FPI Analysis: The Future of Missile Defense in the Asia Pacific

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Missile threats facing both the United States and its allies in the Asia-Pacific are increasing in complexity, number, and source. In response, the Trump administration is using missile defenses to boost military capability and signal resolve, as indicated by the deployment of THAAD to South Korea. The object of such efforts is not the implausible task of intercepting every threat missile, but building an integrated defense for robust protection against North Korea and a limited capability against China is both feasible and affordable. Such a strategy would reduce the coercive leverage of both states in regional conflicts and enable effective military operations should conflict break out.

A more flexible and adaptable missile defense architecture is essential. The principle of adaptability for the missile defenses is nothing new. Each recent administration has emphasized that missile defense will not have a fixed or final architecture, but will rather evolve through incremental, block, or phased development. The Asia-Pacific has not, however, received the focus it deserves. Although the Obama administration laid out phases for European missile defense efforts, for instance, no comparable set of milestones has been articulated for other regions.[i] This patchwork approach should be articulated and pursued in a more systematic way for the Asia-Pacific region.

Two factors drive this need. First, as missile threats in the region grow, the demand for missile defense assets continues to outstrip supply among both the United States and its allies. These trends indicate a need to posture limited U.S. missile defense assets in a deliberate manner to ensure maximum effectiveness. Second, tight and relatively flat defense budgets points to an increasing need for cooperation among allies and burden-sharing. Greater coordination by the United States with its regional allies—including Japan, South Korea, Australia, Taiwan, and others—could be a basis for improving missile defense well beyond current capabilities.

Articulating a new approach to missile defense in the Asia-Pacific, complete with a concrete set of milestones or goals, could be one useful means to unify several partner nations and better leverage existing tools and capabilities. The path forward will almost certainly include an assessment of the current means available, increasing partner and U.S. missile defense capacity, increasing cooperation, better integrating homeland and regional missile defense efforts, and exploring new technological possibilities.

Growing Missile Threats

North Korea is largely reliant upon ballistic missiles and nuclear weapons to hold U.S. and allied forces at risk. These missiles give North Korean leaders the ability to target all of Japan and South Korea, as well as both U.S. forces stationed there and their points of debarkation in the event of a crisis. Pyongyang has pressed forward aggressively with a whole spectrum of missile development, and especially since 2014, has undertaken an unprecedented number of missile tests.

North Korea has made strides toward increasing the survivability and flexibility of its missile forces. In early 2017, North Korea debuted a new solid-fueled ground-launched missile with faster launch times and greater mobility. In addition, North Korea is developing a submarine-launched ballistic missile (SLBM) capability, conducting three tests launches in 2016. Both ground- and sea-launched solid fueled missiles would complicate operational plans to defeat threats prior to launch.

North Korea is also working to develop an ICBM capability to threaten the U.S. territory, which Pyongyang could use to degrade the credibility of U.S. defense commitments to its Asian allies. Pyongyang has at least partially demonstrated a satellite launch vehicle (SLV), the *Unha-3*,. The May 14, 2017 test of a new, 4,500 km range Hwasong-12 signals continued advances for liquid-fueled missiles.

China has also expanded and augmented its considerably more sophisticated long-range missile systems, including the sea-based JL-2 SLBM and a new DF-41 ICBM. Beijing has conducted numerous tests of hypersonic glide vehicles that would challenge current midcourse missile defenses with a less predictable and lower trajectory at the upper edge of the atmosphere, where most midcourse interceptors cannot operate.

China also deploys large numbers of conventional short- and medium-range missiles for regional use. Recent Department of Defense estimates put the number of Chinese short-range ballistic missiles at 1,200. In addition, China is upgrading its medium-range cruise and ballistic missiles for both land-attack and antiship missions. Beijing also unveiled the DF-26, its first intermediate-range ballistic missile, in September 2015, which gives it the capability to conduct strikes all the way to Guam.

China's arsenal of missiles is a key element of its anti-access/area denial strategy to deny the United States the ability to operate in the region and intimidate its neighbors during a crisis. Without a credible ability to overcome these elements of Chinese strategy, at least in a limited fashion, allies may reasonably question whether the United States can make good on its commitments.

The Toolbox: Capacity and Capability

The missile defense toolbox for the Asia-Pacific region includes a mix of various sensors, interceptors, command and control systems, and operational concepts. To develop a more robust missile defense in Asia, the United States will need to both build the capacity of interceptors and sensors in the region and also develop new capabilities to keep pace with emerging threats.

Current sensors include fixed arrays like the PAVE PAWS Early Warning Radar on Taiwan, as well as mobile assets like the TPY-2 radars in Japan, Aegis SPY-1 radars afloat, and the Sea-based X-band radar (SBX). Over the last decade, the United States has made significant strides to improve its radars, to begin development of new UAV- and space-based sensors, and to acquire better understandings of what actual foreign missile flight profiles look like.

On the interceptor side, the toolbox largely consists of the Patriot family, Terminal High Altitude Area Defense (THAAD), Standard Missile-3 (SM-3), and a number of lower cost, lower tier defenses. The employment of these systems should take advantage of largely maritime geography of the region to foster mobility while also protecting important land-based assets with point defenses. In some ways, the foundation for a layered Asian missile defense is already in place, though work remains to make this defense more robust.

Patriot

To defeat cruise missiles and shorter range ballistic missiles, the United States, Japan, South Korea, and Taiwan have adopted the Patriot family of missile defenses, and each is in the process of upgrading its current systems.[ii] The Patriot system has likewise undergone several upgrades, including the Missile Segment Enhancement. The Patriot family of interceptors have a defended area limited to specific points or sites, such as airports, military bases, or residential areas.

Despite a proven track record in several real-world conflicts, however, the pace of Patriot modernization has been glacial. Its radars cannot provide full 360-degree coverage, a problem in light of the growing threat from cruise missiles and sub-launched missiles that could potentially maneuver into the system's blind spots. Modernization of the Patriot radars is currently not scheduled to happen until the mid-2020s, a pace that could be accelerated. Interceptor reloads can also be time consuming, currently requiring the use of special cranes, which in turn reduces the overall capacity and potentially combat effectiveness.

THAAD

Garnering headlines worldwide has been the THAAD system, which has now achieved an initial operating capacity in South Korea despite strong objections from China. This deployment joins another THAAD battery defending U.S. forces in Guam. THAAD adds an additional layer to the existing PATRIOT defenses, with a significantly greater range and defended area.

Significant opportunities exist for near-term improvements to the THAAD system and for how it works with others. The Army has previously articulated plans to develop an extended range interceptor for THAAD, which the 2012 U.S. Army *Air and Missile Defense Strategy* planned to deploy by 2020. More recent memos, however, have pushed the timeline for that deployment back to 2025, and THAAD-ER still remains in concept development. The Army is also working to incorporate THAAD with its Integrated Air and Missile Defense Battle Command System (IBCS) to provide a common battle picture and command and control in order to integrate radar information from Patriot, Aegis, and other systems, a capability that would be important for integrating all region-wide capabilities.

Aegis Weapons System

Against longer range threats, the United States deploys seven Aegis BMD-capable destroyers in addition to the four Japanese BMD capable ships at Yokosuka. Besides the interceptors themselves, Aegis ships carry the AN/SPY-1 radar for locating and tracking incoming enemy missiles. These and other sensors, notably U.S. TPY-2 radars in forward based mode at Kyogamisaki and Shariki, provide the basis for an evolving and more interconnected system. The Aegis BMD system is most closely associated with the Standard Missile-3 (SM-3),which has proceeded along a block development program, with SM-3 Block IA and IB now deployed.

A major step forward will come with the delivery of the first SM-3 IIA interceptor in 2018. Co-developed by the United States and Japan, the SM-3 IIA will feature increased speed, improved sensors, and a larger kill vehicle, which will collectively extend the range and capabilities of today's variants. In a February 2017 test, the SM-3 IIA successfully intercepted a medium-range ballistic missile target, demonstrating the value of co-development as a means to evolve advanced capabilities at lower costs.

Forthcoming sensor and software improvements will take full advantage of the SM-3 IIA's enhanced capabilities. The SPY-6 Air and Missile Defense Radar (AMDR) is due for its first delivery in 2019. By increasing sensor coverage for Aegis ships, this radar will allow larger engagement ranges for interceptors. The fielding of Aegis 5.1 software to support "engage on remote" will allow interceptors to not only launch at targets detected by other ships, but also conduct intercepts after a mid-flight hand-off. This capability will significantly increase the range of engagement for the Aegis system and take full advantage of the IIA's reach.

A final area where the Aegis system is making strides is in the deployment of the SM-6 missile, which can be used to intercept cruise missiles, ballistic missiles in terminal phase, and as an anti-ship weapon. MDA Director VADM James Syring called the SM-6 the future workhorse of Navy missile defense, commenting that "we can't build enough of them."[iii] This program has also now been greenlighted for foreign military sales, a significant development for Asian missile defenses.

Increasing Allied Cooperation

Reflecting the absence of a formal, multilateral alliance, countries such as Japan and South Korea have thus far pursued defensive capabilities in a relatively more independent and parallel courses through established bilateral alliances. While there is no "Asian NATO" as such, more cooperative efforts will improve capability and reduce cost in the long term for all involved. Indeed, increased cooperation and building allied capacity may well be the most important next steps for advancing regional missile defense.

National Investments

Despite tight budgets, both Japan and South Korea are devoting significant funds to missile defenses. In fiscal year 2016, for example, Japan spent roughly $2.1 billion, and is currently considering adding $1 billion in supplementary funding to its proposed $1.8 billion BMD budget for 2017. South Korea increased the budget for its Korean Air and Missile Defense (KAMD) system to $1.43 billion for 2017.

Japan plans to upgrade two of its remaining *Kongo*-class destroyers and also two of its *Atago*-class destroyers to increase its number of deployable BMD ships to eight. The North Korean SLBM tests have also led South Korea to reconsider purchase of the SM-3 interceptor for three of its *Sejong*-class destroyers to provide a more mobile missile defense option.

Another significant step forward would be the deployment of Aegis Ashore in Japan, a capability in which Japan has recently expressed interest. The United States has been slow to approve the export of the system, despite it being less capable than the Aegis destroyers that Japan has already purchased and deployed. Such restrictions on exports could undermine the United States' ability to build allied capacity and interoperability that will be essential to a robust missile defense architecture in the region.

In recent months, Japan has indicated that it may proceed with Aegis Ashore. Just as Aegis ships carry much more than just SM-3s, however, there is little reason that Aegis Ashore sites must be limited only to the longer-range and exo-atmospheric ballistic missile defense capability. Shorter-range and less expensive interceptors for defeating ballistic missiles, and other effectors more tailored to air and cruise missile defense, could potentially also be installed in such an Aegis Ashore site.

South Korea is also developing an indigenous Korean Air and Missile Defense system, which will include the L-SAM high-altitude interceptor and an M-SAM interceptor for rockets, UAVs, and

ballistic missiles in terminal phase. KAMD is scheduled to receive five reconnaissance satellites by 2022 to bolster sensor capabilities. The South Korean government has announced plans to accelerate development of these programs by several years to the early 2020s, a move sparked by the recent escalation of North Korea's missile development. Diplomatic work will be necessary to convince South Korea that stitching these capabilities together with other regional assets will ensure their maximum utility.

For its part, Australia continues work on its first two Aegis-equipped destroyers, which could in the future contribute to missile defense in the region, particularly as Pyongyang continues to develop missiles of greater range.

Should U.S. allies in the region acquire lower cost terminal ballistic and cruise missile defenses such as the SM-6 and deploy such defenses in an effective and adaptable manner, it could be a game changer for the overall allied deterrence and defense posture. Potential customers for such capabilities might include Australia, South Korea, Japan, Taiwan, and others.

Multinational Cooperation

Deep historical and cultural obstacles have repeatedly hampered South Korea and Japan from expanding interoperability and information sharing that could improve their respective detection and tracking of missile threats, but efforts toward such a relationship have been advancing slowly.

The trilateral *Pacific Dragon* exercises between the American, Japanese, and South Korean navies during June 2016 evidenced the prospects and potential for such efforts. While no interceptors were fired, all participants shared information on a live ballistic target, demonstrating that information sharing activities are possible for the future. The NATO At Sea Demonstration exercises in 2015, which included allied navies passing information to United States ships to intercept targets, both demonstrating the value from such cooperative endeavors and serving as a template for what might be possible elsewhere.

Seoul and Tokyo have made strides on intelligence sharing in the past year, as well. Four years after an intelligence sharing agreement was scuttled by political opposition in June 2012, the two sides moved forward in November 2016.

Additional steps might be the addition of early warning low-altitude detection systems, perhaps based on either UAVs or lighter-than-air platforms like the JLENS aerostat. Such systems can provide persistent coverage to track and target cruise missile threats from elevated positions at much greater distances. This ability could be essential for countering Chinese cruise missiles that threaten Japan, Taiwan, and Guam. The potential deployment of, say, Aegis Ashore sites in Japan might be the foundation of not only of a more capable defense of Japan but also of U.S. homeland defense, should a future version of the previously-cancelled SM-3 IIB reappear in the coming years.

To defend against the aging but still capable conventional artillery and short-range rocket threats from North Korea, South Korea might also benefit from low-cost Counter-Rocket and Mortar (C-RAM) and air defenses. Allies might alternatively be interested in purchasing systems comparable to Iron Dome or David's Sling, or perhaps domestically produce (or co-produce) similar systems of the same class. Israel has already demonstrated the utility of Iron Dome in intercepting the same kinds of rockets and artillery that are currently aimed at Seoul. Previous negotiations for South Korea to purchase Iron Dome had snagged, but the purchase of the

Green Pine radar system may provide a helpful precedent for future South Korea-Israel defense exchanges.

Connections to Broader Efforts

Integrating Regional and Homeland Defense

Despite the emphasis on regional missile threats and regional defenses, Asian-Pacific missile defense is not disconnected from U.S. homeland defense. The United States is itself a Pacific power, and thus any new approach to Asian missile defense should include some consideration of elements for the U.S. homeland. Originally, the fourth phase of the European Phased Adaptive Approach included the SM-3 IIB interceptor, which would have been capable of intercepting Iranian ICBMs headed towards the United States. Renewing some kind of comparable efforts for forward-based interceptors of some kind could in principle contribute to defending the U.S. homeland.

So too, homeland defense for the United States—also a Pacific nation—is not disconnected for the defense of our Asia-Pacific allies and regionally deployed U.S. forces. Multiple currently ongoing programs promise to bolster homeland defenses, including the addition of 14 new interceptors at Ft. Greely, Alaska by the end of 2017, the new Pacific-facing Long Range Discrimination Radar based in Alaska due around 2020, various discrimination software improvements, and the testing of a redesigned kill vehicle around the 2020 timeframe.[iv]

The growing North Korean missile threat has also highlighted the threat posed to Hawaii and the difficulty of defending the outer reaches of United States territory. This vulnerability has raised the need to consider options to defend Hawaii, including bolstering radar coverage and potentially stationing interceptors there. The current Aegis Ashore test facility at the Pacific Missile Range Facility could potentially be operationalized to enhance the defense of Hawaii. If the SM-3 IIA demonstrates such capability, such a distributed defense could provide the basis not only to house SM-3 IIAs for the defense of long-range ballistic threats also and importantly for cruise missiles that might attack U.S. forces.

For the time being, however, the only interceptors capable of defending America are the Ground-based Interceptors (GBIs) in the Pacific states of Alaska and California. Increased GBI deployments in Alaska and additional radars will further shore up the protection of the homeland.

Technological Revolution

Looking beyond the immediate future, alternatives to bolster missile defenses include a reinvigoration of boost phase intercept. Currently, the GBI, THAAD, Aegis, and Patriot missiles all intercept incoming threats in the midcourse and terminal phases of flight when missiles are moving at their fastest and, in midcourse, can deploy decoys and countermeasures to complicate the task of missile defense.

In principle, however, the Missile Defense Agency (MDA) maintains a mission to develop the capability to intercept in all phases of flight, a mandate intended to develop a more effective layered defense. In the boost phase, missiles move more slowly and have not had time to deploy countermeasures, rendering them relatively more vulnerable. While this task requires the ability to quickly commence defense operations to reach missiles as they are boosting, the potential payoffs in thinning missile salvos before they reach midcourse and terminal defenses could be considerable.

To support boost phase intercept, MDA plans to fly two demonstrators of unmanned aerial vehicles with directed energy weapons for boost phase defense by 2021. These technology demonstrators will have to prove the ability to mount lasers that are small enough to fit onto a persistent UAV platform, while also powerful enough to destroy a missile. Should this technology prove viable, it would have benefits for both regional and homeland defense. Concepts of operation for such platforms could include flying such UAVs at high altitude off the North Korean coast.

Recommendations

With increased missile and nuclear activity by North Korea, the need to move beyond previous statements of missile defense efforts from the Obama Administration manifests itself no more acutely than in the Asia-Pacific. The above suggestions for future milestone capabilities represent an illustrative menu, but are by no means a comprehensive list.

The need for future defensive capabilities will not, however, be confined only to North Korean threats. Taiwan, for one, must already contend with China's significant missile arsenal directed its way, and must ensure that its limited point defenses remain sufficient to support its overall deterrence posture.

A central question for those designing U.S. missile defense policy will therefore be the degree to which Chinese objections are factored in and the degree to which Chinese missiles will drive requirements. Beijing's objections to the U.S. THAAD deployment to South Korea reflect political concerns about closer U.S.-ROK relations, rather than technical fears of the system's capabilities. In fact, China itself is deploying air and missile defense systems in the region, including on disputed islands in the South China Sea, despite its claims that American missile defenses will upset the strategic balance.

No matter the policy contours, a clearly articulated path that integrates allies' needs and capabilities will be an essential bulwark against the inevitable Chinese objections. Such planning is more important because Chinese complaints about missile defense seem primarily aimed at preserving Beijing's coercive leverage against its neighbors. This tension is unavoidable, since even the more limited North Korean threat will require more effort and capability than that currently fielded today.

In sum, five lines of effort might be a useful guide to shape future Asia-Pacific missile defense policy:

- Prioritize building allied missile defense capacity, including through the purchase of systems currently available, cooperation to develop indigenous capability, the improvement of export control limitations on missile defense sales, and coordinated transnational acquisition to reduce manufacturing costs.

- Pursue more flexible, modular, and adaptable launch systems and concepts of operation to permit lower cost deployments, such as with multiple kinds of interceptor in a single launcher, a kind of "layered defense in a box."

- Increase U.S. and allied strike forces, and the overall integration of offense and defensive means to defeat missiles both left- and right-of-launch. Combined exercises like Pacific Dragon should be continued and expanded, to included test-intercepts of target missiles while integrating multiple assets of different countries.

- Fund the U.S. Army's stated requirement of nine THAAD batteries to increase global operational flexibility and capacity, evaluate the need for further capacity, and develop an extended range THAAD interceptor, pursue new ways to increase the effective deployed levels of Patriot defenses, and continue to expand the number of Aegis BMD ships to more closely approximate combatant commander demand.

- Develop and deploy a space-sensor layer, which will enhance all aspects of the BMDS and increase the defended area and lethality of both regional and homeland missile defenses.

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[i] The Obama administration's missile defense policy was shaped by the Phased Adaptive Approach (PAA), a framework that found more complete elaboration in the 2010 *Ballistic Missile Defense Review* (BMDR). The PAA announcement coincided with a specific plan for Europe, including four specific milestones, named the European Phased Adaptive Approach (EPAA). The 2010 BMDR also pledged to advance missile defense capabilities in the Middle East and in the Asia-Pacific region, but it did not lay out a list of milestones. Instead, the BMDR noted that the United States would "pursue regional structures sharing common assets that are relevant and robust because they are tailored to the unique requirements and opportunities within each region." A 2013 Department of Defense report has been one of the few public articulations of regional missile defense plans, but has not elaborate any new plans or possibilities.

[ii] In 2015, South Korea upgraded its Patriot defenses to employ Patriot Advanced Capability-3 (PAC-3) missiles. The United States is also planning to upgrade its own Patriot systems deployed for the defense of Seoul by the end of 2018. In Japan, the United States deploys a Patriot battery at Kadena Air Base in Okinawa, while Japan deploys 16 Patriot firing units of its own, with plans to upgrade to the MSE version of PAC-3.

[iii] VADM James Syring, *Remarks at the 2016 Space and Missile Defense Conference* (speech, Huntsville, AL, August 17, 2016).

[iv] VADM James Syring, *Remarks at the 2016 Space and Missile Defense Conference,* (speech, Huntsville, AL, August 17, 2016).