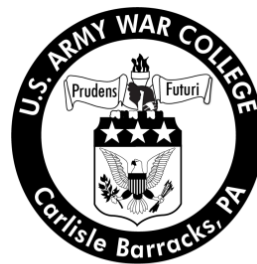


Army Air and Missile Defense: 21st Century Transformation and Modernization

by

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Class of 2012

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**ARMY AIR AND MISSILE DEFENSE: 21st CENTURY TRANSFORMATION AND
MODERNIZATION**

by

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According to FM 3-01, Chapter 11, "The mission of the United States' Army Air Defense Artillery is to protect the force and selected geopolitical assets from aerial attack, missile attack, and surveillance." Since February 2010, there have been three significant decisions that will impact air defense artillery into the 21st Century: 1) Secretary of Defense Robert Gates made "defending against near-term regional threats a top priority of our missile defense plans, programs, and capabilities,"¹ 2) the Department of Defense made the decision to terminate the Medium Extended Air Defense System, and 3) the Army made the decision to terminate the Surface-Launched Advanced Medium Range Air-to-Air Missile program. As a result, it is critical that the Army articulates a strategy that synchronizes and integrates Army air and missile defense policy, requirements, fiscal priorities, resource implementation strategies and air and missile defense program execution. This paper examines current air and missile defense concepts and strategies and will explore the potential for transforming and modernizing Army air defense artillery to best protect the force and selected geopolitical assets from aerial attack, missile attack, and surveillance.

ARMY AIR AND MISSILE DEFENSE: 21st CENTURY TRANSFORMATION AND MODERNIZATION

All services need to make sure civilian leadership is making decisions based on knowledge and not just math. Math decisions are easier than thoughtful decisions based on strategy and what's best for the nation. I will make sure civilian leaders understand what the Marine Corps does for the nation.... Because we truly could reach a point where we won't have that capacity anymore.

— General James F. Amos
USMC

According to the 2010 Quadrennial Defense Review, the Department of Defense balances resources and risks among four priority objectives to help defend and advance our national interests. These four priority objectives: prevail in today's wars; prevent and deter conflict; prepare to defeat adversaries and succeed in a wide range of contingencies; and preserve and enhance the All-Volunteer Force, shape not only considerations of the capabilities our Armed Forces need but also the aggregate capacity required to accomplish their missions now and in the future.² Missile defense is one of the areas in which the Department must balance resources and risks and evolve and adapt in response to a changing security environment.

The United States possesses a capable global missile defense system (GMD) and a proven air and missile defense force that is currently employed to prevent and deter conflict, defeat adversaries, succeed in a wide range of contingencies, and to prevail in its protection of the North American continent and deployed forces. However, recent decisions to terminate air and missile defense programs have created a gap in missile defense coverage. The creation of this gap will require a strategy to mitigate risks. This strategy must be based on the full understanding of air and missile defense.

During the Air Warfare Symposium on 17 February 2011, General Welsh echoed this sentiment when he said that “while there are some people who understand the pieces of missile defense very, very well, there are very few people who understand all the pieces of it very well.”

This paper intends to focus on the likely missile threats and the “Army’s” air and missile defense capabilities to defend our deployed joint forces and allies as we prosecute the nation’s wars. This paper will provide a strategy that will best position the Army to execute its air and missile defense role and mission.

The Threat

The U.S. military is regarded as the world’s premier global power in the air, land, and sea domains. There is not an equal peer that can match U.S. capability in all three domains. It is for this reason that adversaries will seek opportunities to find seams of vulnerability and then attack the seams. Missile attack is one of these conceivable seams. In fact, “many countries view ballistic and cruise missile systems [and unmanned aerial systems] as cost-effective weapons and symbols of national power. In addition, they present an asymmetric threat to [U.S.] airpower.”³ The reality is that several countries are now producing or developing short-range ballistic missile systems, while many other countries have purchased missile technologies from one or more of the missile producers.⁴ It is assessed that at least nine foreign countries will be involved in land attack cruise missile production during the next decade, and many missiles will be available for export.⁵ According to National Air and Space Intelligence Center in April 2009:

Ballistic and cruise missiles [and unmanned aerial systems] present a significant threat to U.S. and Allied forces overseas, as well as to the

United States and its territories. Missiles are attractive to many nations because they can be used effectively against an adversary with a formidable air defense system, where an attack with manned aircraft would be impractical or too costly.... Even limited use of these weapons could be devastating because missiles can be armed with chemical, biological, or nuclear warheads.... The ballistic and cruise missile threat continues to increase with the proliferation of missile technology.⁶

It is this proliferation of technology tied with the current global economic condition that will likely drive adversaries toward less expensive cruise missiles and unmanned aerial systems as the preferred means for targeting U.S. and coalition forces and population centers. In 2008, Dennis Gormley wrote about such proliferation and the aspirations of countries in developing cruise and unmanned aerial missile technology in his book called *Missile Contagion*. Gormley argues that seemingly small events have nudged land attack cruise missile (LACM) growth toward a dangerous tipping point in missile proliferation.⁷ He notes that for at least 15 years prior to 2008, analysts argued that LACMs were likely to proliferate rapidly. However, Gormley identified that most, if not all, of this previous analysis only focused on the technology and lacked the consideration of system integration. As a result, he foresees that rather than supplanting ballistic missiles, adversaries may use LACMs to eventually complement ballistic missiles as a means of assuring that offensive missiles have a high probability of success and increased effectiveness.⁸ Enabling this probability of success is the fact that ballistic missiles have dominated policymakers' attention (e.g. National Security Presidential Directive-23) and lacked any significant inference to the LACMs, which are the more prominent instruments of warfare in the 21st century.⁹

Even though LACMs have not spread widely beyond the arsenals of the United States and Russia in the first years of the twenty-first century, the missile contagion now underway suggests that an entirely different and decidedly more worrisome future is

about to unfold.”¹⁰ One only needs to reference the 2003 war with Iraq to see an example of cruise missiles being integrated with ballistic missile attacks against U.S. and coalition forces and population centers. During this war, U.S. Patriot batteries intercepted all nine of the ballistic missiles Iraq launched but failed to detect or intercept any of the five primitive Iraqi LACMs.¹¹ It is this gap in coverage that is concerning for not only defending assets but also in coordinating fires within and between services. “In fact, the addition of LACMs to the Iraqi missile threat sowed such confusion among U.S. forces that it contributed to a series of friendly-fire casualties.”¹² After the initial stages of the war in Iraq, the chief of staff of the 32nd U.S. Army Air and Missile Defense Command ominously told the New York Times that the use of LACMs was a glimpse of future threats and is considered a poor man’s air force.”¹³

Potential adversaries likely took note of this gap in U.S. capability as they did in fighting the U.S. during the counter-insurgency warfare fought in Afghanistan and Iraq over the last seven years or so. Adversaries adapted to superior U.S. capability in the counterinsurgency fight with inexpensive improvised explosive devices (IEDs). This adaptation and integration of capability is analogous to Iraq’s use of cruise missiles in 2003 in that the enemy adapted and sought ways to asymmetrically attack U.S. vulnerabilities. Adversaries also experienced a new phenomenon in the use of unmanned aerial systems to gain critical intelligence information and, when necessary, to eliminate key individuals. This new use of unmanned systems coupled with the low cost of cruise missiles, which are able to avoid U.S. radar detection, should weigh heavily with senior leaders as they strategically posture the Department of Defense and the combatant commands for future warfare and as they evaluate the gap created by

terminating the U.S. Army Surface Launched Advance Medium Range Air-to-Air Missile (SLAMRAAM) program and the international tri-lateral Medium Extended Air Defense System (MEADS) program. These programs were intended to be key contributors to the defense against enemy cruise missiles and the denial of enemy attempts to gain intelligence via unmanned aerial surveillance.

In regards to surveillance, the ability of an adversary to surveil unimpeded can expose vulnerabilities and provide evidence of U.S. and coalition operations. There are examples of 'red force' unmanned aerial systems being used at training centers to surveil assembly areas, routes, and command and control centers then using the information obtained to attack 'blue force' vulnerabilities. Contributing to this concern is the recently lost Sentinel unmanned aerial system to Iran. The loss of this UAS could be a contributor to accelerating adversarial development of unmanned aerial systems. No one really knows how Iran may use the captured technology but it is safe to suspect that Iran will attempt to reverse engineer the on-board technology and then modify their unmanned aerial vehicle inventory, their cruise missiles, and improve their air defense systems. It is also conceivable that Iran could join with other nations to reverse engineer and proliferate the captured technology.

In sum, the probability of an attack against the North American continent by nuclear or non-nuclear medium- and long-range ballistic missiles exists and the United States is postured to provide limited protection against such threats with its ground and sea based missile defenses and interceptors. However, it is more likely that an attack by rockets, artillery, and mortars, unmanned aircraft, cruise missiles, and short- and medium-range ballistic missiles will occur against allied nation states and deployed joint

and coalition forces. Additionally, these more likely attacks will include a precursor attempt to surveil deployed forces and critical assets with less detectable capability.

Combatant Commander Assessments

Four of the six geographic combatant commanders and at least one of the functional combatant commanders assess that the threat of missile attack and the ability to protect against it is in the forefront of their concerns for their respective region. U.S. Africa Command (USAFRICOM) and U.S. Southern Command (USSOCOM) had no mention of missile defense in their public posture statements. However, this majority view requires that the Department of Defense closely examines how it resources missile defense. The following provides a snapshot of geographical combatant commander's assessments of missile defense in their region for 2011.

The USNORTHCOM Commander assesses that several nations are developing the capacity to target North America with ballistic missiles capable of carrying weapons of mass destruction. Thus far the U.S. is pacing the threat, but a lack of certainty of threat intentions and capabilities demands vigilance and agility. The USNORTHCOM Commander would like to see a more robust and redundant architecture for sensor and command and control nodes. He sees it as critical that the U.S. continues to ensure the sensor network provides adequate warning and targeting information, that the system is tested for reliability, and that the U.S. capabilities remain ahead of the evolving threat. He is attune to the U.S. ability to defend the nation against the potential future threat of cruise missiles and other less conventional forms of air attack from off U.S. coasts.¹⁴

The USCENTCOM Commander assesses that Iran continues to expand and improve its arsenal of over 2,200 ballistic missiles, long-range rockets, and

approximately 225 fixed and mobile launchers. USCENTCOM will work with the partners in the Gulf Cooperation Council and other nations to advance and develop solutions for integrated air and missile defense in the Gulf region.¹⁵

The USEUCOM Commander assesses that there is an existing and expanding threat from ballistic missiles to the European command's area of responsibility. He states that the concentrated efforts by U.S. adversaries to illicitly procure ballistic missile technology, develop increasingly sophisticated missiles, and actively refine their abilities to employ those missiles have not abated. He also judges that the continued development of missile technologies by states such as Iran and Syria, coupled with the transfer of rocket and missile capabilities and technologies to non-state actors present the most significant combination of capability and a tangible threat to European Command's interest in Europe and the Levant.¹⁶ USEUCOM continues to actively implement the European Phased Adaptive Approach (EPAA) in addition to pursuing other NATO missile defense partnership opportunities and initiatives.¹⁷

The USPACOM Commander assesses that the vastness of the region makes permanent and rotational U.S. force presence essential to enabling security and strategic deterrence throughout the region while protecting the homeland.¹⁸ He believes that North Korea's nuclear and missile capabilities, its proliferation of weapons of mass destruction and associated technologies, and its potential for instability pose a threat to the U.S. and its allies. The U.S. and regional partners have invested in the technical capabilities to mount effective defenses against ballistic missile attack, but the broader missile defense of the region remains problematic, especially in response to a large-scale attack. One example of addressing this concern is the deployment of U.S. missile

defense capability to Japan and improved operational coordination between the U.S. and Japan.¹⁹ The United States Forces Korea (USFK) Commander also has responsibilities in the PACOM region and is subordinate to USPACOM. He is in agreement with the PACOM Commander's ballistic missile concerns and adds that he perceives Pyongyang's focus on developing ballistic missile capability as one of two main concerns regarding the future of North Korea.²⁰

Although USSTRATCOM is not a geographic command, in its role as a functional command and the designated synchronizer and advocate for missile defense, it is integral to the future of U.S. missile defenses. The USSTRATCOM Commander assesses that the ballistic missile defense system exists to meet combatant commands' theater defense needs [against ballistic missiles] and to provide for limited defense of the U.S.²¹

Department of Defense Fiscal Year 2012 (FY12) Budget for Missile Defense

In view of the combatant commanders' assessments and requirements and other assessments of the current and future threat, the Department of Defense prioritized needs across the services and then resourced the requirements accordingly. How the combatant commander and service requirements were resourced sent a clear signal of the military priorities for the department for fiscal year 2012.

The Department of Defense viewed its FY12 budget submission as an opportunity to rebalance the force and redirect resources away from lower-priority programs.²² This budget submission presents a plan to enhance ballistic missile defense and refocus plans and programs to counter regional threats, while strengthening U.S. homeland defense. In order to successfully protect and advance

U.S. interests and objectives, the Department is continuing to rebalance the capabilities and capacity of America's armed forces to better enable success in the following priority missions:²³

- Defend the United States and support civil authorities at home.
- Succeed in counterinsurgency, stability, and counterterrorism operations.
- Build the security capacity of partner states.
- Deter and defeat aggression.
- Prevent proliferation and counter weapons of mass destruction.
- Operate effectively in space and cyberspace.
- Maintain the nuclear and strategic deterrent.
- Enhance ballistic missile defense.

This decision to shift away from lower-priority programs ranged from the obvious need to cancel programs that are no longer needed to the difficult choices that clearly required risk assessments and tough decisions. These tough decisions appear calculated and designed to ultimately position the Department of Defense in a manner that protects and advances U.S. interests and provides the nation with the right capability to achieve the objectives laid out in the National Security Strategy and the 2010 Quadrennial Defense Review.

According to the Office of the Under Secretary of Defense (Comptroller), the Department's missile defense program expands and accelerates the fielding of proven capabilities for theater missile defense.²⁴ This includes sensors, interceptors, and command and control systems tailored to individual regions and the program also promotes opportunities for international cooperation. Furthermore, the Department's

program allows for rigorous testing of new capabilities before they are deployed, development of new capabilities that are fiscally sustainable, fielding of missile defenses that are adaptable and flexible to adjust to future threats, and expanding our international efforts.²⁵ While the budget does provide for defense of the homeland against limited ballistic missile attacks and defense against regional short- and medium-range ballistic missile threats to United States forces, allies and partners, it only marginally addresses the cruise missile and UAS threat to the operational and tactical force.

The following is an overview of missile defense funding requested by the services and the Missile Defense Agency (MDA). The overview articulates the focus on regional missile defense and the marginal funding for operational and tactical air and missile defense.²⁶ In the FY 2012 budget, the Navy's request includes funding for Aegis upgrades for at least five additional Aegis ships and 46 SM-3 block IB interceptors that provide missile defense against near- and long-term threats. This is a significant change for the Navy but clearly supports the broader changes in the approach to missile defense. The five additional Aegis ships will build upon the existing Aegis weapons system to provide a forward-deployable capability to detect, track, and destroy short-, medium-, intermediate-, and some long-range ballistic missiles. The future year defense program (FYDP) projects a ramp up of production in SM-3 Block IB interceptors to 62 in FY 2013, 73 in FY 2014, and 82 in FY 2015. MDA's plan is to split production in FY 2016 between 68 SM-3 Block IB and 15 SM-3 Block IIA missiles.²⁷ The FYDP signals that the Navy has adopted this change in approach to air and missile defense and is serious about a joint approach to missile defense.

In the same budget, the Air Force requested funding for the Space -Based Infrared System (SBIRS) that contributes to the detection, early warning, and defeat of threat ballistic missiles. SBIRS is the replacement for the existing Defense Support Program (DSP) satellite constellation and will provide improved warning of ballistic missile launches and support national missile defense and intelligence collection efforts.²⁸ The SBIRS is a critical piece to the missile defense architecture.

The Missile Defense Agency requested research, development, testing, and evaluation (RDT&E) funding for GMD. This funding will deploy and sustain 30 interceptors. The GMD system employs ground based missiles in Alaska and California²⁹ and will provide the homeland with acceptable protection against limited long-range ballistic missile attack.

The largest request for Army missile defense funding centered on Joint Land Attack Elevate Netted Sensor (JLENS), Patriot, and Theater High Altitude Air Defense (THAAD). The FY2012 funding request for JLENS sought funding for continued development and testing. JLENS will provide 360 degree persistent elevated surveillance and fire control and, if successful, it is projected that the JLENS Program will deliver 16 systems. For Patriot, the FY2012 request was only for continued development of the Army's only short and medium range missile system. The development funding to sustain Patriot is critical because the Department ended its participation in the MEADS program in February 2011. For THAAD, the requested funding was for procurement, RDT&E, operations and maintenance, and a missile production increase from three to four interceptors per month. This budget request for THAAD supports the fielding of the first two THAAD batteries, continued procurement of

batteries three and four, and initiation of procurement for battery five.³⁰ THAAD is a system that will provide higher altitude ballistic missile defense above that of Patriot. This higher altitude ballistic missile defense allows for tiered missile defense and multiple engagement opportunities.

The focus of the Army's budget request is consistent with guidance in national strategic documents and, with risks, meets the Army's commitment to protect the joint force against *ballistic* missiles. But what is in question is how does the Army, in an economically constrained environment where resources will likely decline or remain flat for the foreseeable future, best transform and modernize its air and missile defense force to meet the entire demand (inclusive of LACMs and UASs) of its protection mission.

Conceptual Army Air and Missile Defense Artillery

As stated earlier, the primary missile defense threats are short-, medium-, and long-range ballistic missiles and traditional air and missile defense threats such as manned and unmanned aircraft, cruise missiles, and rockets, artillery, and mortars. To defend against or defeat the range of aerial threats, Army air and missile defense forces establish wide area security to consolidate gains and ensure freedom of movement and action.³¹ As defined, wide area security denies the enemy positions of advantage; protects forces, populations, infrastructure, and activities; and, sets the conditions for achieving strategic and policy goals.³² Today, the Army's air and missile defense force, combined with Army field artillery under the fires branch, is capable of executing its protection mission with exceptions. The exceptions are protection against cruise missiles and unmanned aerial systems.

The air and missile defense protection mission requires that air and missile defense forces are able to provide timely situational awareness, protect the Army and joint forces, and provide freedom of maneuver by being able to detect, assess, identify, warn, and defend against threats. The Army retains the capability to perform its protection mission against ballistic missiles and manned aircraft but lacks the ability to provide the entirety of the protection mission against cruise missiles and unmanned aerial systems. The cancellation of SLAMRAAM and MEADS contributes to this gap in capability.

To explain why this is so, it is worth describing how the Army's air and missile defense force accomplishes its protection mission. Fundamentally, the Army's air and missile defense force is partitioned into five mission areas: 1) ballistic missile defense, 2) cruise missile defense, 3) counter-unmanned aerial defense, 4) counter rocket, artillery, and mortar defense, and 5) command and control. The ballistic missile defense area systems are commonly defined as Ground-based Midcourse Defense (GMD), Theater High Altitude Air Defense (THAAD), the AN-TPY-2 Radar, the Patriot Advanced Capability-3, and a Patriot missile variant called Missile Segment Enhancement (MSE).

The cruise missile defense and counter unmanned aerial systems are generally defined as Sentinel, Avenger, Stinger, and JLENS. It is in this area that the Department of Defense cancelled its primary developmental program to defend against or defeat cruise missiles and counter unmanned aerial systems. This system was called SLAMRAAM and would have replaced the Army's ancient Avenger and Stinger capability.

The counter rocket, artillery, and mortar defense area systems are normally referred to as Counter Rocket Artillery and Mortar (CRAM). CRAM, currently not a program of record, is expected to evolve to a future indirect fire protection capability.

The command and control (C2) systems are usually thought of as the Joint Tactical Ground Station (JTAGS), Air Defense Air Space Management (ADAM) cells, Air and Missile Defense Planning and Control Systems (AMDPCS), Patriot Advanced Capability-3 Information Coordination Central, Forward Area Air Defense C2 (FAADC2), and the Integrated Air and Missile Defense Battle Command Systems (IBCS). These systems primarily receive and process data and then fuse that data in order to electronically disseminate warning or cue the engagement of missile threats over integrated missile defense architecture.

It may not be obvious to the casual reader but some Army air and missile defense forces can provide capability in multiple areas. For instance, Patriot is primarily employed to defeat a various range of ballistic missiles but can also provide a limited capability to defend against cruise missiles and unmanned aerial systems. This limited capability can give a false perception of Patriot's ability to defend critical assets and requires additional investment to increase Patriot capability in this area. Avenger and Stinger are other examples. They are antiquated Army air defense systems that are not survivable on the modern battlefield without significant modernization. They are traditionally employed to defend against rotary wing threats however they have limited capability against cruise missiles and manned and unmanned aircraft.

At face value, both of these examples outwardly present an opportunity to eliminate duplicative capability and the actions taken by the Department of Defense

(cancelling MEADS and SLAMRAAM) reflect this line of thinking. The problem in this instance is that there are no planned systems in the acquisition pipeline to replace Patriot, Avenger, and Stinger. Herein lies the substantial risk and raises the question as to why the Department of Defense would cancel systems such as MEADS and SLAMRAAM and only rely on limited capability to defeat cruise missiles and manned and unmanned aerial systems.

MEADS capability would have replaced Patriot and provided a more robust capability to defeat ballistic missiles. MEADS would have also contributed to cruise missile defense by increasing the ability to detect, identify and warn of threats to the force with its 360 degree surveillance radar. SLAMRAAM would have replaced the antiquated Avenger and Stinger systems. It would have provided the capability to defeat cruise missiles and unmanned aerial systems while furnishing our Soldiers with a more survivable system in accordance with the protection needed on the modern battlefield. Now that these decisions are made, how does the Army best transform and modernize its air and missile defense force within a Department of Defense and a joint force framework to meet the demands of its protection mission in an economically constrained environment where resources will likely decline or remain flat for the foreseeable future?

Army Air and Missile Defense Artillery Modernization

Army forces must be prepared to conduct operations abroad to help protect and advance U.S. interests against adversaries that are capable of employing a wide range of capabilities. To protect or advance U.S. interests abroad, the Army's air and missile defense must be able to identify missile threats to the homeland in the forward areas and approaches and employ an active layered defense to respond to these threats

before they can attack the United States³³ and coalition forces. Even in an economically constrained environment where resources will likely decline or remain flat for the foreseeable future, the Army air and missile defense must still provide protection and freedom of maneuver. A review of the Army's 2012 modernization plan for the near future depicts an Army air and missile defense construct based on a common battle manager, improving and recapitalizing current systems (Patriot, CRAM/IFPC, Stinger, and the Patriot interceptor), and fielding near future (2013 – 2017) capabilities such as THAAD and JLENS (Figure 1). This construct is an Army air and missile defense force that is seeking "balance" by focusing on proven theater missile defense that counters ballistic missile threats, investing in capabilities that counter rockets, artillery, and mortars and accepting risks in countering unmanned aerial systems and cruise missiles. On the other hand, this construct may be taking undue risks because adversaries are also undergoing economic constraints and will likely defer to cheaper, more cost-effective weapons (e.g. unmanned aerial systems and cruise missiles) to asymmetrically counter the U.S. and coalition force air and missile defense systems that are designed to protect deployed forces.

The Strategy

As we reconstitute for other missions in the ever-changing security environment, the Department should assess more closely the cruise missile and unmanned aerial threats and implement a better strategy to position the Army to execute its air and missile defense role and mission. It is likely that an attack by rockets, artillery, and mortars, unmanned aircraft, and short- and medium-range ballistic missiles will occur against deployed joint forces and partner nations and that every effort will be made to

surveil the U.S. and coalition force operations. To this end, the Army's air and missile defenses must be able to protect the force against these threats and improve how it operates within networked battle management, command, control, communications and intelligence architecture.



Figure 1.

The Army must pursue a path that first ensures that its air and missile defense budget remains in balance and prevents turbulence resulting from decisions that do not take into account all the pieces that are required to protect the force. In the near-term, the Department and the Army were right to cancel the SLAMRAAM and MEADS programs to address program delays and achieve balance but should soon consider capabilities to fill the cruise missile and UAS gap. As a result of the MEADS and SLAMRAAM decisions, the Department's and the Army's second effort should be the sustainment and improvement of Patriot, Stinger, and Avenger until viable replacements emerge. The mission to protect the force "is not about a particular type of fighter, or a

service, or a weapon system -- it is about ensuring freedom of action for American forces, not just protection from attack, but also freedom to attack.”³⁴

As seen in the Department’s FY2012 budget, the Army will procure THAAD and continue to improve Patriot and its interceptors and buy more launchers to keep Patriot viable until a replacement system is fielded. This is the right approach for the strategic and regional focus but “unless strategy includes a tactical view, it may seek objectives that are practically unachievable, or it may miscalculate the costs and benefits likely to emerge from a conflict.”³⁵ Therefore, the Department should, as soon as practicable, reassess the risk for a counter-unmanned aerial system and cruise missile threat and determine the most effective way to invest in research, development, and testing.

Additionally, the Department should:

- Continue to invest in joint missile defense systems such as AEGIS, SBIRS, fighter aircraft, and coalition air defense.
- Improve the mobility and the intercept capability of CRAM and its integrated fire protection capability and seek to accelerate its progress to become a program of record.
- Rapidly develop and field elevated sensors to detect cruise missiles and counter unmanned aerial systems; extend the range of a family of interceptors; and, to improve warning and denial of information gathered by adversarial unmanned aerial systems.
- Identify and eliminate command and control systems that are not open to integration with other sensors and shooters and then replace them with

command and control systems that are joint, dynamic, scalable, and tailorable.

- Establish a network that enables timely coordination, integrates battle command across services and all missile defense mission areas, and enables ubiquitous engagement capability.
- Consider requiring the Missile Defense Agency to expand its oversight to include research, development, testing, and evaluation of cruise missile defense. This would provide an opportunity for joint development of programs that traditionally are done by a single service.

Conclusion

As far back as World War II, the Army's air and missile defense forces have historically played a significant role in joint operations. There are opportunities for the Army's air and missile force to continue this tradition and meet the entire air defense and protection needs of the nation. To take advantage of the opportunities and reduce risks, the Army will have to be proactive in synchronizing its air and missile defense requirements, fiscal priorities, resource implementation strategies and air and missile defense program execution with national security and national defense policies and strategies. This paper contends that there is a gap created by the termination of both MEADS and SLAMRAAM to defeat the LACM and UAS threats and that this gap should be reassessed as soon as practicable. The Vice-Chief of Staff of the Army's capability portfolio review is a method that is in place and, if synchronized with the acquisition of capability, it is the best way to ensure suggestions like these can be objectively inculcated in a long-term strategy. Requirements have not decreased commensurate

with the reduction in resources and, absent a stimulant, there may not be an impetus to refocus the balance of funding to address today's acceptable risks which can easily translate to tomorrow's reactive response.

Endnotes

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