APRIL 13, 2016

BALLISTIC MISSILE DEFENSE POLICIES AND PROGRAMS

UNITED STATES SENATE COMMITTEE ON ARMED SERVICES

SUBCOMMITTEE ON STRATEGIC FORCES

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STATEMENT OF

BRIAN P. MCKEON

PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE

FOR POLICY

BEFORE THE SENATE

ARMED SERVICES

SUBCOMMITTEE ON STRATEGIC FORCES

APRIL 13, 2016

Chairman Sessions, Ranking Member Donnelly, members of the Subcommittee, thank you for the opportunity to testify on the Fiscal Year (FY) 2017 budget request for ballistic missile defense and the Defense Department's continuing efforts to sustain and modernize our homeland missile defense capability so that we remain ahead of the threat while providing effective, integrated, and interoperable regional ballistic missile defense (BMD) capability. I am grateful for your consistent attention to, and continuing support of, the critical mission of defending the homeland, our allies and partners, and our deployed forces from a growing ballistic missile threat.

I will begin with a discussion of ballistic missile threats and trends, and then focus on several key policy priorities: defending the United States against limited long-range ballistic missile attacks, strengthening defense against regional missile threats, fostering defense cooperation with allies and partners, and examining how to advance the missile defense technology base in a cost-effective manner. I will also briefly address issues associated with other non-BMD tools the Department is examining to assist in the broader effort to defeat ballistic missiles.

Ballistic Missile Threats

Ballistic missiles continue to pose a significant security challenge as nations pursue efforts to make them more survivable, reliable, mobile, and accurate at greater ranges.

North Korea

North Korea's weapons and missile programs pose a growing threat to the United States and to our allies in East Asia. North Korea has conducted four nuclear tests. It is also 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 to operational capacity. Although 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.

Iran

The Joint Comprehensive Plan of Action reached by the P5+1, the EU and Iran last summer effectively cuts off all of Iran's potential pathways to developing a nuclear warhead, thereby removing the greatest danger previously posed by Iran's ballistic missile program. At the same time, Iran already has the largest inventory of ballistic missiles in the Middle East and today can potentially reach targets throughout the region and into southeastern Europe. Iran is seeking to enhance the lethality and effectiveness of existing systems with improvements in accuracy and warhead designs. Iran also has an anti-ship ballistic missile that can potentially threaten maritime activity in the Persian Gulf and the Strait of Hormuz. Although Iran does not yet possess an intercontinental ballistic missile (ICBM), its progress on space launch vehicles (SLV) – along with its desire to deter the United States and its allies and partners – provides Iran with the potential means and potential motivation to develop longer-range missiles, including an ICBM. Iran has stated publicly that it intends to launch the Simorgh SLV this year, which would be capable of ICBM ranges if Iran chose to configure it as a ballistic missile.

Syria

Although 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 Syria.

Other Trends, including Cruise Missiles

As Secretary Carter noted in his posture hearing before this committee, the Department confronts evolving challenges – China, Russia, North Korea, Iran, and countering terrorism – that are now driving the focus of the Department's planning and budgeting. The first two of these challenges reflect a return to great power competition, and both China and Russia are investing in anti-access/area denial capabilities. China is introducing qualitative advances into its nuclear and conventional military capabilities as it continues its rise in the Asia-Pacific region, and is making significant investments in anti-ship ballistic and cruise missiles, which will improve China's ability to strike regional targets at greater ranges.

Russia is making significant investments in cruise missiles, including a cruise missile that violates the Intermediate-Range Nuclear Forces (INF) Treaty, which eliminated an entire class of U.S. and Russian missiles nearly three decades ago. In light of Russia's INF Treaty violation and overall aggressive behavior, we are developing and implementing a strategy to address Russian military actions that includes modifying and expanding air defense systems to deny Russia offensive capabilities; placing an increased emphasis on working with allies and partners to improve our collective capability to counter complex cruise missile threats; working with other departments and agencies to encourage and facilitate allied acquisition of advanced capabilities by those most concerned with Russian behavior; and investing in the technologies that are most relevant to Russia's provocations.

Homeland Missile Defense

The U.S. homeland is currently protected against potential ICBM attacks from States like North Korea and Iran if it was to develop an ICBM in the future. To ensure that we stay ahead of the threat, we are continuing to strengthen our homeland defense posture and invest in technologies to enable us to address emerging threats more effectively in the next decade. 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.

We remain on track to deploy 14 additional interceptors in Alaska by the end of 2017. These interceptors, along with the 30 that are currently deployed, will provide protection against both North Korean and potential Iranian ICBM threats as they emerge and evolve. This year's budget request also reflects Department of Defense's (DoD's) commitment to modernizing the GMD system. It will move us towards a more reliable and effective defense of the United States. It includes funding for development of a new Long-Range Discrimination Radar (LRDR) being installed in Alaska. The LRDR will provide persistent sensor coverage and improve discrimination capabilities against North Korea. It also continues funding for the redesign of the kill vehicle known as Redesigned Kill Vehicles (RKV) for the GBI. Although we have

addressed the causes of past failures in the GBI related to the Exoatmospheric Kill Vehicle, the RKV will have greater performance and discrimination capability.

As directed by statute, the Missile Defense Agency (MDA) is also preparing environmental impact statements (EIS) for sites in the eastern United States that could host an additional GBI missile field. The EISs will be completed later this year. No decision has been made to deploy an additional missile field in the United States. The highest priorities for the protection of the homeland are improving the reliability and effectiveness of the GBI and improving the GMD sensor architecture, which yield the greatest benefit against existing threats. 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 conducting EISs, will shorten the construction timelines associated with deployment of a new missile defense site.

Regional Defense

The Department's FY 2017 budget request also continues to deploy missile defenses that are tailored to the security circumstances in Europe, the Middle East, and the Asia-Pacific region. Our focus is on developing and fielding missile defense capabilities that are mobile and relocatable, which allows us to address crises as they emerge. Systems such as Patriot, Terminal High-Altitude Air Defense (THAAD), and our Aegis BMD ships allow us to have flexible, layered missile defense capabilities tailored to specific regional threats. We are also encouraging our allies and partners to acquire missile defense capabilities, and to strengthen operational missile defense cooperation. In a regional context, we know that we will not be able to purchase enough interceptors to rely purely on missile defense for the duration of a conflict. In such a situation, we must protect our most valuable assets while also drawing on our other capabilities to provide a comprehensive military approach to defeating the threat from ballistic missiles.

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 military forces and facilities.

Technical capability of EPAA Phase II, which includes the Aegis Ashore site in Romania, was declared in December 2015. The site is undergoing operational readiness testing for integration into the NATO BMD architecture. 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 later this decade. As these capabilities become operationally available, they will increase BMD coverage of NATO European territory.

The United States conducts exercises designed to hone our Alliance missile defense capabilities and integration. U.S. European Command 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 the NIMBLE TITAN exercise, an unclassified, two-year, multinational, BMD campaign. The overarching purpose of NIMBLE TITAN is to serve as a venue for collaboration, exchange of views, and coordination of BMD policy and operational development among participating nations and organizations, along with U.S. Government departments, agencies, and military organizations. NIMBLE TITAN has 25 participating nations and organizations, including NATO.

Since 2011, the United States has operated a forward-based radar in Turkey and maintained a sea-based missile defense presence in Europe. And we now have a total of four U.S. Aegis BMD capable destroyers forward-deployed to the naval facility at Rota, Spain. These multi-mission ships support the missile defense mission, as well as other maritime missions.

Spain and Germany have committed Patriot PAC-3 systems to NATO missile defense as demonstrated through the ongoing NATO deployment in defense of Turkey. Spain recently replaced the Netherlands in the defense of Turkey mission through its deployment of a Patriot system, and is strengthening its air and missile defense capabilities by acquiring additional Patriot systems from Germany.

France is planning to provide its Spirale satellite detection system and a long-range radar for NATO territorial missile defense and has offered the SAMP/T air and missile defense system, which was fielded in 2013, to NATO BMD.

Several Allies have modern surface combatant ships that could be equipped with BMD sensor or interceptor capability upgrades. The Netherlands and Denmark have committed to upgrading the SMART-L radars on their frigates to contribute to NATO BMD.

Beyond hosting the second Aegis Ashore site in Europe, Poland has also announced its intention to spend up to $8 billion to acquire advanced air and missile defense capabilities.

The United States will continue to encourage its NATO Allies to do more to cooperate and invest in missile defenses that will contribute to Alliance security.

Asia-Pacific

In the Asia-Pacific region, our force posture includes Aegis BMD-capable ships, along with Patriot batteries deployed in Japan and South Korea. We have also maintained the THAAD battery deployment to Guam in response to North Korean provocations.

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 has an immediate, proximate stake in preventing missile strikes from North Korea. We have worked 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 with South Korea about how it can upgrade its missile defense capabilities as part of an Alliance response to the growing North Korean missile threat. On February 7, 2016, in response to the evolving threat posed by North Korea, the United States and South Korea made an Alliance decision to begin formal consultations regarding improvements to the alliance missile defense posture, specifically exploring the viability of deploying to South Korea a THAAD system to be operated by U.S. Forces Korea.

Japan has its own layered missile defense system, which includes Aegis BMD ships with Standard Missile-3 interceptors, PAC-3 batteries, early-warning radars, and sophisticated command-and-control systems. Japan is upgrading two ATAGO-class Aegis destroyers to BMD capability with certification scheduled for Japan FY 2018 and Japan FY 2019, and plans to build two additional Aegis BMD ships, which would increase its inventory to a total of eight BMD-capable ships. Japan also hosts two U.S. missile defense radars.

Additionally, Japan is 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 longstanding 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.

We will continue to emphasize the importance of developing a regional ballistic missile defense system that includes the sharing of sensor data among allies to take full advantage of the benefits of system interoperability and integration.

Middle East

We also maintain a robust missile defense presence in the Middle East, including land- and sea-based assets deployed in defense of our forward-deployed forces, and our allies and partners. This is in addition to our efforts to build the capacity of those allies and partners that will ultimately contribute to their ability to defend themselves.

The United States maintains a strong defense relationship with Israel, and our cooperation on missile defense has resulted in one of the most sophisticated missile defense systems in the world. Since 2009, the United States has provided more than $3 billion in missile defense assistance to Israel, which has supported the joint development and production of David's Sling and the Arrow Weapon System as well as joint production of Iron Dome. This support, in conjunction with operational cooperation, gives Israel the ability to respond to simultaneous missile and rocket attacks from Hamas or Hezbollah, and from the longer-range ballistic missiles being developed by Iran. During the summer conflict in 2014, Iron Dome had a 90 percent success rate and saved countless Israeli lives. Missile defense was also the central focus of the JUNIPER COBRA exercise conducted in Israel last month – which is an important U.S.-Israeli military exercise that allows us to work through key interoperability challenges in responding to a potential missile crisis with Israel.

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 (UAE) is procuring the THAAD system. This is in addition to the UAE's earlier purchase of Patriot systems. 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. Qatar also joined the group of U.S. Patriot partners late last year, a group that includes Kuwait.

U.S. Air Forces Central Command maintains a series of regular exchanges between U.S. 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. Following the Camp David Summit in 2015, the United States and GCC States agreed to study Ballistic Missile Early Warning System (BMEWS) requirements, including sensor and command and control architectures. The study will inform potential GCC-wide BMEWS acquisition plans. MDA has been working on the BMEWS architecture study since September – and is in the process of presenting results of the study to the GCC. 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.

Technology Development

We must continue to look ahead. This means ensuring that our investment strategy and priorities balance the needs of addressing the most dangerous threats we confront today while positioning us to respond to threat developments in the next decade. Areas for priority technology investment include persistent discrimination in the current and future Ballistic Missile Defense System sensor architecture; high-power lasers for multiple BMD applications; common kill vehicle technology leading to a multi-object kill vehicle; advanced technology for high-risk/high-pay-off breakthroughs; and a rail gun to lower the cost per kill.

Additionally, we are looking to invest in our cruise missile defense architecture—especially as it relates to the National Capital Region. Given the threat facing the U.S. homeland, we require persistent surveillance and detection of cruise missiles. To that end, we are working with North American Aerospace Defense Command and others to identify technologies that give us this persistent surveillance and detection. We are also working closely with our Canadian partners to examine future technologies to cover the northern approaches.

As we confront the growing complexity and size of ballistic and cruise missile threats in the next decade, the Department will continue to fund investments in new technologies as well as adapting current technologies to new purposes. As Secretary Carter stated in his testimony in February on the President's Budget request for FY 2017, the Department remains committed to continued investments directly supporting efforts to defeat missiles by using innovative technologies and operational concepts to lower the cost-per-round. This includes investments in

directed energy/high-powered lasers, rail and powder guns, and enhanced munitions as well as employing systems like the Navy's SM-6 interceptor that can operate not only against a range of tactical missiles (air and ballistic), but can support anti-surface ship capacity as well.

This leads to a larger point the Secretary has made – that today's security environment is dramatically different than the one in which we have been engaged over the last 25 years. It requires new ways of thinking and acting. It also requires new ways of acquiring and employing capabilities. Given this new security environment, we must also look at new ways to support our U.S. defense strategy. In the case of defeating ballistic missiles, we need to develop a wider range of tools and that includes the efforts underway to address such threats before they are launched, or "left of launch." The development of left-of-launch capabilities will provide U.S. decision-makers additional tools and opportunities to defeat missiles. This will in turn reduce the burden on our "right-of-launch" ballistic missile defense capabilities. Taken together, left-of-launch and right-of-launch will lead to more effective and resilient capabilities to defeat adversary ballistic missile threats.

CONCLUSION

The President's FY 2017 Budget Request supports our strategies for protecting vital U.S. interests. It continues funding missile defense capabilities to ensure we remain well ahead of adversary ballistic and cruise missile defense developments and lays the foundation for investment in innovative programs to lower the cost-per-intercept and defeat emerging ballistic and cruise missile threats.

We request the Committee's support for this budget.

Thank you for the opportunity to appear before you today. I look forward to your questions.

STATEMENT OF

ADMIRAL WILLIAM E. GORTNEY, UNITED STATES NAVY

COMMANDER,

UNITED STATES NORTHERN COMMAND

AND

NORTH AMERICAN AEROSPACE DEFENSE COMMAND

BEFORE THE SENATE ARMED SERVICES COMMITTEE

STRATEGIC FORCES SUBCOMMITTEE

APRIL 13, 2016

INTRODUCTION

Chairman Sessions, Ranking Member Donnelly, and distinguished members of the Committee, I appreciate the opportunity to appear before you today to discuss the posture of United States Northern Command (USNORTHCOM) and North American Aerospace Defense Command (NORAD). I am here representing the Commands' Soldiers, Sailors, Airmen, Marines, Coast Guardsmen, National Guardsmen, Reservists, and civilians safeguarding our nation amidst the most diverse and challenging security atmosphere in our history. Brave men and women are confronting this rapidly changing defense environment head-on. It is an honor and a privilege to serve alongside them and I am grateful to the Committee for the support you provide.

North America is increasingly vulnerable to a vast array of evolving threats--from highly capable, national powers to disaffected individuals who act in response to extremist propaganda. These threats are growing and becoming much more diffuse and less attributable. Moreover, I believe that many of the crises originating as regional conflicts elsewhere in the world are rapidly manifesting themselves here at home and they continue to challenge our ability to warn and defend.

The complexity and volatility of our strategic environment demands that we advance and sustain the capabilities to protect our Homelands. I believe the President's FY17 budget represents a balanced approach to maintaining our strategic advantage within the realities of a fiscally-constrained environment. We are still feeling the impacts of sequestration, primarily because the majority of the Services' cuts were from the operations and maintenance accounts, which directly impedes their ability to provide trained and equipped service members to

Combatant Commands. I thank the Committee for your support in passing the Bipartisan Budget Act of 2015, which represents another important step toward permanent relief from the sequestration caps in the Budget Control Act of 2011.

We are resolute in our commitment to deter, prevent, and defeat attacks against the United States and Canada. We stand ready to provide rapid and robust support to the primary lead agencies responding to domestic disasters and the law enforcement agencies (LEAs) charged with combating transnational organized crime. And we continue to strengthen our regional and homeland partnerships; they are our center of gravity.

STRATEGIC ENVIRONMENT

The expansive complexity of the contemporary security environment makes defending the Homeland a continual challenge. The spectrum of threats to our national security ranges from traditional nation-state military capabilities to individuals with access to increasingly destructive technologies. The diffusion of capability, the inexact art of predicting intent, and the complications of attribution all contribute to a blurring of lines between traditional military threats and asymmetric threats that trigger military support or response. Technological advances and proliferation coupled with pockets of instability will generate a growing array of potential threats against which we must posture ourselves. Many of our potential adversaries are pursuing advanced weapons development not seen in decades. Individually, they pose serious concerns to our national security and the international community. Collectively, they represent a vast spectrum of complex and volatile threats that I believe will only continue to grow and threaten the homeland if we hesitate to act decisively.

RUSSIA

A resurgent Russia continues to assert itself on the world stage. No longer content merely to pursue primacy within its near abroad, Russia's forays into Syria highlight Vladimir Putin's willingness to employ military power to advance his agenda outside Russia's near abroad. Last year I stated that Russia is progressing toward its goal of deploying long-range, conventionally armed cruise missiles comparable to Western systems. In 2015 these efforts came to fruition, as Russia employed heavy bombers, surface vessels, and a submarine to launch advanced conventional cruise missiles at targets in Syria. These operations served as a proof-of-concept for weapons systems and tactics ultimately intended to provide flexible deterrent options in a future crisis.

Russia's strategic nuclear forces remain the only foreign military threat that could imperil our nation's existence, and Moscow continues to spend significant resources to modernize its nuclear arsenal and delivery systems. While Russia seeks to avoid a strategic conflict with the United States, Moscow perceives itself to be threatened by a coordinated Western effort to erode its sovereignty, weaken its economy, and undermine its regime. I am concerned these threat perceptions could prompt Russia's leaders to misinterpret our intentions in a crisis, leading to inadvertent escalation.

CHINA

As part of its long-term, comprehensive military modernization program, China continues to modernize and expand its strategic forces with a focus on improving its ability to survive a first strike and penetrate United States' missile defenses. Concerned that that United States precision strike and missile defense capabilities undermine its strategic deterrent, Beijing is

working to improve the survivability of its nuclear force to ensure a credible second-strike capability.

China continues to supplement its modest silo-based intercontinental ballistic missile (ICBM) force with a growing number of road-mobile ICBMs and is now in the process of operationalizing its first viable class of ballistic missile submarines, which, if successful, would be China's first sea-based strategic nuclear deterrent. China is also developing a range of anti-access and area-denial weapons which, along with its cyber, counter-space, and strategic nuclear capabilities, are designed to discourage United States intervention in a regional crisis. Meanwhile, Beijing's diplomatic strategy appears to be focused on limiting U.S. options by denying physical and political access in key regions around the globe.

NORTH KOREA

North Korea's recent hostile cyberspace activity, nuclear testing, and continued ballistic missile development represent a dangerous threat to our national security. North Korea's recent nuclear test and satellite launch demonstrate Kim Jong Un's commitment to developing strategic capabilities, as well as his disregard for United Nations Security Council resolutions. The regime's efforts to develop and deploy the road-mobile KN08 ICBM have profound implications for homeland missile defense, primarily because the missile obviates most of the pre-launch indicators on which we have traditionally relied to posture our defenses. While the KN08 remains untested, modeling suggests it could deliver a nuclear payload to much of the Continental United States. We assess Kim Jong Un is unlikely to attack our Homeland unless he perceives an imminent threat to his regime's survival. However, we are concerned the possession of a nuclear ICBM could embolden the regime's intransigence below the nuclear threshold and complicate our response to a crisis on the peninsula. While I do not believe that

North Korea's efforts to develop a submarine-launched ballistic missile represent a near-term threat to the U.S. Homeland, the program underscores the level of effort and resources the regime is willing to devote to developing advanced weapon systems. As the combatant commander charged with defending the homeland, I take this threat very seriously, particularly in light of North Korea's unpredictable leadership.

IRAN

Iran poses multiple significant security concerns to the United States, and I remain wary of its strategic trajectory. Last year's conclusion of the Joint Comprehensive Plan of Action was a welcome development, but, Iran's continuing pursuit of long-range missile capabilities and ballistic missile and space launch programs, in defiance of United Nations Security Council resolutions, remains a serious concern. Iran has successfully orbited satellites using a first-generation space launch vehicle and announced plans to orbit a larger satellite using its ICBM-class booster as early as this year. In light of these advances, we assess Iran may be able to deploy an operational ICBM by 2020 if the regime choses to do so. Additionally, Iran has invested in developing advanced offensive cyberspace capability and has demonstrated cyberspace operations that could threaten our critical civil infrastructure.

LINES OF OPERATION

In my statement last year, I described the unique aspects of USNORTHCOM as the nation's homeland geographic combatant command (GCC) and NORAD as the nation's oldest bi-national

USNORTHCOM and NORAD Lines of Operation

- → Defense of our Homelands
- → Defense Support of Civil Authorities
- → Homeland Partnerships
- → Regional Partnerships
- → The Arctic
- → Professionalism and Excellence
- → Warfighters and Families

command. I explained the importance of prioritizing our complementary and individual functions with a focus on our shared end states. Our key Lines of Operation are more critical than ever to our mission success. We map all of our activities to these Lines of Operation, which shape our activities and effort.

DEFENSE OF OUR HOMELANDS

As the Commander of USNORTHCOM and NORAD, my primary task is to defend the homelands. ***Defense of our Homelands*** is our dominant line of operation, and it is the core focus of USNORTHCOM and NORAD primary missions. We are ever mindful of the supreme responsibility we have of defending the security of the United States, our citizens, and our allies and partners. In 2015, we celebrated NORAD's 57th year defending North America against attack through our no-fail aerospace warning and aerospace control missions. NORAD was born in the Cold War and expanded to an internal threat focus after 9/11. By contrast, USNORTHCOM was born in the aftermath of 9/11 and shaped by the seminal nature of those attacks. Both Commands are ever-adapting within the strategic environment, and we work hard to develop our capabilities to outpace threats.

MISSILE DEFENSE

USNORTHCOM's most prominent homeland defense mission is ***Ballistic Missile Defense (BMD)***. Currently, our BMD architecture is designed primarily to defend against limited long range ballistic missile attacks from North Korea and Iran. In light of an evolving threat and the increasingly enigmatic and unpredictable nature of North Korea's dictator, Kim Jong Un, I believe it is imperative that the United States continue to develop more capable forces and broader options for effective ballistic missile defense. Our BMD architecture is comprised of a group of independent, yet interrelated components that form a complex and unified

defensive network. This system of systems cannot be modernized and maintained sequentially; each component must be improved concurrently to outpace the evolving threat. I agree with and support the modernization priorities set by Vice Admiral Jim Syring and his team at the Missile Defense Agency (MDA), including improvement in our discrimination sensors, lethality of our kill vehicles, sustainment of the BMD architecture, and development of our kinetic and non-kinetic options. I am grateful to this committee for your support and commitment to modernizing our Ballistic Missile Defense System (BMDS).

We are on the right path to improving our sensors through the development and deployment of the new Long Range Discrimination Radar (LRDR). This critical midcourse sensor is expected to provide persistent sensor coverage and vastly improve our target tracking and discrimination capability. The LRDR will help us evaluate our countermeasure options and increase the capability of our Ground-based Midcourse Defense (GMD) interceptors.

We remain on track to deploy the final 14 interceptors in Alaska, which will give us 44 missiles in the ground by the end of 2017. Finishing the inventory is a big step toward the robust BMDS of the future, but it is critical that we not stop there. We need to continue working on enhancements to the current Exo-atmospheric Kill Vehicle (EKV), and investments in the future Redesigned Kill Vehicle (RKV). We need to invest in the lethality of our kill vehicles, and in ways to get us to the right side of the cost curve. Our adversaries are developing relatively inexpensive technologies, which we assess can reach the homeland. By contrast, our interceptors are vastly more expensive. Today, our BMDS is investing in new technologies and adapting current technologies to new purposes which will enable us to meet the advancing threat and lower the cost per round.

I believe that homeland defense is fundamentally an "away game", and missile defense is no exception. Today's GMD system is designed to intercept incoming threats after the launch is initiated. While that approach offers us sufficient decision space, we need to augment our defensive posture with one that is designed to defeat ballistic missile threats in the boost phase as well as before they are launched, known as "left of launch." In concert with our public and private stakeholders, MDA is working on an emerging technology that will enable us to employ non-kinetic methods to defeat ballistic missile threats when we receive indications that a launch is imminent. I believe this technology will reduce the overall cost of engagement-based missile defense and provide us options to defeat ballistic missiles that continue to proliferate around the world.

We work closely with other GCCs, functional combatant commands, and partner nations to leverage capabilities that enable us to protect the Homeland. Thanks to agreements with the government of Japan, United States Pacific Command (USPACOM) was able to deploy a second Army Navy/Transportable Radar Surveillance and Control Model 2, or AN/TPY-2 to Japan, which dramatically improved our ability to "defend forward."

In addition to the proliferation of ballistic missile threats, I am deeply troubled by the development of advanced long-range cruise missiles and the growing threat they represent to North America. Russia possesses both conventional and nuclear cruise missiles with the range to reach North America and it has proliferated some advanced cruise missile technologies to other actors. This threat is real and it is imperative that we develop effective response options to outpace the threat and enhance our deterrence. We are working with the Joint Integrated Air and Missile Defense Organization (JIAMDO), MDA, and other stakeholders to improve our ***Cruise Missile Defense (CMD)*** capabilities.

Effectively countering and defeating cruise missiles requires a layered and integrated architecture that can defend across the full spectrum of the engagement sequence. Cruise missiles represent a real operational challenge because of their increased standoff capability, low altitude and small radar signatures. Although no single system can counter all cruise missiles, we have confidence in our layered architecture to defend the homeland. To defeat this more capable threat, we are working on enhancements to each of the individual systems, including our Indications and Warnings capabilities, wide-area-surveillance, and advanced fire control infrastructure.

We are in the first segment of our three-phase Homeland Defense Design (HDD) effort, which will improve our capability to find, fix, track, target, and engage growing air threats, such as those posed by cruise missiles, low-slow aircraft, and long-range aviation. In this first phase, we are testing and evaluating advanced sensors as well as integrated command and control capabilities. In addition to the new STateside Affordable Radar System (STARS), we had begun a three-year operational exercise of the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS). This exercise had been an opportunity for us to see how well JLENS can fit into the existing Integrated Air Defense System (IADS) of the National Capital Region (NCR), including deployment of a JLENS Fire Control System aerostat, which is designed to work in tandem with the surveillance aerostat.

Unfortunately, on October 28, 2015, the JLENS Fire Control System aerostat detached from its mooring station on Aberdeen Proving Ground, Maryland, and eventually grounded in a wooded area in northeast Pennsylvania. The Army is now finishing up the last of their investigations to determine the root causes of the incident. However, with the recent congressional disapproval of the FY16 above-threshold-reprogramming request, termination of

the JLENS operational exercise is now underway and the Department is working to determine the way ahead.

CONCLUSION

We are very fortunate to be able to depend on the brave men and women who choose to wear the cloth of their nation and defend their fellow citizens, despite what is likely to be an onerous fight against increasingly diffuse threats. We embrace our no-fail mission at a time when our unique capabilities are needed most, and with your support, together with the exceptional men and women of USNORTHCOM and NORAD and our trusted partners, we will remain the greatest force for freedom, safety, and security for North America. I look forward to your questions.

Unclassified Statement of

Vice Admiral J.D. Syring, USN

Director, Missile Defense Agency

Before the

Senate Armed Services Committee

Subcommittee on Strategic Forces

Wednesday, April 13, 2016

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Senate Armed Services Committee
United States Senate

Vice Admiral J.D. Syring, USN
Director, Missile Defense Agency
Before the
Senate Armed Services Committee
Strategic Forces Subcommittee
April 13, 2016

Good afternoon, Chairman Sessions, Ranking Member Donnelly, distinguished Members of the subcommittee. I appreciate this opportunity to testify before you today.

Our current budget request of $7.5 billion for Fiscal Year (FY) 2017 will continue the development of defenses for our Nation, deployed forces, allies, and international partners against increasingly capable ballistic missiles. The FY 2017 missile defense program will continue to support the Warfighter and needs of the Combatant Commanders with the development, testing, deployment, and integration of interceptors, sensors, and the command, control, battle management and communications (C2BMC) system for the Ballistic Missile Defense System (BMDS).

Ballistic Missile Threat

The threat continues to grow as potential adversaries acquire a greater number of ballistic missiles, increasing their range, incorporating BMD countermeasures, and making them more complex, survivable, reliable, and accurate. Space-launch activities involve multistage systems that further the development of technologies for intercontinental ballistic missiles (ICBMs). 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) with a range greater than 3,000 km. Last October North Korea paraded a previously unseen, new, or modified road-mobile ICBM. North Korea has recently assumed an aggressive posture, having conducted rocket and ballistic missile launches in addition to the launch of the Taepo Dong 2

space launch vehicle/ICBM this past February. Today it fields hundreds of Scud and No Dong missiles that can reach U.S. forces forward deployed to the Republic of Korea and Japan.

Iran has successfully orbited satellites and announced plans to orbit a larger satellite using a space launch vehicle (the Simorgh) that could be capable of intercontinental ballistic missile ranges if configured as such. 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. Tehran's overall defense strategy relies on a substantial inventory of theater ballistic missiles capable of striking targets in southeastern Europe and the Middle East, including Israel. Iran continues to develop more sophisticated missiles and improve the range and accuracy of current missile systems, and it has publicly demonstrated the ability to launch simultaneous salvos of multiple rockets and missiles. Demonstrating it is capable of modifying currently deployed ballistic missile systems, Iran has flight-tested a Fateh-110 ballistic missile in an anti-ship role. By adding a seeker to improve the missile's accuracy against sea-based targets, Iran could threaten maritime activity throughout the Persian Gulf and Strait of Hormuz.

Support for the Warfighter

Our priority is to continue to deliver greater missile defense capability and capacity to the Warfighter for employment in support of Combatant Command priorities. This budget maintains the commitment to build out homeland defenses to 44 Ground Based Interceptors (GBIs) by the end of 2017 and enhance GBI reliability. To strengthen regional defenses, we plan to deliver a total of 39 SM-3 Block IBs to the Navy in FY 2017 for use on Aegis BMD ships and at the Aegis Ashore site, for a total of 146 delivered since December 2013. MDA also will deliver in FY 2017

61 additional Terminal High Altitude Area Defense (THAAD) interceptors to the Army, for a total of 205 delivered since May 2011.

On 18 December last year, we delivered the Aegis Ashore system in Romania in support of Phase 2 of the European Phased Adaptive Approach (EPAA). The technical capability declaration included the Aegis Ashore Romania missile defense complex, Aegis BMD 5.0 (Capability Upgrade, or CU) weapon system, as an integrated component of Aegis Baseline 9, and Standard Missile (SM)-3 Block IB (with a Threat Upgrade). This is the first EPAA land-based interceptor component, and it is mission capable today. On 30 December 2015, the U.S. Navy accepted ownership of the Aegis Ashore site in Romania. U.S. Warfighter acceptance is expected in May 2016. MDA will continue to support the Navy and NATO through the operation of the system. Also, plans remain on track to deliver a second Aegis Ashore site in Poland along with an upgraded missile defense system and the initial Standard Missile-3 (SM-3) Block IIA missiles by the end of 2018 to support EPAA Phase 3.

MDA routinely provides Warfighter operational support by performing the mission essential functions of BMDS configuration control, asset management, and operational readiness reporting and by providing an operational-level interface to United States Northern Command (USNORTHCOM), European Command (USEUCOM), Central Command (USCENTCOM), and Pacific Command (USPACOM) and facilitating increased Warfighter participation in development of future missile defense capabilities. MDA will continue to lead the integration of evolving MDA, Service, and COCOM command and control capabilities through systems engineering analysis and development of technical integration requirements and interface control documents to address the continued fielding by U.S. adversaries of air, missile, and rocket capabilities.

MDA executes a fully integrated test program that synchronizes the system with the Warfighters trained to operate the system under varying wartime conditions against current and emerging threats. This ensures that BMDS capabilities are credibly demonstrated and validated prior to delivery to the Warfighter. We continue to work closely with independent testers within DoD -- the Director, Operational Test and Evaluation; Deputy Assistant Secretary of Defense, Developmental Test & Evaluation; Service Operational Test Agencies; and Combatant Commands, represented by the Joint Forces Component Commands Integrated Missile Defense -- to develop an Integrated Master Test Plan to execute a robust, cost-effective flight test program. Our flight tests feature operationally realistic conditions and integrate U.S. government stakeholders – to include Soldiers, Sailors, Airmen, and Marines – and allies to prove BMD capabilities before they are fielded. From October 2014 to the present, we have executed 25 flight tests. For the remainder of FY 2016 we will conduct six more flight tests, and in FY 2017 16 flight tests. In addition to 22 element level ground tests, we conducted 11 developmental and operational system-level ground tests from October 2014 to the present. There are three more system-level ground tests scheduled for this fiscal year, and four more planned for FY 2017. Last year we also conducted or participated in more than 20 multi-event exercises and wargames, which are critical to the Warfighter and the intensive engineering efforts across the Agency.

Increasing Reliability and Confidence in the System

Before I review our FY 2017 program, I want to give you a brief overview of what we are doing within the current program to increase reliability and confidence in the system and how we are developing technologies to get ahead of what is sometimes referred to as the kinetic (hit-to-kill) cost curve.

We are working hard to find more cost-effective ways to do the missile defense mission. There are challenging scenarios where adversaries will be able to launch large numbers of relatively cheap and increasingly complex missiles and our only option is to intercept them with very expensive weapon systems. MDA is making critical investments in future system development that we believe will significantly improve system performance and effectiveness. By improving reliability, enhancing discrimination, and expanding battle space to make possible a re-engagement firing strategy, I believe we can reduce the cost per kill. We also need to investigate solutions that help reduce reliance on expensive kinetic intercept solutions.

Reliability is paramount and a critical part of how the warfighter decides upon a shot doctrine, that is, the estimation of how many shots it will take to defeat a credible threat. With a highly reliable interceptor, fewer shots would be required. As we are able to decrease the number of shots we must take against each threatening missile, we can increase overall warfighter confidence in the effectiveness of the system. The work we are doing to improve GBI reliability and develop the Redesigned Kill Vehicle (RKV) will help us reach this objective. We can also improve the missile defense cost curve by increasing the number of kill vehicles we place on a single interceptor. This is the rationale behind the Multi-Object Kill Vehicle (MOKV) program – the more kill vehicles we can put on an interceptor, the greater raid capacity our Ground-based Midcourse Defense system will have. I will address both of these efforts in more detail below.

We must also take steps to improve the discrimination and assessment capabilities of the system. The better Warfighters are able to determine the lethal payload in a target cluster and assess whether it has been actually hit, the fewer interceptors they will need to expend. With our investments in radars while developing advanced electro-optical sensors, we are striving for a diverse sensor architecture that eventually will provide highly accurate midcourse tracking and

discrimination. Development of the Long Range Discrimination Radar and our advanced discrimination sensor technology and space-based kill assessment programs will improve system target discrimination and assessment capabilities. Improved sensor coverage and interceptor capabilities will help the warfighter expand the battle space in order to reengage threats as needed.

The development of non-kinetic technologies, such as directed energy, and new concepts of operation, such as boost-phase intercept and left-of-launch missile defeat, are game-changing and would have a dramatic effect on the need to rely exclusively on expensive interceptors.

I will address all of these development efforts and initiatives below.

Homeland Defense

MDA remains committed to operating, sustaining, and expanding our nation's homeland missile defenses and requests $1.32 billion in FY 2017 for the Ground-based Midcourse Defense (GMD) program, or $440 million below what we requested in PB 16. The FY 2017 budget request is lower than the FY 2016 budget due to the fact that the FY 2016 budget provided a significant increase to historical funding to improve overall reliability and performance and extend the service life of the GMD system. Last year's larger request was driven by the developmental content required to reach 44 GBIs by the end of 2017, the first full year of the RKV program, ground system modernization, completion of Capability Enhancement (CE)-II Block 1 design and full-rate manufacturing as well as CE-II upgrades, development, and procurement. This year we will continue efforts to expand the GBI fleet to 44 by the end of 2017 for Enhanced Homeland Defense, continue flight and system ground testing, undertake RKV and C3 Booster development, enhance the Stockpile Reliability Program, expand the battle space to enable later GBI engagements, upgrade the GMD ground system, and deploy upgraded GMD fire control software to enhance our ability to use land-based sensor discrimination data. We will

continue to add precision and confidence in our reliability assessments by performing failure modes and process analyses, reliability testing, short-circuit and grounding analyses, and verification of our on-going development efforts.

Increasing GBI Capacity

We resumed interceptor manufacturing following the successful intercept in the June 2014 FTG-06b flight test. Since October 2014 we have delivered eight GBIs equipped with the CE-II Exo-atmospheric Kill Vehicle (EKV) identical to the configuration flown in that test. We have also removed eight previously delivered CE-II GBIs and are modifying them to match the FTG-06b configuration. These upgraded GBIs began delivery in March 2016. We are completing development of the CE-II Block 1 EKV and Configuration 2 (C2)/Consolidated Booster Avionics Unit (CBAU) for the Integrated Boost Vehicle (IBV) to address parts obsolescence and eliminate several reliability concerns found in the older GBIs. Our confidence in the CE-II Block 1 IKV design changes was enhanced by the results of the GM Controlled Test Vehicle flight test (GM CTV-02+) earlier this year. We expect the FTG-15 intercept test planned for the end of this calendar year using a CE-II Block 1 EKV and C2/CBAU IBVto boost that confidence level even further. Upon a successful FTG-15 flight test, we plan to deliver ten GBIs configured with CE-II Block 1 EKV and C2/CBAU IBV.

GMD Testing

This past January we successfully executed GM CTV-02+, a non-intercept flight test involving the launch of a GBI from Vandenberg Air Force Base and an air-launched IRBM target over the Pacific Ocean. We were able to exercise fully the new Alternate Divert Thruster in the CE-II EKV in a flight environment and undertake an early evaluation of near term discrimination

improvements for homeland defense. The EKV used SPY-1, SBX, and AN/TPY-2 data for target selection.

The next intercept flight test of the GMD system will take place later this calendar year. FTG-15 will be the first intercept flight test for the CE-II Block 1 EKV and the C2/CBAU IBV. It also will be the first intercept of an ICBM range target by the GMD system or any other BMDS element. A successful test will allow MDA to meet the commitment to deliver 44 GBIs by the end of 2017. Following FTG-15, MDA, in collaboration with DOT&E, plans to conduct the FTG-11 operational intercept flight test in the first quarter of FY 2018, which will demonstrate the full capability of the GMD system with a two GBI salvo for an engagement of an ICBM.

Redesigned Kill Vehicle

The primary objective for the RKV is to improve reliability. Its development will make homeland defenses more robust. We plan to employ a modular design made up of mature subsystems and components to improve producibility, maintainability, and reduce unit cost. The RKV program will strive for performance improvements by incorporating on-demand communications between the kill vehicle and the ground, a wide field of view seeker, improved data processing and discrimination algorithms, and enhanced survivability. We established a cross-industry team to develop the RKV. We will then compete the production of an RKV-equipped GBI all-up round. The program schedule includes a controlled test vehicle flight test of the RKV in 2018 (GM CTV-03) and first intercept flight test in 2019 (FTG-17) to demonstrate the RKV, with a second intercept flight test in 2020 (FTG-18). We plan initial deliveries of the RKV in the 2020 time frame.

In order to achieve full capability of the RKV, improvements are needed in other areas of the GMD program. We will modify the booster so that it can fly in either a selectable two-stage or

three-stage mode and match survivability of the RKV. Additionally, we will upgrade the GMD fire control software to enable mixed engagements with RKV and EKV capabilities, utilize improved sensor data for on-demand communications, and provide improved situational awareness information to the Warfighter. We will modify components of the In-Flight Interceptor Communications System Data Terminals (IDT) to enable on-demand communications.

Ground System Upgrades

The Ground System hardware at Fort Greely and Vandenberg Air Force Base is 1990s technology installed in the early 2000s. We have parts obsolescence challenges and the operating systems are no longer supported by the original manufacturers. Without an upgrade, ground system reliability would decay and impact GBI availability to the Warfighter.

Plans include the refurbishment of Missile Field 1 at Fort Greely, upgrades to the GMD ground system hardware, improvements to the fire control software, and substantial reliability testing and assessments to characterize the reliability and performance of the system. The work on Missile Field 1 began last year. We will complete the refurbishment and reactivation of Missile Field 1 in 2016 to provide sufficient silos for 44 GBIs. We have cleaned out the rust and mold in the utilidor and upgraded the climate control system to match what we have in Missile Field 2 and Missile Field 3. (A utilidor is an underground man-made structure used in extreme cold climates to run utilities lines between facilities. If the utilities -- communications lines, power, heating and ventilation (HVAC) -- were buried into the ground the freeze and thawing of the ground would crush the plastic casings.) The old Mechanical Electrical Building (MEB) was demolished and the new MEB completed in March 2016. We will complete replacement of Command and Launch Equipment, GMD Fire Control (GFC) equipment, and IDT equipment by 2017. The Fort

Drum, New York IDT construction is complete and now operationally available to the Warfighter. This new IDT will enable communication with GBIs launched from Fort Greely, Alaska and Vandenberg Air Force Base in California over longer distances and improve defenses for the eastern United States.

We are also initiating a longer term effort to replace the GMD Communications Network equipment by 2019. We will deliver two significant upgrades to the GFC software. The first, GFC 6B3, provides the Warfighter the capability to operate with 44 GBIs, improves discrimination capability, and adds several warfighter requested upgrades to improve operational capability. The second, GFC 7A, improves fail-over between redundant systems and system availability by removing the aging Command and Launch Equipment and streamlining the GMD fire control system architecture. Ground Systems Build 7B is also underway and will be in full development in 2017. The 7B build includes upgrades for two- or three-stage selectable boosters and associated flyouts, improved nuclear weapons effects planning, improved battle management, additional target discrimination capabilities, and the new RKV On-Demand Communications.

Homeland Defense Sensors

Last year we integrated, tested, and delivered the capability for the Warfighter to manage the second PACOM AN/TPY-2 radar in Japan and introduced the boost phase cue capability of that radar site into the BMDS. This radar and the new C2BMC capability will enhance the overall performance of the two Japan radar sites when operating in a mutually supporting AN/TPY-2 dual radar mode, providing improved tracking coverage for all ballistic missile launches out of North Korea.

The Cobra Dane Early Warning Radar is now operating new software to enhance object classification for the Discrimination Improvement for Homeland Defense (DIHD)-Near Term

capability. We will continue missile defense upgrades of the Early Warning Radars in Clear, Alaska and Cape Cod, Massachusetts. We completed Cape Cod UEWR facilities design in August 2015 and began facility modifications in September 2015. We expect to complete the Clear radar upgrade in second quarter FY 2017 and the Cape Cod upgrade in the fourth quarter of FY 2017.

With our budget request of $68.8 million in FY 2017 for the Sea Based X-band (SBX) radar, we will continue to support flight testing with SBX to demonstrate improvements to discrimination and debris mitigation and be available for contingency operations. SBX will continue development of Discrimination Improvements for Homeland Defense. This past year the U.S. Coast Guard and American Bureau of Shipping five-year recertification of SBX vessel was completed. SBX also completed significant industrial work, including overhaul of two thrusters and three diesel generators, hull preservation, upgrade of the radar cooling system, and replacement of obsolete computer components.

In FY 2017 we request $162.0 million to continue the development of the Long Range Discrimination Radar (LRDR), the new midcourse tracking radar that will improve discrimination capabilities against threats to the homeland from the Pacific theater. LRDR will provide larger hit assessment coverage enabling improved warfighting capability to manage GBI inventory and improving the capacity of the BMDS. The Deputy Secretary of Defense approved designation of the U.S. Air Force as the Lead Service for the LRDR this past August. Supported by system trade studies and with concurrence from the USSTRATCOM, USNORTHCOM and USPACOM Commanders, the Clear Air Force Station, Alaska was selected as the future site of the LRDR. We are also requesting $155.0 million MILCON in 2017 for construction of the LRDR System Complex at Clear AFS, to include the mission control facility, the radar foundation, site

infrastructure and security, along with the necessary utilities to provide initial operations of the radar. We request the MILCON be fully funded to ensure an on-time delivery of the facilities, which in turn allows the Radar Prime contractor to erect the radar equipment shelter and install the radar components to meet the 2020 operational requirement. The LRDR System Complex Phase 2 project is planned in 2019 to provide a permanent shielded power plant for the radar system.

Homeland Defense C2BMC

We request $439.6 million in FY 2017 for Command, Control, Battle Management and Communications (C2BMC). We are fielding C2BMC Spiral 8.2-1 capabilities to NORTHCOM and PACOM in the 4th quarter of FY 2017 to support an enhanced homeland defense capability. This will allow C2BMC to integrate data from multiple TPY-2 radars, SBX, UEWRs, Cobra Dane, and space sensors to increase system raid size and tracking capacity by a factor of five. It will also improve the system information security posture. We also are developing C2BMC Spiral 8.2-5 to support LRDR sensor management and enhanced engage-on-remote and support a more robust homeland defense by December 2020.

Regional Defenses

Our FY 2017 budget request continues to prioritize deployment of regional defenses to protect our deployed forces, allies and international partners against SRBMs, MRBMs, and IRBMs in support of Combatant Commanders' near-term and future priorities.

Terminal High Altitude Area Defense

We have delivered and started training for the fifth Terminal High Altitude Area Defense (THAAD) Weapon System Battery and completed training on the fourth battery now under Army

control. To meet the demand for THAAD, MDA recently delivered 12 THAAD interceptors for U.S. batteries and 24 for THAAD batteries operated by the United Arab Emirates (UAE). This past year we also delivered the latest evolution in THAAD software, SW B2.2.1 Debris Mitigation Phase I capability and flight-tested SWB2.7.0. MDA continued to provide maintenance and supply support of the first deployed THAAD battery (comprising the THAAD system and AN/TPY-2 radar) in Guam.

This past fall THAAD added two more successful intercepts, improving its hit-to-kill record since 2006 to 13 for 13. FTO-02 Event 2a was our first operational test of integrated regional BMD capabilities, with the THAAD and Aegis BMD weapon systems sharing common defended areas. Two air-launched ballistic missile targets and one cruise missile target were launched in this scenario. The THAAD battery destroyed the first ballistic missile target, demonstrating its advanced algorithm capability and satisfying a condition for the Army's materiel release of the THAAD weapon system. Following receipt of the remote cue, the Aegis BMD ship, USS JOHN PAUL JONES, operating in the Integrated Air Missile Defense mode, launched to engage the second target, but the SM-3 Block IB Threat Upgrade missile experienced an anomaly early in flight. The THAAD battery crew, which also had launched a second THAAD interceptor at the medium-range ballistic missile, located this second target and destroyed it. The crew of the USS JOHN PAUL JONES then used the SM-2 Block IIIA guided missile to destroy a cruise missile target. The test, conducted at Wake Island, also involved the THAAD Terminal Mode AN/TPY-2 Radar, the Forward Based AN/TPY-2 Radar, and Aegis BMD Spy-1 Radar, and the C2BMC infrastructure, as well as space sensor assets. Warfighters representing the entire chain of command operated the BMDS system while using tactics,

techniques and procedures and successfully defended against air and missile attacks. This test was a valuable demonstration of the benefits of layered, integrated missile defenses.

In FY 2017 THAAD will participate in two flight tests, FTT-18 and FTT-15. In FTT-18 THAAD will demonstrate an intercept of a separating IRBM target using the THAAD radar, launcher, fire control and communication, interceptor operations and engagement operations. Turbulent weather in the Pacific Ocean precluded the timely execution of FTO-02 E2, which forced the delay of FTO-02 E2a. The turbulent weather forced the delay of FTO-02 E2 into the FTT-18 window in late fourth quarter FY 2015, effectively forcing the re-planning of FTT-18 into FY 2017. In FY 2017, we will conduct FTT-15 to demonstrate the capability of the system to do an endo-atmospheric intercept against an MRBM target with associated objects.

For FY 2017, MDA is requesting $369.6 million for THAAD procurement, which includes the purchase of 24 THAAD interceptors. By the end of FY 2017, MDA will deliver an additional 61 THAAD interceptors to the U.S. Army, for a total of 197 interceptors in inventory (this total does not include interceptors expended in flight-testing including two we plan to expend in FTT-18 and FTT-15). We will deliver and initiate training for the 7th THAAD Battery and complete training for the 6th THAAD Battery and turn it over to the Army by the end of FY 2017. We will also complete the training of the 2nd UAE THAAD Battery and continue to support the forward deployed THAAD battery in Guam.

We are requesting $270.3 million in RDT&E funding in FY 2017 as part of the continued development and testing of THAAD baseline 2.0 capabilities. THAAD will continue activities to explore and mature the design concept of expanding THAAD system interoperability with air and missile defense systems and expanding the battlespace and defended area of the current baseline

THAAD Weapon System. We are also requesting $72.1 million for THAAD operations and maintenance for delivered batteries.

Aegis Ballistic Missile Defense

Aegis BMD continues to be the backbone of the Nation's regional defense for our deployed forces, allies, partners and friends, and directly supports and expands our homeland defenses with long range surveillance and track capability. The FY 2017 budget request supports continued advancement of the system to counter the growing threats.

In FY 2015, MDA expanded global BMD capability for the Aegis Fleet. Together with the U.S. Navy, we completed four BMD Weapons System upgrades on Aegis ships -- two Aegis BMD 3.6 to 4.0 ships (ships with 4.0 can cover a wider threat set compared to the initial weapon system), and two Aegis BMD 3.6 to Aegis Baseline 9.C1 (BMD 5.0 Capability Upgrade (CU)) ships (ships with Baseline 9 and 5.0 CU can conduct the anti-air warfare and ballistic missile defense missions concurrently). We also commenced four additional upgrades, one from 3.6 to 4.0 and three from 3.6 to Aegis Baseline 9.C1 (BMD 5.0 CU). All upgrades were done to the existing BMD fleet of 33 BMD-capable Aegis ships. To meet an ever-growing demand by the Combatant Commanders, we continued delivery of Standard Missile-3s, including eight Block IAs and 20 Block IBs. FY 2015 also marked the end of manufacturing for SM-3 Block IA rounds. We completed 26 Block IA recertifications and will continue to support maintenance for the deployed SM-3 Block IA rounds. In 2016, we expect to complete analysis that would support the extension of service life of the SM-3 Block IAs from 8 to 12 years, leaving these critically needed assets in the Fleet 50% longer.

MDA conducted several critical flight tests this past year to prove the operational effectiveness of Aegis BMD and support certification of the at-sea and ashore versions of Aegis

Baseline 9 (BMD 5.0 CU) Weapon System. Starting with FTM-25 on November 6, 2014, we successfully executed integrated air and missile defense (IAMD) by intercepting one short-range ballistic missile target with an SM-3 Block IB, while simultaneously engaging two air-breathing threats with SM-2 Block IIIAs. For this test, the Aegis Baseline 9 ship, USS JOHN PAUL JONES, was configured in IAMD mode, which provides the ship the ability to manage SPY-1 radar resources to conduct both anti-air warfare and ballistic missile defense concurrently. All three targets were successfully intercepted, and we met all primary and secondary objectives.

In FTX-19, conducted in February 2015 off the coast of Virginia at NASA's Wallops Island facility, MDA successfully simulated engagements against a raid of three short-range targets using the Aegis BMD 4.0 Weapons System, demonstrating coordinated SM-3 engagements between two Aegis BMD ships utilizing the Distributed Weighted Engagement Schema between two Aegis ships coordinating engagements. This weapon system functionality will be used, particularly in raid scenarios, when more than one ship is able to engage inbound threat missiles, and it determines a Preferred Shooter solution for SM-3 engagements. During this test, an Aegis Baseline 9 (BMD 5.0 CU) ship also participated, performing IAMD by simultaneously conducting simulated engagements of the three SRBM targets and four simulated anti-air warfare targets.

In July MDA and the Navy conducted a series of four flight test events to verify the Sea-Based Terminal capability. The Sea Based Terminal program delivers an added layer of defense for Aegis BMD to engage short range threats in the terminal phase of flight and defend the sea base and high value assets ashore. During this series, the USS JOHN PAUL JONES used Aegis Baseline 9 (BMD 5.0 CU) to search, detect, track, and discriminate two short-range ballistic missile targets and two cruise missile targets. In four separate flight test events we verified the

Sea Based Terminal capability using the SM-6 Dual I and the SM-2 Block IV missiles, successfully destroying the short-range ballistic missile and cruise missile targets and demonstrating the ability of Aegis Baseline 9 (BMD 5.0 CU) and the SM-6 to conduct both terminal ballistic missile defense and anti-air warfare. This campaign marked the first flight of the SM-6 Dual I missile, and it was the first demonstration of the tactical interface between the Aegis Baseline 9.C1 Weapons System and the SM-6 and SM-2 Block IV guided missiles. The SM-6 is a dual-use (anti-air warfare and BMD) missile that provides an accurate and highly capable BMD capability. It will replace the legacy SM-2 Block IV for terminal defense as those missiles reach the end of their service life. We are planning additional flight tests in 2016 for SM-6 Dual I missiles, which will enter the fleet inventory this spring.

This past December we successfully conducted the Standard Missile-3 (SM-3) Block IB Threat Upgrade (TU) controlled test vehicle (CTV) test, which we launched to engage a simulated ballistic missile target. The simulated engagement was controlled by the Aegis Ashore Missile Defense Test Complex with Aegis Baseline 9 (BMD 5.0 CU) to verify G-switch operation of the SM-3 Block IB TU. This test put us in a confident position later in the day to conduct the operationally realistic FTO-02 E1a intercept test. The Aegis Ashore missile defense test complex at the Pacific Missile Range Facility in Hawaii fired the SM-3 Block IB interceptor for the first time to collide with and destroy an air-launched MRBM target. This operational flight test was the first to demonstrate an intercept using the Aegis Ashore test complex and demonstrated important modernization updates to the Aegis Weapon System.

In FY 2017, we will continue our commitment to develop, test, and deliver global naval capability to the Warfighter and support defense of our deployed forces and European NATO allies through supporting operational readiness of EPAA Phase 2 and delivery of Phase 3. In FY

2016, following successful flight testing of the redesigned SM-3 Third Stage Rocket Motor nozzle to increase overall missile reliability, MDA anticipates a full-rate production decision for the SM-3 Block IB. Anticipating that authorization, we request $463.8 million in FY 2017 to procure 35 SM-3 Block IBs and supporting material, for a total of 256 procured (235 Defense Wide Procurement plus 21 RDT&E) and 146 delivered by the end of FY 2017. To recertify SM-3 rounds that have been previously delivered and deployed to the Fleet, MDA requests $38.9 million in FY 2017 for sustainment of SM-3 assets.

We request $106.0 million for the SM-3 Block IIA Cooperative Development (SCD) effort with the Japan Ministry of Defense. In FY 2015, the SM-3 Block IIA executed a controlled test vehicle, in which controlled first-stage flight through nosecone separation was successfully demonstrated. In December of 2015, a second controlled flight test was conducted to further test the Kinetic Warhead and Throttleable Divert and Attitude Control System. We will complete flight testing for the SCD Project with two intercept tests scheduled for the fourth quarter in FY 2016 and second quarter in FY 2017. In FY 2017, we will begin transition to testing the SM-3 Block IIA within the U. S. BMDS architecture with the upgraded Aegis Baseline 9 weapon system and BMD 5.1, for at sea and ashore deployment, and we request $254.7 million in RDT&E funding to continue manufacturing rounds to support flight testing and EPAA Phase 3.

MDA is strongly committed to further enhancing capability of the Aegis BMD weapon system to give Sailors the tools needed to successfully execute their mission. In FY 2015, we delivered the BMD 4.0.3 weapon system, which further enhances Aegis BMD's homeland defense role by improving long range surveillance and tracking capability to provide data to the GMD system for longer range and more sophisticated threats. MDA requests $28.3 million in FY 2017 for the BMD 4 series weapon systems to bring advanced threat and raid scenario capability

to the legacy Aegis BMD Fleet. Having certified the Aegis Baseline 9.C1 (BMD 5.0 CU) weapon system in November of 2015, MDA is shifting focus towards delivering BMD 5.1 capability on schedule and requests $92.4 million to continue software development and testing to certify in FY 2018 and meet the delivery timeline of the SM-3 Block IIA for deployment on ships and at Aegis Ashore sites. In addition to weapon system development, MDA requests $50.1 million to procure weapon system equipment for installation and upgrade to the BMD Fleet and $19.9 million to sustain BMD specific equipment on the existing Fleet.

Adding an additional layer to the Aegis BMD weapon system, we are using an incremental development approach integrated within the Navy's Baseline 9 architecture to develop and deliver a Sea Based Terminal capability. By expanding the capability of the SM-6 guided missile and BMD 5 series weapon systems, we are delivering capability to protect maritime forces against anti-ship ballistic missiles and provide layered defense for forces ashore. We will further test the first increment of Sea Based Terminal with follow-on performance testing in FY 2016 during FTX-21. Sea Based Terminal Increment 2 is on schedule to be certified and operational in the 2018-2019 timeframe.

European Phased Adaptive Approach

We will continue to support the EPAA as a U.S. contribution to NATO BMD to provide full coverage and protection of NATO European territory, populations, and forces from the increasing threat of ballistic missile proliferation from outside of the Euro-Atlantic area by investing resources for EPAA development, testing and deployment. It is important to emphasize that this capability is not capable of threatening, nor is it intended to threaten, Russia's strategic nuclear deterrent. EPAA Phase 1 was implemented in 2011 with the fielding of an AN/TPY-2 radar in Turkey and stationing of an Aegis BMD ship in the Eastern Mediterranean. EPAA Phase

2 achieved technical capability declaration in 2015, which enhances U.S. and NATO capabilities with the addition of Aegis Ashore in Romania, additional deployment of Aegis BMD ships home-ported in Rota, Spain, more capable Aegis BMD SM-3 Block IBs, and an upgraded Baseline 9 weapon system with BMD 5.0 CU. With Aegis Ashore Romania turned over to the Navy for operations, in FY 2017 we have requested $13.9 million for sustainment of the system. To augment needed ship stationing requirements of EPAA Phase 2, MDA is providing sustainment support for BMD specific equipment to the four ships that shifted home ports to Rota, Spain.

Although not directly in support of the BMDS architecture for EPAA Phase 2, MDA assisted the Maritime Theater Missile Defense Forum and U. S. Navy in a multi-national, two month long event. At-Sea-Demonstration 15 (ASD-15) met its objective to prove multi-national interoperability for air and ballistic missile defenses. During the seven weeks of live fire events, four IAMD scenarios were exercised. The capstone IAMD event was an SM-3 Block IA intercept of a short range threat by the USS ROSS cued by Netherlands' HNLMS DE ZEVEN PROVINCIEN, with simultaneous engagements of air breathing targets by the USS THE SULLIVANS and Canada's HMCS MONTREAL. United Kingdom and Spanish ships sent track data for analysis back to Dahlgren, Virginia. In all, ASD-15 demonstrated the power of a multi-national maritime task force to share information and work cooperatively in a complex integrated air and missile defense environment.

EPAA Phase 3 will improve defensive coverage against medium- and intermediate-range threats with the deployment of a second operational Aegis Ashore site in Poland, equipped with the upgraded Aegis Baseline 9 weapon system with BMD 5.1 and capability to launch SM-3 Block IIAs. These Aegis Weapon System upgrades are further enhanced by spiral upgrades to the C2BMC network enabling Engage on Remote capability and extended defensive coverage for

NATO Europe. In FY 2016 we requested $169.2 million for the construction of the Aegis Ashore site in Poland. The MDA MILCON contract for the Redzikowo, Poland Aegis Ashore site was awarded on February 10, 2016, and construction start was March 2016. We request $57.5 million in FY 2017 for procurement of Aegis Ashore equipment. We plan to complete this site by the end of 2018 and will upgrade the Aegis Ashore Romania site to BMD 5.1 when operationally feasible.

Command, Control, Battle Management, and Communications and Sensors

C2BMC provides persistent tracking, cueing, discrimination, and fire control quality data to Aegis BMD, GMD, THAAD, and coalition partners to support homeland and regional defense objectives. We continue to support Warfighter command, control and battle management needs across the globe by providing the strategic BMD planner, which provides Combatant Commanders situational awareness tools to support weapons release authority for homeland defense and control and tasking of forward-based AN/TPY-2 radars. C2BMC operators and maintainers are deployed forward in some of the world's highest threat spots and continue to provide around-the-clock support to the local commanders.

As the BMDS integrating element, C2BMC has demonstrated proven interoperability across regional BMD architectures. Of note this past year in the regional defense area, we integrated with Aegis Ashore to support Aegis Launch on Remote capability required for EPAA Phase 2 declaration in December 2015. MDA also fielded Cross-Area of Responsibility capability to USEUCOM and USCENTCOM C2BMC, allowing each Combatant Command to take advantage of the other's BMD assets. We also supported enhancements to the BMDS to keep pace with emerging threats worldwide by investing in the development, integration, and testing of advanced algorithms to improve discrimination capabilities and enhance the use of

space-based sensor data using the BMDS Overhead Persistent InfraRed (OPIR) Architecture (BOA). MDA's C2BMC engineers continued to make progress in the Simultaneous Correlation of Unambiguous Tracks (SCOUT) algorithms and Aggregated Discrimination. SCOUT is a multiphase activity to develop a physics-based capability to identify the lethal object(s) of a threat complex in a moderately complex countermeasure environment.

We will field C2BMC Spiral 8.2-1 to USNORTHCOM and USPACOM in the fourth quarter of FY 2017 in support of enhanced homeland defense. Spiral 8.2-1 is a complete hardware update to the C2BMC System that will allow C2BMC to integrate data from multiple TPY-2 radars, SBX, UEWR, Upgraded Cobra Dane, and BMDS OPIR architecture. It will increase system raid size and tracking capacity by a factor of five and will improve the system Information Assurance/Cyber security posture. Continued development, integration and testing of C2BMC Spiral 8.2-3 (Engage on Remote) will support the EPAA Phase 3 capability declaration in December 2018. Development of C2BMC Spiral 8.2-5 (LRDR Sensor Management and Enhanced Engage on Remote) will enable us by December 2020 to reach a robust homeland defense capability. Finally, we will continue to support incremental improvements to the BMDS to keep pace with emerging threats world-wide by investing in the development, integration and testing of advanced algorithms to improve discrimination capabilities and to enhance the use of space based sensor data using the BMDS OPIR architecture.

We request $32.1 million for continued operation of the Space Tracking and Surveillance System (STSS) in FY 2017. STSS satellites operate in low earth orbit and continue to collect valuable test data. STSS collected data on the most complex scenes to date during the FTX-20 test event in October 2014. (FTX-20 involved the launch of a separating MRBM and the

simulation of an exo-atmospheric engagement by an Aegis Baseline 9.C1 configured destroyer. GM CTV-02+ involved a non-intercept test of a Ground Based Interceptor against a complex target scene presented by an air launched IRBM.) STSS also successfully tracked and collected data during Glory Trips 215 and 212, and participated in two other Air Force Global Strike Command flight tests of the Minuteman III.

In FY 2015, we began the process of decommissioning the Near-Field Infrared Experiment (NFIRE) satellite that MDA launched in April 2007. This satellite captured high resolution phenomenology data from the exhaust plumes of boosting ballistic missiles. The NFIRE satellite was decommissioned in August 2015 and safely deorbited this past November. Looking to the future, we completed the Critical Design Review for the Spacebased Kill Assessment (SKA) in January 2015 and the SKA Flight Model Manufacturing Review in April 2015; delivered the first shipset of flight models to the payload integrator in November 2015 and the second shipset in January 2016. The SKA experiment is comprised of a network of sensors hosted on commercial satellites to collect data on missile intercepts, make an independent kill assessment, and pass that information on to the BMDS to support a multi-sensor kill assessment of the target. In FY 2017 we will complete the integration and testing of SKA payloads onto hosted payload modules and satellites and conduct on-orbit deployment, checkout, calibration and commissioning of the SKA sensor network.

The Services and COCOMs, with logistical support from MDA, are operating forward based X-band radars (AN/TPY-2(FBM)) in Japan, Israel, Turkey, and United States Central Command. All of these radars contribute to regional defense, and some also provide a significant contribution to the defense of the U.S. homeland. Last year we completed the integration and performance characterization testing of the 2nd AN/TPY-2 radar to Japan, located at

Kyogamisaki (Site KCS). In order to reduce noise levels at a seaside community near the KCS site, we completed muffler installation on Mobile Electric Power (MEP) -810 power generators in March 2015. MDA increased environmental protection for the radar equipment by coordinating and receiving approval for construction and modification of the Prime Mission Equipment/Rubb structure at Site KCS. In FY 2015 we delivered new operational mission profiles that provided cooperative coverage/capability for USEUCOM and USCENTCOM sensors and successfully completed operational flight testing of new capabilities in operational flight tests (FTO-02 events) and ground test campaigns, improving cross-Area Of Responsibility operational mission profiles, debris mitigation logic and increases operational availability. Last year we completed the THAAD Reliability Growth Test and critical maintenance periods on Radars #2, #3 and #5 at Guam. We also delivered Radar #11 to THAAD Battery #6 and continued production of Radar #12 (the final U.S. production AN/TPY-2).

We request $653.4 million in FY 2017 to develop, deploy, test, and sustain BMDS sensors (this includes $162.0 million for the continued development of the Long Range Discrimination Radar), and $172.6 million to sustain the twelve (terminal mode and forward-based mode) AN/TPY-2 radars and support the UEWRs and Cobra Dane radar. We expect to complete development efforts for the next incremental software build (CX3.0), which will expand electronic protection functionality and further improve discrimination and debris mitigation capabilities to handle more advanced threat set requirements. We will also develop common U.S. and FMS software architecture for AN/TPY-2 to improve synergy and achieve cost savings for future software builds. In FY 2017 we also will deliver the operational Float Antenna Equipment Unit (AEU) to improve Warfighter operational/maintenance flexibility; continue fleet-wide depot maintenance to retrofit Electronics Equipment Units with new signal data processors; and retrofit

a product redesign for AN/TPY-2 AEU transformers with upgraded reliability improvements across the fleet. AN/TPY-2 radars will participate in three BMDS flight tests (FTG-11, FTG-15, and FTT-18).

Developing New Capabilities

MDA is developing technology to address gaps in the BMDS and drive the cost of defending the homeland down dramatically. MDA's goal for these investments is to deploy a future BMDS architecture more capable and cost-effective that instills warfighter confidence in the ability of the BMDS to defeat missile attacks. Our vision is to shift the calculus of our potential adversaries by introducing directed energy into the BMDS architecture. This would revolutionize missile defense by dramatically reducing, if not eliminating, the role of very expensive interceptors. Our long-term goal is to deploy lasers on high altitude, long endurance Unmanned Aerial Vehicle (UAV) platforms to destroy ICBMs in the boost phase. To achieve this vision we must demonstrate two key elements: laser scaling with high efficiency and excellent beam quality, and high altitude, long endurance aircraft to carry the laser system.

We request $71.8 million in Weapons Technology to continue development and test of our high-powered directed energy program to build the foundation for the next-generation UAV-borne laser system. A UAV-borne laser would be capable of acquiring, tracking and eventually destroying an enemy missile at a much lower cost than the existing BMDS. Within the Directed Energy project, we will collaborate with our Air Force and DARPA partners to develop and demonstrate the technology necessary to scale laser power to a level required for speed-of-light missile defense. In FY 2015, the Massachusetts Institute of Technology's Lincoln Laboratory (MIT/LL) Fiber Combining Laser achieved 44 kilowatts (kW) continuous power with near perfect beam quality, a record for fiber combined lasers. In 2017, MIT/LL will demonstrate a 30 kW,

low Size Weight and Power (~ 7 kg/kW) fully packaged fiber laser. They also will demonstrate a flight qualified 1 kg/kW fiber amplifier traceable to BMDS high energy laser system requirements. The Lawrence Livermore National Laboratory (LLNL) achieved similar success with their Diode Pumped Alkali Laser (DPAL) system, reaching 14 kW, a record for the DPAL system. In FY 2017, LLNL will demonstrate a DPAL system at 30 kilowatts average power, more than double the power ever achieved by a hybrid laser. The Agency also will make technology investments in Divert and Attitude Control Systems for future BMD interceptors and kill vehicles.

In our effort to mature laser technology for missile defense, we awarded five contracts with key aerospace partners to produce concepts for an airborne low power laser demonstrator. We will use these concepts to guide our requirements for the follow-on competitive design contracts in FY 2017 under our Technology Maturation Initiatives program element. MDA requests $90.3 million in FY 2017 for Technology Maturation Initiatives to build on the successes in weapons technology and discrimination sensor technology. Our vision is to add high altitude airborne or space-based electro-optical sensors into the BMDS architecture that can acquire, track, and discriminate ballistic missile targets.

One of the goals of the Discrimination Sensor Technology flight test development program is to demonstrate that the Aegis Weapon System can launch an SM-3, engage and destroy a ballistic missile solely on tracks from remote airborne sensors. Test campaigns exercise the test analog of the BMDS architecture using operationally proven Multispectral Targeting System sensors aboard MQ-9 Reapers as the tracking element. During FTX-20, FTM-25, and GM CTV-02+, the Reapers received cues, acquired and tracked the target and transmitted these tracks to the BMDS C2BMC laboratory at Schriever Air Force Base. C2BMC fused the tracks

and transmitted them via Link 16 to the Aegis Ballistic Missile Test Bed at Space and Naval Warfare Systems Command (SPAWAR) in San Diego, CA where the engagements were simulated in real-time. During GM CTV-02+ the Aegis Weapon System authorized Remote Engage Doctrine within 30 seconds of target burnout.

Over the next two years, we will incrementally demonstrate the value of increasingly more capable electro-optical/infrared sensors while developing tactics and procedures for future operational use. This work will culminate in a real time Aegis SM-3 engagement using tracking information from airborne sensor data in 2017 and again using higher precision, advanced sensor data in 2019. These tests are a crucial step in developing persistent sensor technology to defeat the evolving ballistic missile threat first from aircraft and eventually from space. Finally, MDA will contract with industry to begin the design of an airborne laser demonstrator to quantify the target acquisition, tracking, and handover performance required for boost phase missile defense.

MDA requests $71.5 million for the MOKV effort. We have made considerable progress on the development strategy for the next generation exo-atmospheric kill vehicles. In FY 2015, we awarded three contracts with industry to define concepts for deploying multiple kill vehicles from a single booster. In FY 2016, industry delivered their MOKV concepts, and we are evaluating those concepts. The next step will be to focus on reducing component technical risk in critical areas identified by industry, which is necessary to make this revolutionary concept a reality. By 2017 we will develop and test MOKV command and control strategies in both digital and Hardware-in-the-Loop venues that will prove we can manage the engagements of many kill vehicles on many targets from a single interceptor. We will also invest in the communication architectures and guidance technology that support this game changing approach. Ultimately, MOKVs may revolutionize our missile defense architecture.

MDA requests $23.4 million for Advanced Research and development that capitalizes on the creativity and innovation of the Nation's small business community and academia to enhance the BMDS. We are also fostering research between U.S. and foreign universities of allied nations through international cooperative science and technology projects. We awarded nine new contracts and exercised continuation options on ten additional contracts for innovative new research that can transition onto the BMDS.

MDA also requests $17.9 million for the Advanced Concepts & Performance Assessment effort, which models the capability of advanced BMD technology to address evolving threats to the warfighter. The request will fund the digital simulation and hardware-in-the-loop framework and models required for testing of the Airborne Advanced Sensor, Kill Vehicle Modular Open Architecture test bed, and maturing sensor fusion algorithms.

International Cooperation

The FY 2017 budget request includes funding for regional missile defense capabilities to protect deployed U.S. forces, reassure allies and partners, and build cooperative regional security architectures. MDA is engaged with over twenty countries and international organizations, such as NATO and the Gulf Cooperation Council (GCC). MDA is committed to expanding work with our international partners, to include conducting joint analyses to support partner missile defense acquisition decisions, cooperative research and development projects, deploying BMD assets, Foreign Military Sales (FMS), and co-production efforts. Our major international efforts reflect the Department's goals in the Asia-Pacific, Middle East, and European Areas of Responsibility and will enable implementation of EPAA, build partner capacity, and support the strategic shift to Asia-Pacific.

The investments of our allies and partners in their own missile defense capabilities allow us to build more effective regional security architectures that complement U.S. regional missile defense capabilities. MDA is currently executing an FMS case with the United Arab Emirates for two THAAD batteries and accompanying launchers, radars, and interceptors. MDA is actively engaged with several nations, particularly those in the Arabian Gulf region, to provide program information and cost data that may inform future decisions to procure THAAD and other missile defense systems. We are currently conducting a Ballistic Missile Early Warning Study for the GCC, analyzing sensor and C4I architecture options for defense of the region.

We continue to have a very strong cooperative missile defense partnership with Israel. Over the past year, the Israel Missile Defense Organization (IMDO) and MDA successfully completed the third and fourth series of tests of the Stunner Interceptor for the David's Sling Weapon System (DSWS). IMDO and MDA also achieved the successful first engagement of a ballistic missile target with the Arrow-3 interceptor in December 2015. This was a major milestone in the development of the Arrow Weapon System and provides confidence in future Israeli capabilities to defeat developing threats. The Department continues to support the critical Iron Dome Program to defeat short-range rockets and artillery through co-production efforts.

We are making significant progress with our Japanese counterparts on the SM-3 Block IIA, our largest co-development effort. The development work, which remains on track for first delivery in the 2018 time frame, will expand extended deterrence to our friends and allies and establish an important vehicle for closer defense cooperation ties. Once deployed at the Aegis Ashore site in support of EPAA Phase 3 and on ships, the SM-3 Block IIA will improve and expand defenses against MRBM and IRBM threats.

We continue to work on meeting our EPAA commitments with our NATO Allies. In December 2015, we completed major weapon system construction and achieved Technical Capability Declaration of the Aegis Ashore site in Romania. We anticipate declaring Initial Operating Capability of EPAA Phase 2 as well as beginning work on the Aegis Ashore site in Poland in support of EPAA Phase 3 this year. In addition to our interoperability activities with NATO, MDA continues to work with our European allies collectively as we build upon the synergy and lessons learned from ASD-15 as well as bilaterally to further individual national progress with missile defenses.

Cybersecurity/ Supply Chain Risk Management

We are very cognizant of the growing cyber threat and aggressively working to ensure the Nation's missile defenses are resilient and able to operate in a highly contested cyber environment. Potential adversaries are developing cyber forces as part of their military structure and integrating them into their overall strategy. We are working very closely with the Armed Services, the Combatant Commands, especially Strategic Command's USCYBERCOM, and other agencies in DoD and the Federal Government to counter this growing threat.

We are improving the cyber hygiene of our missile defense capabilities by ensuring our cybersecurity infrastructure has the latest security upgrades and patches. We are assessing our systems, our suppliers, and our overall acquisition processes. We are ensuring robust and secure configurations of our critical software and hardware to reduce the risk of malicious activities. We also have a rigorous cyber and supply chain risk management inspection program to examine everything about our systems from the trusted supply chain to the fielded capability. This helps us ensure the highest possible levels of compliance.

In support of the DoD Cybersecurity Culture and Compliance Initiative signed out by the Secretary of Defense on September 28, 2015, we are developing a cybersecurity program that focuses on the five operational excellence principles: Integrity, Level of Knowledge, Procedural Compliance, Formality and Backup, and Questioning Attitude. These principles are fundamental to the DoD cyber enterprise.

We are also instituting the DoD Cybersecurity Discipline Implementation Plan to mitigate risks for the information systems we own and manage. Our program implements the DoD campaign four lines of effort: 1) Strong Authentication, to degrade the adversaries' ability to maneuver on DoD information networks; 2) Device Hardening to reduce internal and external attack vectors into DoD information networks; 3) Reducing the Attack Surface, to lessen external attack vectors into MDA information networks; and 4) Alignment to Cybersecurity / Computer Network Defense Service Providers, to improve detection of and response to adversary activity. These efforts run across all facets of MDA and the BMDS mission systems and general services infrastructures. We also created five additional Lines of Effort critical to MDA and the BMDS including: 1) Safeguarding BMD information in the defense industrial base; 2) Positioning, Navigation, and Timing; 3) Transitioning to Risk Management Framework; 4) Cybersecurity Testing and 5) Cybersecurity Workforce Management (training and certification).

We are also increasing efforts to establish additional cybersecurity awareness training in support of the DoD Cybersecurity Culture and Compliance Initiative to improve the individual human performance and accountability within the DoD cyber enterprise. This applies to our leaders, service providers, cyber warriors, and all of our general users. Our efforts align to the DoD Cyber Strategy program and are meant to enable and augment the existing mandated cyber training efforts. Our training reinforces DoD training and exists to shift cybersecurity cultural

norms at all levels to increase cybersecurity situational awareness across all personnel and inculcate a high level of personal responsibility.

MDA has established an insider threat program in accordance with the DoD Directive 205.16, "The DoD Insider Threat Program." We are leveraging computer network defense capabilities, in addition to other information streams to proactively detect, mitigate and defeat potential insider threats. This program also ensures that only trusted individuals have access to MDA program information and systems.

The MDA Computer Emergency Response Team (CERT) continues to provide Computer Network Defense (CND) services as an accredited Tier II CND service provider to MDA programs of record. The MDA CERT executes a battle rhythm that includes daily monitoring and collaboration with USCYBERCOM, Joint Forces Headquarters DoD Information Networks, and other sources for latest threats to DoD and the MDA. As a result, the MDA CERT tracked and managed 109 cyber taskings in FY 2015, contributing to the overall cybersecurity posture of MDA networks and resources. From August to November 2015, the Information Security Oversight Office (ISOO) inspected MDA. The ISOO is responsible to the President for policy and oversight of the Government-wide security classification and the National Industrial Security Program and is a component of the National Archives and Records Administration. In addition to security classification and Industrial Security, the ISOO reviewed MDA's cybersecurity program. ISOO's review confirmed that the MDA operates a robust CNSI program, one that enjoys leadership support and utilizes numerous best practices. Nearly all of the program elements are very strong, and the personnel who implement the program are dedicated and innovative. The Agency's Security Classification Guides are developed and updated utilizing a sound process and those that ISOO reviewed were current, very well prepared, and included all of the elements

required by Executive Order 13526 and ISOO Directive 1. As with any program, there are areas for improvement. MDA is working those areas for improvement based on the findings and recommendations.

Over the last year we also conducted two Enterprise Cyber Range Environment (ECRE) experiments with independent, DOT&E red team penetration testing on the Joint Information Operations Range (JIOR). The purpose of these experiments is to determine the BMDS cyber robustness to both external and insider threats. We are planning an additional ECRE for the GMD program in May 2016. MDA also completed 85 cybersecurity inspections worldwide to ensure compliance with DoD and MDA cybersecurity standards. We follow up on these inspections to ensure remediation of all identified cybersecurity risks.

We must build resilient cyber defenses that are capable of detecting and mitigating threats without impeding operations in order to "fight through" the cyber threat. MDA collaborates with the Director of Operational Test and Evaluation to conduct cyber penetration testing on key missile defense capabilities. We then use the results of those tests to conduct risk assessments to prioritize cybersecurity improvements, develop mitigation strategies, and improve cyber training. We are also working to develop better cyber concept of operations to ensure every network defender in every location knows how to react to cyber challenges.

MDA is working hard to incorporate cybersecurity requirements early into our acquisition lifecycle. We are focused on ensuring we are designing and building cybersecurity into missile defenses, rather than adding it after the fact. In addition, we are working closely with our industry partners in the defense industrial base to ensure they can protect both classified and unclassified information they are processing on their systems to ensure that it will not be exposed to potential adversaries. We know that malicious cyber actors are constantly attempting to

exfiltrate information from U.S Industry. We will continue to work with the defense industrial base, the FBI, and other partners to identify these issues and raise the costs of this behavior to those responsible, in coordination with national authorities and in accordance with national policy.

We are working diligently with the COCOMs, Services, and other agencies in the Federal Government to ensure the missile defense capabilities we field will operate successfully in a highly contested cyber environment. We have structured and continue to improve an ongoing robust cybersecurity program to protect information about current and future missile defense capabilities and ensure a persistent state of enterprise cybersecurity readiness. This ensures that the Agency remains a strong mission partner, protects and defends MDA information systems and networks, and optimizes cybersecurity management and processes at a level commensurate with our critical national defense mission.

Program Oversight

There continues to be significant interest in MDA's development and deployment of the BMDS and management of the missile defense program. MDA is highly visible and one of the most scrutinized agencies within the Department of Defense. Each year, throughout the budget hearing cycle and congressional mark-ups and floor debates of the defense authorization and appropriations bills, there is intense congressional oversight of the missile defense program. MDA is also subjected on an annual basis to numerous Government Accountability Office audits, the support of which has required MDA to expend significant time and enormous resources. Dozens of MDA personnel are engaged in supporting 21 GAO audits and answering more than 750 inquiries. Just within the past year MDA has provided nearly 11,000 pages of internal

documents and prepared responses. MDA has concurred or partially concurred with all 21 GAO recommendations in their annual Mandate Report since 2011.

In addition, the National Defense Authorization Act for Fiscal Year 2010 requires that Defense Department financial statements be validated as ready for audit no later than September 30, 2017. The Office of the Under Secretary of Defense (Comptroller), Financial Improvement and Audit Readiness (FIAR) Directorate, initiated the Statement of Budgetary Activity (SBA) Examination for the MDA in April 2015 to evaluate the Agency's readiness for audit. In December 2015, the audit firm conducting the SBA reported that MDA management's assertion is fairly stated, which is a successful audit opinion. The Missile Defense Agency continues to make significant progress with FIAR initiatives and new Department policies. The successful SBA examination confirmed the Agency is on track to meet financial statement requirements and full auditability by the end of Fiscal Year 2017.

MDA also annually delivers the congressionally mandated Baseline Acquisition Review (BAR) reports to Congress and GAO. We released the latest BAR in early March. MDA and the Department also continue to produce and deliver, as required by the annual defense bills, on average, over 30 reports to congress on missile defense.

Conclusion

Mr. Chairman and Members of the Subcommittee, in closing, I want to assure Congress that MDA programs are cost-effective, efficient, and managed in accordance with the Missile Defense Executive Board process set up by the Department to ensure all missile defense programs and operational requirements are validated, adhere to sound acquisition practices, and can meet warfighter demand in a cost effective manner. Our budget request for Fiscal Year 2017 will continue to increase the capability and capacity of fielded homeland and regional missile defense

systems and make measured investments in advanced technology to reverse the adversary's numerical advantage. I look forward to answering the committee's questions. Thank you.

RECORD VERSION

STATEMENT BY

LIEUTENANT GENERAL DAVID L. MANN, USA

COMMANDING GENERAL,
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
ARMY FORCES STRATEGIC COMMAND
AND
JOINT FUNCTIONAL COMPONENT COMMAND FOR
INTEGRATED MISSILE DEFENSE

BEFORE THE

COMMITTEE ON ARMED SERVICES
STRATEGIC FORCES SUBCOMMITTEE
UNITED STATES SENATE

SECOND SESSION, 114TH CONGRESS

BALLISTIC MISSILE DEFENSE PROGRAMS IN REVIEW OF THE DEFENSE AUTHORIZATION REQUEST FOR FISCAL YEAR 2017 AND THE FUTURE YEARS DEFENSE PROGRAM

APRIL 13, 2016

NOT FOR PUBLICATION
UNTIL RELEASED BY THE
SENATE ARMED SERVICES COMMITTEE

Lieutenant General David L. Mann, USA
Commanding General
U.S. Army Space and Missile Defense Command/
Army Forces Strategic Command
and
Joint Functional Component Command for
Integrated Missile Defense

Chairman Sessions, Ranking Member Donnelly, and distinguished Members of the Subcommittee, thank you for your continued support of our Service Members, Civilians, and Families. In the same capacity as my previous appearances before this subcommittee, I appear before you today bringing both a Joint and Army perspective on effective missile defense capabilities. Let me again express my appreciation to this Subcommittee for its continued support of the Army, the U.S. Strategic Command, the Department of Defense, and the missile defense community. I am honored to again testify before this Subcommittee along with these distinguished witnesses who provide missile defense capabilities to our Nation, forward deployed forces, partners, and allies.

As previously outlined during appearances before this subcommittee the last two years, my responsibilities encompass several main areas. First, as the Commander of the U.S. Army Space and Missile Defense Command (USASMDC), I have Title 10 responsibilities to man, train, maintain, and equip space and global ballistic missile defense forces for the Army. As Commander of USASMDC, I also serve as the Army's force modernization proponent for space, global ballistic missile defense, and high altitude forces and capabilities. Second, as the Commander, Army Forces Strategic Command (ARSTRAT), I am the Army Service Component Commander (ASCC) to the U.S. Strategic Command (USSTRATCOM). I am responsible for planning, integrating, coordinating, and providing all Army space and missile defense forces and capabilities in support of USSTRATCOM missions. Third, as the Commander of USSTRATCOM's Joint Functional Component Command for Integrated Missile Defense (JFCC IMD), I am responsible for synchronizing missile defense planning, supporting ballistic missile defense operations, recommending allocation of missile defense assets, and advocating for missile defense capabilities on behalf of the Combatant Commanders.

Lastly, I serve as the Army's Air and Missile Defense (AMD) Enterprise Integrator. My responsibility is to synchronize the balanced implementation of the Army's AMD strategy across the functions of force planning and sourcing requirements, combat and materiel development, AMD acquisition and life cycle management, and to orchestrate consistent strategic communication messaging themes.

In accordance with these responsibilities, my intent today is to again highlight the most significant missile defense asset—our great people; to briefly outline the strategic environment; to emphasize USASMDC/ARSTRAT's missile defense force provider responsibilities with respect to the Army and the Geographic Combatant Commanders (GCCs); to outline JFCC IMD's role as an operational integrator of Joint missile defense for USSTRATCOM; and finally to summarize a few of the key Army air and ballistic missile defense activities and developments in the context of a comprehensive approach to addressing an evolving ballistic missile threat.

The Workforce—Recognizing and Protecting Our Greatest Asset

The challenges that we face cannot be mitigated without the dedication of our greatest asset—our people. Just as I outlined during my previous appearances, I feel it important to highlight our workforce and my concern of potential out-year sequestration on our workforce. At USASMDC/ARSTRAT and JFCC IMD, our people remain our most enduring strength. The Service Members, Civilians, and Contractors support the Army and Joint Warfighter each and every day, both those stationed in the homeland and those globally deployed. We remain committed to providing trained and ready Service Members and Civilians to operate and pursue enhanced capabilities for the Nation's ballistic missile defense system (BMDS).

While the 2015 Bipartisan Budget Agreement provides some short term relief and stability, the potential future return of sequestration causes great concern—especially with regards to its impact on the workforce and our overall readiness. Within my commands, any future year sequestration will negatively impact the space and missile defense enablers our Soldiers and Civilians provide to the Combatant Commanders. Specifically, readiness, training, and enhancements to space and missile defense capabilities will be degraded. Also, a return of sequestration will negatively impact the

morale of our workforce. As stated last year, I believe that a more prudent course of action should be identified and implemented to ensure that we can continue to meet our current global responsibilities and those of tomorrow.

The Evolving Threat

Current global trends indicate ballistic and cruise missiles are becoming more complex, due in part to the increase in proliferation of advanced technologies, resulting in systems with greater ranges and accuracy. Additionally, many foreign ballistic and cruise missile systems are progressively incorporating advanced countermeasures including maneuverable reentry vehicles, multiple independent reentry vehicles, electromagnetic jamming, and hypersonics, with the purpose of challenging our ballistic missile defense systems. Moreover, ballistic and cruise missile platforms are increasing quantitatively, and as most are mobile field-based systems, is decreasing our ability to detect and track these systems before they are launched.

Numerous countries are developing ground-, sea-, and air-launched land-attack cruise missiles utilizing an assortment of unconventional and inexpensive launch platforms. Presently, nearly 30 countries possess ballistic missile capability. Together, these countries have approximately 50 different variants of ballistic missiles. Additionally, there are currently 13 new intermediate-range and eight intercontinental ballistic missiles (IRBM and ICBM) variants under development. As an example, North Korea, has probably tested ICBM capabilities in recent space launches and continues to develop the KN-08 road-mobile ICBM and an IRBM variant capable of reaching Guam and the Aleutian Islands.

"Maintaining the capability to deter and defeat attacks on the United States is the Department's first priority."

--Quadrennial Defense Review March 2014

In the future, our BMD systems will encounter more complex advanced electronic and cyber-attacks and will also need to combat directed energy capabilities that could significantly degrade US missile defense operations. It should also be expected that

cyber- and electronic-attacks will increasingly be part of an adversary's anti access/area-denial (A2/AD) approach.

To meet the objectives of the current Quadrennial Defense Strategic Guidance, USSTRATCOM and the Army continue to provide and enhance homeland and regional missile defense. In accordance with the Department's strategy to rebalance to the Asia-Pacific region, we have worked with partners in U.S. Pacific Command (USPACOM), U.S. Northern Command (USNORTHCOM), and USSTRATCOM to review and improve our capabilities in the USPACOM area of responsibility. In addition to the deployment of a Terminal High Altitude Area Defense (THAAD) battery in Guam, we have deployed an additional forward-based sensor in Japan to bolster our regional and homeland defense capabilities. The Army is presently working to forward station a THAAD battery on Guam to reduce the deployment turbulence and create more strategic flexibility in the THAAD force. We have completed the final environmental protection submission for the Fish and Wildlife Service and expect to have a long-term solution in place this year.

The emplacement of 14 additional Ground-Based Interceptors at Fort Greely, Alaska, scheduled for completion in 2017 and an Inflight Interceptor Communications System Data Terminal at Fort Drum, New York, will provide improved capability and capacity to defend the Nation against a limited ICBM attack. In addition, we continue to work with regional partners and allies to increase our information and data sharing and develop a global AMD force posture that leverages ever growing partner nations' capabilities. This will result in reduced strain on our force and enable more timely modernization of our AMD assets.

"Effective missile defense is an essential element of the U.S. commitment to strengthen strategic and regional deterrence against states of concern"

-- USSTRATCOM Posture Statement February 2016

The Quadrennial Defense Review also establishes a priority to maintain a strong commitment to security and stability in Europe, the Asia Pacific region, and the Middle East. In conjunction with our allies and partners, the DoD continues to maintain forward committed PATRIOT, THAAD, and Counter Rocket, Artillery and Mortar (C-RAM) air

and missile defense forces in order to enhance our current AMD posture while sending a strategic deterrence message to potential adversaries. The scope and quantity of these deployments result in a highly deployed and stressed Army AMD force. We must seek to balance today's operational requirements with shaping the force to counter future challenges. Our efforts must also include the critical modernization of our AMD force over the next five years.

In summary, enemy air and missile threats continue to develop in complexity, quantity and capacity. The evolution of multiple sophisticated capabilities requires a holistic approach that effectively integrates offensive and defensive, passive, kinetic and non-kinetic, and alternative capabilities to defeat air and missile threats. The growing complexity of the strategic environment based on technological advances of the threat and fiscal realities requires cost effective methods to integrate current and future capabilities. We continue to prioritize integrated air and missile defense resources to optimize all our capabilities in support of the Warfighter, particularly in light of the expense associated with traditional approaches. We continue to partner with the Missile Defense Agency (MDA), Combatant Commands, and Services to pursue a fiscally responsible path to keep pace with evolving threats by identifying and prioritizing capabilities that provide the greatest operational value.

Providing and Enhancing Missile Defense Capabilities

USASMDC/ARSTRAT, a force provider of missile defense capabilities, is manned by multi-component Soldiers, Civilians, and Contractors. Commands around the world, including USSTRATCOM, USNORTHCOM, 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 USSTRATCOM's missile defense mission. USASMDC/ARSTRAT also serves as the Army's global operational integrator for missile defense, the Army's proponent for global ballistic 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. As the Army AMD Enterprise Integrator, our tasks include working across the AMD community of interest to balance priorities, informing resourcing

decisions, and pursuing innovative approaches in order to enhance our strategic flexibility. The AMD Enterprise remains focused on meeting operational demands and AMD modernization initiatives. Achieving a balance of fiscal resources and force structure between operational requirements and timely development and implementation of the AMD modernization priorities is imperative. Collectively, the conduct and integration of these roles help to set conditions for the protection of GCCs and Joint Warfighters while maintaining their freedom of action, provide the ability to build and project combat power, and assure access to the global commons.

Our operational function is to provide trained and ready missile defense forces and capabilities to the GCCs and the Warfighter—in other words, to address the requirements of today. 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. Highlights of the missile defense capabilities provided by our missile defense professionals include:

Support to Global Ballistic Missile Defense: Soldiers from the 100th Missile Defense Brigade, headquartered in Colorado Springs, Colorado, and the 49th Missile Defense Battalion, headquartered at Fort Greely, Alaska, remain ready, 24/7/365, to defend our Nation and its territories from a limited intercontinental ballistic missile attack. Under the operational control of USNORTHCOM, Army National Guard and active component Soldiers operate the Ground-based Midcourse Defense 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, California. These Soldiers, in conjunction with USNORTHCOM, also oversee the maintenance of GMD interceptors and ground system components. At the Missile Defense Complex at the Fort Greely site, 49th Missile Defense Battalion military police secure the interceptors and communications capabilities from physical threats.

> ***"…will remain ready to deter and defeat threats to the homeland…"***
>
> ***-- National Security Strategy February 2015***

Recently, MDA completed the fielding of an additional Inflight Interceptor Communications System Data Terminal (IDT) at Fort Drum, New York. Just last month, the Army completed its Title 10 responsibilities and, in conjunction with USNORTHCOM, declared the IDT operational. In addition to increasing the overall effectiveness of the entire inventory of ground-based interceptors, the Nation's only active defense against an ICBM attack, the IDT will also greatly enhance the coverage and protection of the Eastern U.S.

GMD System Test and Development: Soldiers from the 100th Missile Defense Brigade actively participate in GMD test activities and continue to work with MDA developers on future improvements to the GMD system. The rigorous testing regime of MDA, conducted through their series of operational flight as well as ground-based tests, emphasizes operational realism during test design and execution. Therefore, in addition to gaining test data and insight, Soldiers of the 100th Missile Defense Brigade gain tremendous training value by executing their actual responsibilities while providing Warfighters with confidence the system will perform as planned in support of their Joint campaigns.

Support to Regional Capabilities: The 100th Missile Defense Brigade also provides GCCs with trained and certified AN/TPY-2 FBM radar detachments. These operational capabilities are present today at five strategic locations around the globe where they contribute to the early warning, cueing, tracking, and discrimination of threats to our friends and allies. These forward-based radars also represent a tangible contribution to regional defense that is the centerpiece of the Administration's Phased Adaptive Approach (PAA). In several instances, these Soldiers, deployed to remote and austere locations, are the only persistent demonstration of our national commitment and resolve to the PAA.

Ballistic Missile Early Warning: Space enabled capabilities are essential for missile defense operations. Everything from communications, precision navigation and timing, intelligence, surveillance, reconnaissance, and early warning are dependent on space enabled capabilities. Through the Joint Space Operations Center, we routinely coordinate and collaborate with the Joint Functional Component Command for Space

(USSTRATCOM) to ensure resilience of the space architecture that forms the backbone of the missile defense joint kill chain.

In support of the Joint Force Commander, 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 tactical control of USSTRATCOM's Joint Functional Component Command for Space, are operated by USASMDC/ARSTRAT space-professional Soldiers who monitor launch activity and other infrared events. They provide essential information to members of the air, missile defense, and operational communities. Our JTAGS Detachments are forward deployed around the globe, providing 24/7/365, dedicated, assured missile warning to USSTRATCOM and GCCs in support of deployed and forward-based forces. We continue to optimize this capability and this year we gained support from the Government of Italy to relocate the JTAGS in Europe to Sigonella Naval Air Station.

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 provide relevant and updated training on our global missile defense systems. During the past fiscal year, USASMDC/ARSTRAT trained 185 Soldiers and was 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 Joint and Army validation of its requirements. As a recognized Army Center for Analysis, USASMDC/ARSTRAT conducts studies to determine how to best meet the Army's assigned missile defense responsibilities. With these insights, we develop and operationalize the Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, Facilities, and Policy (DOTMLPF-P) domains to address evolving threats and potential vulnerabilities to the 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.

Our third major missile defense task 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 the space and high altitude domains. However, while MDA is the principal materiel developer for ballistic missile defense capabilities, USASMDC/ARSTRAT has a number of supporting missile defense related materiel development efforts, to include supporting research and development of an OSD-sponsored conventional prompt global strike capability. These technical capabilities are at the forefront of developing holistic, cost-effective approaches to address the missile defense challenge. Following is a brief summary of two of our research and development efforts, as well as an overview of the capabilities of an essential Army testing range.

High Energy Laser Technology Development and Demonstration: The objective of the Army's high energy laser science and technology project is to develop laser system components, ruggedize and integrate them onto an Army vehicle, conduct demonstrations to characterize performance capability, and transition the technology to a Program Executive Office. A solid-state laser weapon system has potential to be a low cost, effective complement to kinetic energy capabilities in countering rockets, artillery, and mortars (RAM); unmanned aerial vehicles (UAVs); and other threats. The project is building upon pathfinder demonstrations with a 10 kilowatt-class laser system in 2013 and 2014, by continuing to develop and integrate technology at higher power and technology maturity levels. The next major demonstration will occur in 2018 following integration of a 50 kilowatt-class laser system onto a High Energy Laser Mobile Test Truck (HEL MTT). In 2015, the Army Science and Technology Working Group approved changes to the laser project to better align with the Army's Indirect Fire Protection Capability Increment 2 Block 1 (IFPC Inc 2-1) program. These changes will result in a pre-prototype laser weapon system demonstration, on a family of medium tactical vehicles variant, in the early 2020s designed to meet counter RAM requirements in the draft IFPC (IFPC Inc 2-1) Capability Development Document.

Providing Future Warfighters with Innovative Missile Defense Capabilities

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, we completed detailed designs for three new short range ballistic missile targets leveraging existing excess solid rocket motors. The first risk reduction flight of these targets is planned for May 2016. The Army will realize significant savings conducting operational test events using these new targets beginning in Fiscal Year 2017. We will continue to leverage existing missile inventory and technology advancements to develop less expensive targets that are representative of real world 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. Including the recent successful MDA Warfighter and homeland defense tests, FTO-02E2 and CTV-02 respectively, these tests have grown ever more challenging and complex over the last few years, providing a means to replicate theater missile defense architectures superimposed over these Pacific test sites. Through shrewd and efficient resource investments, RTS retains preeminent missile defense testing capabilities and personnel to continue to provide critical testing support. In concert with its testing mission, Reagan Test Site conducts continuous deep space surveillance and space object identification operations to further increase national capabilities and reduce expenditures for both mission sets. During the past month, the U.S. Air Force began construction of their most advanced surveillance system—the Space Fence. In a few years, this improved surveillance capability will enable proactive space situational awareness while complementing existing systems at Reagan Test Site.

Joint Functional Component Command for Integrated Missile Defense—Synchronizing Global Missile Defense Planning, Force Management, and Operations Support

The Joint Functional Component Command for Integrated Missile Defense, or JFCC IMD, is USSTRATCOM's missile defense integrating element. Like the other

Joint Functional Component Commands, JFCC IMD was formed to operationalize USSTRATCOM 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 intercontinental ballistic missile attack, even in the face of the changing fiscal environment. While resources remain constrained, we continue to increase regional and homeland defense capabilities. We remain partnered with the GCCs and MDA to initiate development of future capabilities in the Long Range Discrimination Radar in Alaska, development of the Redesigned Kill Vehicle (RKV) for the next GBI upgrade, and various other improvements in the global missile defense capability.

Defense of the Homeland Priority Requires Execution of a Holistic Global Missile Defense Plan

On behalf of USSTRATCOM, JFCC IMD is working across the DoD enterprise to improve the integration of existing capabilities in order to maximize our efficiency and effectiveness to protect the homeland, deployed forces, partners, and allies. The key force multiplier is “integration,” which is a critically important mission area for JFCC IMD and directly supports USSTRATCOM’s assigned Unified Command Plan (UCP) responsibilities for missile defense.

As an operational and functional component command of USSTRATCOM, JFCC IMD has seven priorities for this year in support of USSTRATCOM UCP responsibilities:

- Remain postured to provide operational support during all missile events of interest and conduct BMDS asset management.
- Incorporate the Global Missile Defense CONOPS (GMDC) elements into policy, doctrine, and practice.
- Ensure operational realism and Warfighter priorities in tests to support operational acceptance of new capabilities.

- Conduct a holistic operational assessment through the Global Integrated Air and Missile Defense Assessment (GIAMDA) for advocacy of critical operational requirements to influence the missile defense investments.
- Recommend, through USSTRATCOM, the allocation of missile defense assets in support of geographic combatant command requirements and priorities.
- Evolve Joint BMD training to reflect technical and operational changes and improvements and to increase efficiency.
- Strengthen integration with USSTRATCOM subordinates and other organizations to improve cross-mission synergies.

To accomplish these priorities, 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. We continually enhance our deployed capabilities while gaining operational experience and confidence in our collective ability to defend the Nation, deployed forces, partners, and allies. Some of our key efforts to enhance missile defense planning and capabilities for both the homeland and regional architectures follow.

Expansion and Integration of the Missile Defense Architecture: In response to the evolving strategic environment, we continue to bolster homeland and regional missile defense capabilities. Over the past year, we have deployed an additional AN/TPY-2 FBM radar to Japan, expanded the existing European Phased Adaptive Approach (EPAA) by operationalizing the Aegis Ashore capability in Romania, started construction of a second Aegis Ashore capability in Poland, upgraded Ft Greely, Alaska's existing GBI capability and inventory, and initiated key future capability developments in the Long Range Discrimination Radar and the RKV. Given many of the challenges associated with implementation of these architectures, JFCC IMD, in support of USSTRATCOM's global synchronizer role for missile defense, is

We will maintain "a robust missile defense capability to defend the homeland against a limited ballistic missile attack."

--Quadrennial Defense Review March 2014

collaborating with the GCCs to assess and address the cross-regional gaps in the areas of planning, policy, capabilities, and operations.

Global Planning and Assessment: Regional and global missile threats continue to increase in numbers and complexity. This year, after successfully completing a revision to the Global Missile Defense Concept of Operations, JFCC IMD operationalized many of the emerging processes identified in this seminal document. We led the missile defense community in an objective analysis of missile defense looking at risk from the lens of impacts across multiple GCC plans given a crisis with a single adversary problem set. This assessment will identify systemic risk, inform recommendations for shortfall mitigation, and improve effectiveness in missile defense planning. The output of this analysis directly informs the GIAMDA which serves to shape recommendations for global force management and advocacy efforts for future capability investments. We have completed the 2015 GIAMDA and its findings further underscores the holistic missile defense strategy that the Department is undertaking in technology development, allied integration, left-of-launch options, and cyber operations.

Global Force Management: USSTRATCOM, 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. This year, JFCC IMD participated in a Joint Staff led effort to develop a prioritization schema for global assets. This global Prioritized Defended List will categorize GCC critical assets based on global risk to inform the Global Force Management process and enable senior leaders to make more informed decisions on the allocation of low density missile defense forces.

Multi-Regional BMD Asset Management: JFCC IMD, in coordination with USSTRATCOM and the GCCs, manages the availability of missile defense assets to balance operational readiness postures, scheduled and unscheduled maintenance activities, and the 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.

Allied Ballistic Missile Defense Integration: JFCC IMD continues to focus on the integration of allies into regional missile defense architectures, enhanced security cooperation between missile defense capable nations, and shared regional deterrence and defense responsibilities across partner nations. One tool employed to promote cooperation is the NIMBLE TITAN campaign, a biennial series of multi-national missile defense experiments designed to explore policy and operational concepts required for coalition missile defense. The NIMBLE TITAN campaign provides a unique venue to advance U.S. missile defense policies and combatant command regional security objectives. The NIMBLE TITAN community of interest consists of 23 nations and 3 international organizations.

NIMBLE TITAN 16 includes Ministry of Foreign Affairs and Ministry of Defense representatives from North America, Europe, Middle East, and Asia-Pacific regions, along with Department of State, OSD, Joint Staff, MDA, and combatant command representatives. While past NIMBLE TITAN campaigns have focused only on Ballistic Missile Defense, NIMBLE TITAN 16 is the first campaign that expands the focus to Integrated Air and Missile Defense (IAMD), a growing area of concern for both the United States and many of our partner nations and allies. Other discussion topics include national policies and the need for increased regional and cross-regional coordination, sensor integration, and multinational MD planning solutions.

As the premier strategic/policy level focused missile defense event in the world, this campaign provides participating nations with critical opportunities for multi-national discussions and experience in information-sharing as well as command and control procedures that enhance synchronized missile defense capabilities. Conclusions derived from this campaign continue to inform real world policy decisions and multinational BMD planning

Joint BMD Training: In coordination with USSTRATCOM, the Joint Staff, Combatant Commands, and the Services, we have developed a comprehensive and innovative training program to close gaps between Service, Joint, and regional BMD training and education. This past September, we declared Final Operational Capability for the Joint BMD Training and Education mission. Nine new mission oriented courses have been developed and fielded to enhance combatant command and warfighter

training needs. Online, distant learning courseware offerings are under development to improve efficiency in delivery and reduce costs. Over the past year, JFCC IMD provided 199 courses to over 3444 students worldwide via the Joint BMD Training and Education Center and Mobile Training Teams. Additionally, in keeping with Joint Vision 2020, JFCC IMD provided training courses to ally and partner nations using both Military-to-Military and Foreign Military Sales Training venues. We developed and launched our Community of Practice, an interactive knowledge portal for the missile defense mission, providing virtual problem solving, idea sharing, standards-setting, relationship improvement, collaboration, and joint, cross-domain awareness. Over the next two years our primary goal is to establish and gain Joint Staff accreditation as a Joint Training Center of Excellence.

"…I believe it is imperative that the United States continue to develop more capable forces and broader options for effective missile defense."

-- USNORTHCOM Posture Statement March 2016

Warfighter Acceptance and Integrated Master Test Plan: As the missile defense architectures mature, Warfighters require a credible, comprehensive assessment of new capabilities to inform operational acceptance of emerging capabilities into the global BMDS. In 2015, we jointly conducted FTO-02 E1a to test the Aegis Ashore system with the SM-3 IB interceptor and, with FTO-02 E2a, performed an integrated BMDS test with Aegis BMD, THAAD, and AN/TPY-2 FBM simultaneously engaging SRBM, MRBM, and cruise missile targets in a layer defense to support the operational acceptance of the EPAA Phase II capability. For homeland defense capability, we participated in the January 2016 GMD CTV-02, demonstrating the Exo-atmospheric Kill Vehicle alternate divert thruster in support of GBI upgrade efforts and key discrimination capabilities for future sensor network improvements. In the coming year, the focus of our BMD tests is to begin demonstrating the operational capability of the SM-3 IIA interceptor capability for Phase III of the EPAA architecture and to test the GMD system's GBI Capability Enhancement-II Block I. The Warfighter relies on a robust and operationally relevant

test campaign to confidently field and integrate new capabilities into their existing Integrated Air and Missile Defense architectures.

In summary, JFCC IMD continues to expand our nation's global missile defense architecture and explore future capabilities to maintain operational advantage against current and future threats. Our competitive edge is maintained through our deliberate investments in our capability developments by MDA and the Services, investments in our warfighters through education and training, and expansion of our collaboration with allies and partners.

Army Contributions to the Nation's Missile Defense Capabilities

As we transition from an Army at war to one of deterrence, air and missile defense (AMD) units have become a key strategic enabler. AMD is an enduring Army core function and an essential component of the Army mission to provide wide area security and support Joint campaigns. In addition to defense against ballistic missiles, the current AMD strategy seeks to develop a more comprehensive portfolio of IAMD capabilities to provide protection against cruise missiles, unmanned aerial systems, and long-range precision rocket, artillery, and mortar attacks.

The Army works closely with MDA and continually supports its materiel development efforts to develop and field systems that are integral to our Nation's air and missile defense capabilities. To ensure the mission of providing trained and ready Army AMD forces, we continue to refine and implement the strategic direction of the Army's AMD strategy. A summary of the Army's major air and missile defense ongoing strategic direction and programs, both specified and implied, follows.

Air and Missile Defense Readiness: Readiness remains the Army's top priority and the challenges to sustain the readiness of the total Army AMD forces requires constant vigilance and senior leader focus. The operational demand on the Army AMD force to meet the requirements of the Joint Warfighters continues to stress the force, impacting both current and future readiness, as well as modernization initiatives. With over 50 percent of the AMD force either forward assigned or deployed, the Army has taken steps to mitigate this stress and restore strategic flexibility. Implementation of a Sustainable Readiness Model, an Army Campaign Plan strategic effort, supported the

characterization of the challenge. A recent study on striking a balance between operational demand and modernization led to the activation of an AMD test detachment in Fiscal Year 2018. This same study supported normalization of AMD rotations to nine months vice the current 12 month cycle.

Mission Command: Closely linked to the challenge of sustaining AMD readiness is the ability to provide low density/high demand AMD command and control elements. The command and control elements are especially critical to enable the integration of total Army AMD forces into Joint operational and technical architectures. Operationally, the Army recently activated a third Air Defense Brigade Headquarters within the South Carolina Army National Guard to support command and control rotations for the integrated air defense mission of the National Capital Region. Additionally, a sixth active duty air defense brigade headquarters will soon be activated. Beginning next fiscal year, the Army will begin fielding five Dismounted PATRIOT Information Coordination Centrals (DPICC) to the Army Air and Missile Defense Commands (AAMDC), which will mitigate the requirement to deploy a Patriot Headquarters element with each 1-2 battery deployment. These operational measures are being conducted in concert with technical measures, specifically the development of the Army IAMD Battle Command System (IBCS), which will facilitate the optimal pairing and provide additional time to prosecute tracks to enhance selective target engagement and improve combat identification. The Army PATRIOT force remains the cornerstone of AMD protection for our deployed forces, friends, and allies.

Army Integrated Air and Missile Defense (IAMD): As we continue to transition from an Army at war to one of deterrence, AMD units remain a key strategic enabler. AMD is an enduring Army core function and an essential component of our mission to provide wide-area security. In addition to providing defense against ballistic missiles, the current AMD strategy continues to develop a more comprehensive portfolio of IAMD capabilities to provide protection against cruise missiles, unmanned aerial systems, fixed and rotary wing aircraft, and long-range precision RAM attacks.

The IBCS remains an Army priority effort and serves as the foundation for Army AMD modernization. Modernization is critical to stay ahead of the advancement of the threat. The program will field a common mission command system to all echelons of

Army AMD forces in order to defend against cruise missiles, manned and unmanned aircraft, air-to-ground missiles, tactical ballistic missiles, and RAM attacks. The IBCS network will be capable of coordinating air surveillance and fire control across Services and with coalition partners, enabling over-the-horizon engagements that provide Joint Warfighters with more decision space and time. In 2015, the IBCS successfully executed two flight tests. During the March test, the IBCS coordinated the engagement of a surrogate tactical ballistic missile utilizing a PATRIOT radar and interceptor on the Integrated Fire Control Network. In the November test, the IBCS coordinated the engagement of a surrogate cruise missile utilizing Sentinel radar data and a PATRIOT interceptor. This was a first of its kind engagement with a PATRIOT engaging a target using Sentinel radar data. When fielded, in 2019, IBCS will componentize the AMD force, breaking the current system-centric control paradigm, which will dramatically increase capability and also facilitate open industry competition in support of the AMD community. Additional efforts are currently underway to integrate the Army's IBCS and MDA's BMD System Command, Control, Battle Management, and Communications (C2BMC) in order to fully support integrated air and missile defense interoperability with the ballistic missile defense system.

The IBCS and inherent integrated fire protection efforts will provide the future force with a means to defend against cruise missiles, unmanned aerial systems, and long-range precision rockets, artillery, and mortars. However, the Army must also be trained and ready to fight tonight. Recent conflicts, for example in the Ukraine and Israel, have highlighted the growing threat of UAS in support of tactical operations. This poses an increasing risk to the Army's combined arms team who are operating where the strategic and operational advantage of highly technical stand-off weapons have limited utility. A coordinated effort involving the Army Staff, the Fires Center, PEO M&S, and select ASCCs is underway now to investigate holistic approaches to enable the Army to fight tonight against these emerging threats. The technical options under consideration run the gamut from assessing pre-PAC-3 missiles to leveraging older generation interceptors in the inventory to opportunities for the acceleration of existing AMD modernization plans. Operationally, the team is assessing the ability to leverage capabilities of the other Services, as well as the integration of allied contributions.

Senior Army leaders acknowledge that these options may require reprogramming within the current Defense plan and await the team's report this summer.

PATRIOT/PATRIOT Advanced Capability-3 (PAC-3): In support of the GCCs increasing air and missile defense demands, operational tempo and stress remain high. To meet these demands, reduce stress, and avoid adversary overmatch, the Army has implemented a comprehensive modernization strategy that replaces PATRIOT's command and control hardware while upgrading the radar, launcher, and interceptor components through competitive development and procurement. The strategy's aim is to increase reliability, drive down operational and sustainment costs, in light of an evolving threat. The three significant facets of this strategy—the development of IBCS, radar and launcher modernization, and the PAC-3 Missile Segment Enhancement (MSE), are critical to our Nation's ability to provide GCCs with greater strategic flexibility and enhanced capabilities.

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 fielding of Post Deployment Build (PDB) 7 software and the modern adjunct processor to all fifteen PATRIOT battalions and achievement of first unit equipped with the next generation PAC-3 missile, the MSE, two months ahead of schedule. The PAC-3 MSE Initial Operational Capability (IOC) is planned for next year.

PATRIOT must continually modernize through PDBs software and hardware upgrades to avoid obsolescence and provide initial launch capability of the PAC-3 MSE interceptor. As part of this continuing modernization strategy, the Army is in the process of delivering the next software build, PDB-8. The PDB-8 software upgrade has successfully completed three live fire test events, the most current occurring last month, and is on schedule to complete developmental testing this year. The PDB-8 software IOC is planned for Fiscal Year 2018, which when fielded, will exploit the expanded kinematic capabilities of the PAC-3 MSE interceptor. The Army continues to move forward with the next generation sensor for the PATRIOT system. An analysis of alternatives has been completed for the Lower Tier Air and Missile Defense Sensor and an Army Requirements Oversight Council review will occur soon.

Finally, while these Patriot modernization efforts are an imperative to retaining an operationally relevant capability and not risking obsolescence as threat capabilities seek to outpace the Patriot, we still remain committed to balancing modernization with operational demand and strategic flexibility requirements. We can point to the Army's recent, no-notice, deployment, integration, and redeployment of Global Response Force Patriot forces from Ft Bliss, Texas to South Korea as evidence of this commitment, and of the readiness of the force.

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 that is mobile and globally transportable. A fully operational THAAD battery consists of 95 Soldiers, an AN/TPY-2 radar, six launchers, a fire control and communications element, a battery support center, and a support element. THAAD has a unique intercept capability in both the endo- and exo-atmosphere using proven hit-to-kill technology. There are now four available THAAD batteries. Equipment training and fielding is on-going for a fifth unit and it will be operationally available next fiscal year. 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. By 2019, the THAAD force is scheduled to consist of seven batteries. A new training facility, which enables virtual training for the Soldiers who will operate the THAAD system, is operating at Fort Sill, Oklahoma. 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.

Integrated Fire Control Capability Increment 2 Block 1 (IFPC Inc 2-1): As the operational life cycle of short-range AMD capabilities such as Avenger draw to a close, the Army is developing capabilities to defeat cruise missile, UAS, and RAM threats. The IFPC Inc 2-1, currently under development, is a mobile, ground-based weapon system designed to provide 360-degree protection capability for these threats. A block acquisition approach is being used to provide this essential capability. The Block 1 System will consist of an existing interceptor, sensor, utilize the IBCS for command and

control, and the development of technical fire control and a multi-mission launcher to support the counter UAS and cruise missile defense missions. The Block 2 System will develop interceptors, sensors, and technical fire control to support the counter RAM mission. The IFPC Inc 2-1 System will be compatible with the Army IAMD command and control architecture. The IFPC Inc 2-1 System will be transportable by Army common mobile platforms and is scheduled to provide IOC capabilities against cruise missile and UAS threats in Fiscal Year 2020.

Conclusion

Mr. Chairman and Ranking Member Donnelly, as a member of the Joint missile defense community, the Army continues to pursue enhancements to the Nation's missile defense system, both at the strategic and tactical levels. As a Service, the Army has lead responsibility for GMD, AN/TPY-2 FBM, IFPC Inc 2-1, IBCS, PATRIOT, and THAAD. Our trained and ready Soldiers operating GMD elements in Colorado, Alaska, New York, California, and from remote, globally deployed locations, remain on point to defend the homeland against a limited intercontinental ballistic missile attack. As a force provider to the GCCs, our Soldiers provide essential regional sensor capabilities and ballistic missile early warning. Our regional forces continue to leverage ally collaboration and planning efforts in developing integrated and interoperable defenses against the various threat sets. USSTRATCOM, through the JFCC IMD, continues to integrate BMDS capabilities to counter global ballistic missile threats and to 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, Civilians, and Contractors who develop, deploy, and operate our missile defense system. I appreciate having the opportunity to address missile defense matters and look forward to addressing your questions.