activities for six additional contaminated-soil sites
• Support cleanup at multiple sites across the DOE complex by disposing of approximately 1,200,000 cubic feet of low-level and mixed low-level radioactive waste generated at those sites

Sandia National Laboratories, NM

[In thousands of dollars]

Fiscal Year 2014 Enacted	Fiscal Year 2015 Request
$2,814	$2,801

Key Accomplishments Planned for Fiscal Year 2015

• Finalize and submit to the New Mexico Environment Department a Class III permit modification for regulatory closure of the Mixed Waste Landfill and transfer the landfill to long-term stewardship
• Submit updated Technical Area V Current Conceptual Model/Corrective Measures Evaluation Report to the New Mexico Environment Department
• Install up to eight new groundwater-monitoring wells at the Burn Site

Lawrence Livermore National Laboratory, CA

[In thousands of dollars]

Fiscal Year 2014 Enacted	Fiscal Year 2015 Request
$1,476	$1,366

Key Accomplishments Planned for Fiscal Year 2015

• Complete the site-specific, baseline human-health risk assessment
• Complete groundwater-contamination fate-and-transport modeling
• Develop risk-based uranium cleanup standards for the Building 812 Operable Unit
• Evaluate available soil-remediation treatment technologies and develop remedial alternatives

Carlsbad Field Office, NM

[In thousands of dollars]

Fiscal Year 2014 Enacted	Fiscal Year 2015 Request
$221,170	$220,475

Key Accomplishments Planned for Fiscal Year 2015 (assuming timely restoration of normal operations)

• Support transport and disposal of remote-handled and contact-handled transuranic (TRU) waste at the Waste Isolation Pilot Plant
• Continue Central Characterization Project for TRU waste at Los Alamos National Laboratory, Idaho National Laboratory, Oak Ridge National Laboratory, and the Savannah River Site
• Maintain capability for receipt and disposal for up to 26 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 our 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. Our fiscal year 2015 request allows us to capitalize on our past investments and successes. We will make progress in the high-level-waste treatment mission, complete the cleanout and demolition of several major facilities across the complex, approach the end of our legacy transuranic waste disposition mission, and continue the significant progress we have made in the management of nuclear materials and remediation of contaminated soil and groundwater. I am pleased to answer any questions you may have.

Senator UDALL. Thank you, Mr. Owendoff.

Dr. Cook, let me start with you. I asked you this question a year ago, and I want to make sure we'll still get the same answer. We're embarking on a LEP of the B61 gravity bomb. The number of B61 weapons will be reduced by 50 percent, I think, if I am right, as a result of this LEP. Your estimate's on the order of $8 billion for the LEP, and the informal DOD estimate was $10 billion. Is the program cost still around $8 billion? Second, can you reduce the costs further? Then, third, is it adhering to schedule?

Dr. COOK. So, in order, the cost remains in the $8 billion range. I've signed out, at this point, three selected acquisition reports. These are required by Congress. They're quarterly reports. The number has not changed, and the schedule has not changed since the first. So, that stays on schedule.

You're correct that the result will be that we not only reduce the number of air-delivered bombs by a full factor of 2, but this sets the stage to retire the last of the megaton-class bombs in America's deterrent, the B83. Additionally, it will reduce the amount of special nuclear material in the air-delivered bomb leg by more than 80 percent. This comes back to Mr. Held's comment about the integration between defense programs and nonproliferation.

Have I answered everything you wanted?

Senator UDALL. I think you did, thank you.

Dr. COOK. All right.

Senator UDALL. Admiral Richardson, let me ask you a question tied to the Idaho National Laboratory. The Naval Reactors is proposing to replace the spent fuel handling facility at Idaho National Laboratory. Suggestions have been made that other spent fuel storage facilities at the Laboratory, such as the Idaho Nuclear Technology and Engineering Center (INTEC), can perform this mission. Could you explain whether this existing facility is suitable, or not, and why?

Admiral RICHARDSON. Thank you, sir.

In short, that existing facility is not currently suitable for the mission of handling spent fuel from our program. When we undertook this mission to consider options, the best way forward to recapitalize our spent fuel handling facility, we did that business case in 2009. We considered the full range of options at that time, including upgrading our existing facility or using other facilities, like the one at INTEC, which is the one you referred to. That analysis concluded that, by far, the most cost-effective way and the most effective from a process standpoint was to recapitalize the facility on our Naval Reactors facility on the Idaho National Lab. There would be significant modifications required if we were going to use an existing facility. The cost of those modifications would exceed the cost to do a new facility, and would require that we do

that work with radiological controls, which would increase the risk, as well. The business case pointed us to a new facility.

Senator UDALL. I'd follow up: When it comes to Idaho, have there been effects on the deployed nuclear fleet because of the delay in replacing the existing fuel handling facility in Idaho?

Admiral RICHARDSON. Sir, to date, we have managed those delays, but that has come at an increased cost. Instead of moving spent naval nuclear fuel into that facility, we have instead had to buy temporary storage containers that will hold that fuel until the new facility is built. That's about $100 million a year in cost for containers that I don't need. In short, we're at a position right now that it costs more to delay that facility than it does to just get on and do the work, because of these temporary containers.

Going forward, the other thing that we have to consider is, the current facility is aging, and as I said, it's one of the oldest facilities of its type, and, at some point, it's just going to be unsuitable for further operation. At that point, we will have no other way but to impact the fleet.

Senator UDALL. Let me turn to Mr. Owendoff. I wanted to ask you a little bit more detail about what's happened at WIPP. Do you believe, given the recent Accident Review Board's findings—was there adequate safety training of workers in the maintenance of equipment at WIPP?

Mr. OWENDOFF. No, sir, that has been demonstrated as being inadequate. That's one of the things that we have already started on, is the training of those individuals and going through and revamping all of our maintenance procedures and the safety culture, sir.

Senator UDALL. Referring to the same Accident Review Board, do you believe the Contractor Assurance System was effective at WIPP?

Mr. OWENDOFF. No, sir, it was not.

Senator UDALL. I would like to acknowledge the important role that WIPP played in the cleanup of the Rocky Flats Nuclear Facility, which is in my home State of Colorado. I also live within a few miles of that facility, so I know all of my neighbors appreciate the fact that the WIPP facility was brought online, that the State of New Mexico posts that important facility. Having said that, we have work to do, obviously, based on what happened.

Mr. OWENDOFF. Yes, sir, we sure do.

Senator UDALL. What the Review Board demonstrated.

Let me turn back to Dr. Cook. I want to ask you a question tied to the IW. I think you're proposing to delay the warhead by up to 5 years. This warhead was to combine the W88 submarine warhead with the W78 intercontinental ballistic missile warhead in order to reduce the total number of warheads in the stockpile. Can you explain why the delay occurred? By the time we're ready to start this program, we will have finished replacing the fuzes on the W88 submarine warhead, which is in relatively good shape. Given that, wouldn't it make more sense and be less expensive to consider simply life-extending the W78 warhead? So, two questions.

Dr. COOK. Sure. On the first question, it was a joint agreement at the NWC, followed by a meeting at the DOD DMAG. The set of agreements resulted in keeping the W76 life extension moving ahead at full speed, increasing the cost, year per year, but accord-

ing to the projection, so that we could execute the B61–12 life extension, because B61s are the oldest weapon system in our deterrent. Then, the third part, a strong commitment to doing, just as you say, the W88 arming, fuzing, and firing unit. But, given the amount of money that was available then, that required a deferral of the first interoperable by 5 years, and it required a deferral of the long-range strike option, or the cruise missile replacement, by a time of up to 3 years. So, that was a joint agreement.

Now, with regard to the W88, yes, we will be modernizing that, but through the surveillance program, we found that both the 78 and 88 are aging, as predicted. We have good stockpile stewardship tools. We believe those systems will be good out through 2030, and that's why we've set, collectively, the timing for the IW at that point.

A key part of the IW is to improve the safety. There was an earlier question. Given that we can put the 78 and 88 both on insensitive high explosives, that would be very strong and important improvement in safety.

Senator UDALL. Thank you for that update.

Admiral Richardson, let me come back to you to talk about the status of the *Ohio* ballistic submarine reactor. You're developing the reactor for the replacement to the existing fleet of *Ohio* submarines. I understand there might be delay of up to 6 months due to a funding shortfall. Could you comment?

Admiral RICHARDSON. Sir, I am managing a funding shortfall in my fiscal year 2014 budget. A portion of that total shortfall, which was $150 million, about $100 million of that was marked against my operations and infrastructure budget, and $11 million of that money prevented me from buying a high-performance computer that I had scheduled to buy in fiscal year 2014.

Part of the capacity of that high-performance computer was being allocated against the *Ohio* replacement reactor design. By virtue of being able to do more sophisticated modeling in that computer, we had saved about $40 million by avoiding building prototypes and doing actual testing.

By virtue of not being able to purchase that computer, I am about 6 months behind right now. If I get funded in fiscal year 2015, though, sir, I want to make it clear that I believe I can make that difference up, keep the project on schedule, be ready to award the building contract on schedule, and keep this top national priority on track.

Senator UDALL. Okay, thank you for that update.

Admiral RICHARDSON. Yes, sir.

Senator UDALL. Mr. Owendoff, let me come back to you and focus on whistleblowers at Hanford. I'd like your help here. Let me lay out the predicate. My understanding is that the contractors reimbursed for reasonable costs under the current contract structure at Hanford; for that matter, at most other cleanup sites. This seems to allow reimbursement of lawyers' fees in cases involving whistleblowers, which shifts the cost burden against them, since they have to pay for their own lawyers' fees. Do you have any recommendations for the subcommittee to make this burden equitable between parties?

Mr. OWENDOFF. Mr. Chairman, I think that's a question I need to take back. I know that's been a question before, and I know DOE is working on an answer for that issue, sir. So, if I could, I'll take it. I don't have any recommendations at this time.

[The information referred to follows:]

I understand that the General Counsel is undertaking a review of the Department of Energy's handling of whistleblower costs in a different context. We would be happy to share the results when it is complete.

Senator UDALL. If I might, let me stay on Hanford.

Mr. OWENDOFF. Yes, sir.

Senator UDALL. I felt, referencing Rocky Flats again, that because we were at the head of the line, we in Colorado would work with other States all over the country to help them in their cleanup efforts. Hanford is probably the most expensive, the thorniest, and the most technologically challenged, just due to the scale and also the effect on the Columbia River, potentially. That's not to downplay any of the other sites.

With that as a backdrop, it's my understanding you're now considering an option to treat low-level waste at Hanford, which comprises 90 percent of the bulk volume of the storage tanks—my understanding is, this will involve another pretreatment facility, in addition to the one that's already been under construction for the main facility. What's the status of the new pretreatment facility, and how much will it cost?

Mr. OWENDOFF. Sir, we submitted a data sheet for that, a construction data sheet for that, as part of the 2015 budget. There is a cost range that I want to say is about $300 million roughly.

Senator UDALL. Yes.

Mr. OWENDOFF. But, it's very small when you compare that to the main pretreatment facility that will serve as the bulk of the material. We believe that, by getting this first facility, the low-activity facility, which is the lowest in radioactivity level, we can get that up and running and start making glass. The next more complex facilities are the high-level waste and then the very large pretreatment facility.

We believe this is the right way to go, to get started. The Secretary is really pushing us to get that low-activity waste facility up and running, sir.

Senator UDALL. As a follow-on, more on the technological side, we're going to vitrify some fair amount of that waste? Is that the plan?

Mr. OWENDOFF. Yes, sir. In fact, it's about a 20 to 1 low activity that will stay on site vitrified. Then the high activity, which will go ultimately to a repository. So, that's a higher activity waste. Both will be vitrified into glass.

Senator UDALL. Dr. Cook, let me come back to you with a question about Los Alamos. We have worked, through the subcommittee and members of the full committee, to ensure we continue to develop a strategy to replace the plutonium facility at Los Alamos. It looks like, with the help of DOD, we have a way forward that would involve using smaller modules constructed in stages. I think the forecasts are, we could save several billion dollars. Are you committed to that approach? What stages do you still have to pur-

sue to begin construction of the smaller facilities? Then, when would construction begin?

Dr. COOK. Sure. We are committed to the overall approach. To run through it very quickly, the DOD Cost Assessment and Program Evaluation, with support by NNSA, went through a business-case analysis for the plutonium strategy. This was endorsed by the NWC. It has three phases:

The first phase, to provide capabilities in an existing building, brand-new, the radiation lab put additional tooling in that building to handle a large part of the analytic chemistry work.

The second phase is to do some retooling of the existing PF–4. We've determined that there are some missions that we no longer need; therefore, older contaminated equipment can be pulled out; and, with about a quarter of the space of that facility, we can put in new tooling that will support the preparation to make pits and some material characterization.

The third phase of that is to reduce the material at risk in PF–4. That will give us a longer lifetime of PF–4. But, to do that, we have to create some new special-purpose modules that would be placed adjacent to PF–4 and connected via tunnels.

The budget request in 2015 through 2019 supports that strategy. We are committed to the strategy. We'll take the first and second phases sooner than we take the third phase, but we will be doing some conceptual activity for the new modules that we require in concert with other two phases.

Senator UDALL. Thank you for that update.

Admiral Richardson, in February it was revealed that there was a cheating incident with instructors at the Naval Reactors Training Facility in South Carolina. Can you update the subcommittee on your investigation and the status of it and, if possible, how many persons are involved?

Admiral RICHARDSON. Yes, sir. In February, as you said, sir, we were disappointed to learn that we did have an incident with cheating among the instructors in our school in Charleston, in our training reactor.

Senator UDALL. Yes.

Admiral RICHARDSON. I took two immediate steps. First, was to ensure ourselves and the country that the reactors remain safe. We were able to do the analysis and convince ourselves beyond a shadow of a doubt that the reactors did remain safe. The second action I took was to dispatch an admiral to go down and lead the investigation. That investigation is complete, and has been forwarded to me. We're in the deliberative process of working through that investigation. Our way forward is really taking shape along three lines of effort:

The first line is just a purely technical effort. It should be near impossible these days to cheat on a written exam. The incident was limited to a written exam for one qualification down there. With encryption and password protection and those sorts of measures, it should be technically almost impossible to cheat on a written test these days. We're going to upgrade our technical program down there.

Second, there will be some accountability for those who exhibited misconduct. I am really not at liberty to talk about the numbers

at this point, because I am in the middle of that process. But, as soon as I get through that, I am committed to coming here and providing you an update. I will close that out with the final numbers.

The third and most important line of effort is really to examine our culture across the program so that we can do everything—ensure ourselves we're doing everything to strengthen the character and the moral courage of our team so that it becomes part of the atmosphere in our program, that it would be unthinkable to do anything that would compromise the integrity of the program or the personal integrity of any of our people inside of it.

I've talked to people across the Navy, experts outside the Navy, in academia. We're really leaving no stone unturned. I've already held a summit of all of the major commanders of nuclear-powered warships, and we are getting after this aggressively to make sure that we not only are very clear about teaching the principles of why it is important to be truthful and honest in the program, but also strengthening the character of our team and minimizing to the point of eliminating any obstacles that would make it more difficult just simply do the right thing. By virtue of that comprehensive approach, we are looking forward to improving across the program.

Senator UDALL. Thank you for that update. I know that for the large majority of the men and women who serve in this important area, that they had nothing to do with what happened and this doesn't reflect on them. I know, under your leadership and with the subcommittee's partnership, we will look at the culture, as you pointed out, and make the changes and mete out whatever punishment's necessary, and then move forward. Because I know, again, 99 percent or more of your personnel are all in and comply with what we expect them to do. I appreciate the update.

Admiral RICHARDSON. Thank you, sir. I appreciate that endorsement and validation. We expect those folks to do that, and we take no comfort in the fact that this is a small number of people. This is still a big problem we're paying very close attention to. It has my personal attention daily.

Senator UDALL. Yes, I know you are. Again, I don't want it to reflect on all the people who have worked 150 percent.

Admiral RICHARDSON. Yes, sir.

No, most of those folks are very disappointed in the action of this very small cadre of people.

Senator UDALL. Yes.

Admiral RICHARDSON. Yes, sir.

Senator UDALL. Let me move back to nuclear fuel. The status of highly enriched uranium. Admiral Richardson, based on current fleet projections, when do you believe we'll have to seek a new supply of the highly enriched uranium used in your fleet?

Admiral RICHARDSON. Sir, by current arrangements, we have a sufficient supply of highly enriched uranium, out to about 2064. Beyond that, really, no solution in sight, pending some other arrangement or some technology for developing more highly enriched uranium.

Senator UDALL. If the subcommittee will suspend for a minute. [Pause.]

All right. Dr. Cook, you're the winner of the jackpot. I think you're going to receive the last question of the hearing. [Laughter.]

Dr. COOK. Yes, sir.

Senator UDALL. Can you explain to the subcommittee whether the life extension of the B61–12 will enable you to retire the W83 gravity bomb or will be retired independently of the B61–12?

Dr. COOK. It is required, it is linked. It was a difficult set of discussions to go through with the NWC. The conclusion was that, once successfully implemented, with the first production unit, as I said, March 2020, a few years after that, once we have what we call stockpile returns and we're satisfied that the 61–12 performs well in service, the NWC is fully prepared, and intends, to retire the B–83.

Senator UDALL. Thank you for that.

I am tempted, because Admiral Richardson is here, to get his opinion on small- and medium-sized reactors and their application in the civilian and domestic power arena. That's long been an interest of mine. I know we are doing research at DOE.

Admiral, would you have an opinion or any insights on the suitability of such reactors on land and as supplements to existing power plants or as substitutes for power plants that might be retired?

Admiral RICHARDSON. Senator, we have been following the development of small modular reactors closely. It might be most appropriate, sir, if I came in and gave you a brief on what our opinions on that are and where we see that going.

Senator UDALL. I would very much welcome that.

Admiral RICHARDSON. Yes, sir.

Senator UDALL. I thank you for the offer.

Admiral RICHARDSON. Yes, sir.

Senator UDALL. Senator Vitter asked his questions, and he, I think, is indisposed on the Senate floor.

I am going to bring the hearing to an end. I want to thank all of you for your time, your expertise, your patriotism, and your hard work.

We'll leave the record open through the beginning of next week, through Monday.

The Subcommittee on Strategic Forces is now adjourned.

[Whereupon, at 3:46 p.m., the subcommittee adjourned.]

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