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TECHNICAL REPORT

Employing Land-Based Anti-Ship Missiles in the Western Pacific

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Prepared for the United States Army

RAND ARROYO CENTER

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Summary

In his strategic defense guidance of January 2012, President Obama declared that U.S. economic and security interests are "inextricably linked to the developments in the arc extending from the Western Pacific and East Asia into the Indian Ocean and South Asia."[1] In doing so, he shifted the U.S. focus to the Indian and Pacific Oceans and provided a set of precepts that will shape the future orientation of the joint force.

This shift in strategic priorities to East Asia was preceded by a growing literature about threats to the ability of the United States to project and sustain power there. Over the past several years, some strategists have argued that China is shifting the balance of power in the Western Pacific in its favor, in large part by fielding anti-access weapons that could threaten U.S. and allied access to vital areas of interest.[2] Others have argued that such innovations have lowered the costs of anti-access capabilities such that regional actors can contest "America's 60-year-old dominance over the global commons and its ability to maintain their openness."[3]

As a result, new concepts such as "AirSea Battle" are being developed to "set the conditions at the operational level to sustain a stable, favorable conventional military balance throughout the Western Pacific region."[4] In general terms, AirSea Battle envisions integrated Air Force and Navy operational concepts to mitigate missile threats to U.S. bases; correct imbalances in strike capabilities; enhance undersea operations; offset the vulnerabilities of space-based command and control (C2) and intelligence, surveillance, and reconnaissance systems; increase interoperability; and enhance electronic and cyber warfare capabilities.[5] It would do so by improving the "integration of air, land, naval, space, and cyberspace forces to . . . deter and, if necessary, defeat an adversary employing sophisticated anti-access/area-denial capabilities."[6]

Although land-based systems feature prominently in China's anti-access/area-denial (A2AD) capabilities, comparatively little work has been done to define the land-based support capabilities featured in the AirSea Battle debate. Such capabilities may prove potent and

[1] U.S. Department of Defense, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense*, Washington, D.C., January 2012a, p. 2.

[2] See, for example, Andrew F. Krepinevich, *Why AirSea Battle?* Washington, D.C.: Center for Strategic and Budgetary Assessments, 2010, pp. vii–viii, 13.

[3] Abraham M. Denmark and James Mulvenon, eds., *Contested Commons: The Future of American Power in a Multipolar World*, Washington, D.C.: Center for a New American Security, January 2010, p. 6.

[4] Jan van Tol, Mark Gunzinger, Andrew F. Krepinevich, and Jim Thomas, *AirSea Battle: A Point-of-Departure Operational Concept*, Washington, D.C.: Center for Strategic and Budgetary Assessments, May 18, 2010, p. xi.

[5] van Tol et al., 2010, p. xiv.

[6] U.S. Department of Defense, *Joint Operational Access Concept*, version 1.0, Washington, D.C., January 17, 2012b.

inexpensive joint force multipliers. One such complementary approach is to develop concepts that employ the same inexpensive anti-access technologies to significantly raise the cost of a conflict for China and, should deterrence fail, to limit China's ability to inflict damage off the Asian mainland.

Approach

This report explores one such option: using ground-based anti-ship missiles (ASMs) as part of a U.S. A2AD strategy.[7] We note that if the U.S. military had such capabilities, it could use them in a host of ways, ranging from security cooperation initiatives to help regional friends and allies improve their own anti-access capabilities to using them to interdict warships or (if supplemented by other assets) help form a full blockade in times of war. We make no claim of having analyzed the strategic implications of deploying or employing anti-ship missile capabilities but, rather, seek only to demonstrate what is possible using existing capabilities and comment on possible contributions they could make should the United States adopt an A2AD strategy of its own.

To determine what is possible and to illustrate potential capabilities, we conducted a missile-by-missile comparison of 45 current anti-ship cruise missiles. These missiles are popular with armies in the region; China, Indonesia, Malaysia, Vietnam, and Brunei are all believed to possess multiple types of ground-launched ASMs (and some possess missiles that are fired from other platforms as well). Appendix A of this report describes some of the missiles that we considered.

We assessed the likely effectiveness of land-based ASMs by exploring the technical potential and possible impact of a U.S. anti-access strategy that could challenge Chinese maritime freedom of action should China choose to use force against its island neighbors. In our research approach, we assumed that the ability to cut off Chinese seaborne access beyond the first island chain would serve as a major deterrent, and would have a significant effect on China's ability to attack its overseas neighbors and wage a prolonged war. Furthermore, this capability does not require the permanent stationing of assets in the Western Pacific, and, as such, is not presented as part of an effort to contain China. Rather, it should be seen as a capability that could be used if China initiated a conflict. Finally, while U.S. Pacific Command will lead efforts to develop and execute military strategy in the Pacific, this report addresses the potential for U.S. land forces to significantly contribute to its efforts.

To illustrate the potential of land-based ASMs while acknowledging that a land-based-only approach would not be practical, this report examines the possibility of cutting off Chinese sea routes using land-based ASMs only. Not only would this have a significant effect on China's ability to project power, but it would also vastly expand the set of military problems that the People's Liberation Army (PLA) would face should it consider initiating a conflict with its neighbors or U.S. partner nations. Specifically, because these missile systems are relatively easy to operate and are strategically and tactically mobile (i.e., they are not fixed targets), the PLA would have to search across a huge number of locations and have assets within range to

[7] The utility of quickly deployable ASMs is not limited to Western Pacific contingencies or to China; they could be used in a range of scenarios in which the United States wished to limit, deter, or complicate an adversary's power projection potential.

locate and interdict them. Missile systems that could be placed in many locations over thousands of miles of island chains would significantly dilute the effectiveness of PLA missile and air forces.

It is important to point out that a comprehensive analysis of the regional political, economic, and military dimensions of these operations is critical but beyond the scope of this report. As a result, this report does not try to analyze how fielding ASMs would affect these strategic factors. Rather, it focuses on exploring the tactical and operational feasibility of ASM employment, including some observations on procurement and logistics. To this end, our approach assumed a wartime strategic context in which limiting Chinese maritime freedom of action would be important and in which a U.S.-led coalition decided to institute "far blockade." We also assumed that some regional states would be supportive of such a course of action in the context of a wider war, as their cooperation is important to our demonstration.

Finally, this report's purpose is to illustrate capabilities, not to make detailed recommendations about force structure or doctrine. Importantly, our intent is as much to encourage strategists to think of new approaches as it is to propose that the U.S. military consider developing a capability. This is but one such approach; there are others that should also be considered.

A Joint Approach

A land-based ASM capability would be relatively easy to create in the U.S. armed forces and could be seen as a 21st-century extension of the Army's earlier coastal defense role. It would need to operate as part of a joint effort. In general, it would require access to other services' (and perhaps national) sensor systems capable of identifying targets to engage, a C2 system that can receive and act on this information, and firing batteries that can respond to this C2 architecture. In this case, the range of these assets must span all passages through the straits that provide access to the seas surrounding China. If such a land-based ASM capability were to be used as part of a blockade, it would also have to be paired with assets that could challenge and board commercial ships, such as rotary-wing aircraft or partner-nation navies and coast guards. If allied firing platforms were preferred to U.S. ones, they would similarly have to be integrated into such a C2 architecture. In this report, we provide a general description of the elements of such a system while noting that more analysis would be required to produce a complete operational concept.

Feasibility of a Land-Based ASM Blockade

To illustrate the possibility of ASM employment, we built a "far blockade" of chokepoints in the Asia-Pacific region in phases.

Straits of Malacca, Sunda, and Lombok

The Strait of Malacca is both narrow and of significant strategic importance. Both Indonesia and Malaysia have robust arsenals of medium-range ASMs that, if these countries were willing, could effectively engage targets anywhere along the strait's approximately 730-km length. A coalition with access to these countries could similarly contribute. A concerted effort to close the Strait of Malacca using ASMs of medium capability would be difficult to defeat without

employing land forces to locate these missile systems, which are mobile and relatively small in size.[8]

Longer-range ASMs would put ships under threat from missile batteries for even more time. For example, Indonesia's C-802 ASM, a version of the Chinese YJ-2 with a range of at least 120 km, is the farthest-reaching ground-launched ASM in the region. Other longer-range ASMs on the world market could effectively cover more than 1,200 km of the Strait of Malacca and the sea approaches around it. Finally, the BrahMos PJ-10, developed and produced jointly by India and Russia, could extend this coverage to approximately 1,500 km.[9]

A coalition's ability to deny China the use of the Strait of Malacca would not amount to a blockade, however. Ships coming from the Indian Ocean could simply use the next-closest waterways, the Sunda and Lombok straits. However, the narrowness of these passages means that they could be easily covered with short-range missiles as well.

Japan, Taiwan, and the Philippines

Should Taiwan and Japan be involved in a future scenario, ASM-based threats emanating from their territory would offer another capability to limit maritime freedom of action. For example, ground-launched ASMs located in Taiwan with a range of no more than 100 km, along with missiles with an effective range of 200 km in Okinawa, could effectively cover all naval traffic south of Okinawa. Another possibility is to position missiles with a 200-km range solely on the Ryukyu Islands, which would also effectively close the area south of Okinawa. The area between Okinawa and mainland Japan could be effectively covered by ASMs with a 100-km range in Japanese territory alone.

An implied task of this operational concept is to prevent Chinese forces from capturing these strategic islands. While this would be a joint and coalition force operation, it is useful to note that the very same ground-based A2AD systems used for the blockade would play a key role in these operations by targeting amphibious forces.

Similarly, the Luzon Strait between the Philippines and Taiwan, as well as the waterways between the Philippines and Borneo, could be covered by 100-km-ranging missiles positioned in the Philippines, Taiwan, and Malaysia or by 200-km-ranging missiles (in the case of Taiwan) or even shorter-range missiles (in the case of Borneo) fired solely from Philippine islands. The closure of these areas would significantly limit all naval activity, but more strategic depth could be achieved by also denying transit through the waters between Australia and Indonesia. While such a move is not a necessity, the requirements would include the use of cruise missiles with a range of approximately 300 km (such as the BrahMos PJ-10) positioned in both Australian and Indonesian territory.

Japan and South Korea

China may also wish to transit PLA naval vessels between Japan and South Korea via the Korea Strait. In such a scenario, ASMs with a range of 200 km could be launched from either Japanese or South Korean territory (or 100-km-ranging missiles could be launched from both sides or from the Japanese island located near the middle of this strait). However, as in the Strait of Malacca, operational flexibility and system survivability would increase with the use of both

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[8] For detailed geospatial depictions of how ASMs could shut down all shipping routes to China, see Appendix B.

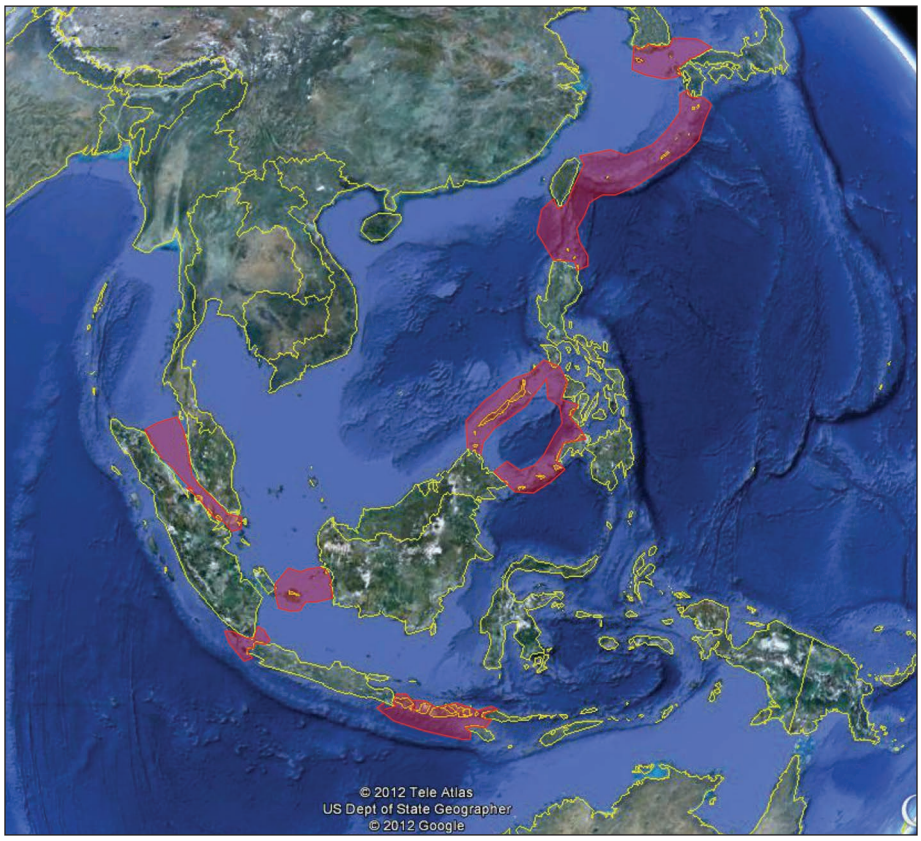
[9] The BrahMos PJ-10 is also one of only a few supersonic cruise missiles. Allegedly, a second version is being developed by India and Russia that is likely to be even faster than the original.

sides of this chokepoint. The full effect of the ASM deployments described here is illustrated in Figure S.1.

Logistical and Procurement Considerations

The deployment of ground-based ASMs could be quite flexible, permitting them to serve as a deterrent without requiring them to be permanently stationed in areas that the Chinese would see as threatening. Stationing ASM forces in the region would needlessly threaten and provoke China, as well as damage U.S. efforts to cooperate with China. Furthermore, host-nation access would be critical for employing ASMs and might not be forthcoming short of a conflict with China. However, should China use or threaten to use force against U.S. allies or partners in the region, the United States might want such assets available. As a result, it would need to be able to rapidly move ASMs into the region from U.S. territory or from other prepositioned stocks in Asia.

Figure S.1
Potential Chokepoint Engagement Areas for Ground-Launched Anti-Ship Missiles in Partner Nations



SOURCE: Google Earth, with overlays based on authors' geospatial analysis.
NOTE: Red areas are locations where access is denied by ASMs.
RAND *TR1321-S.1*

Many of these ASMs can be fired from a multitude of platforms and thus can be integrated with existing material and tactical requirements. The ability to transfer these missile systems to multiple platforms and deploy them from a number of vehicles with differing dimensions adds to their flexibility. However, this also makes it more difficult to determine specific mobilization and employment requirements.

One method to generalize these requirements is to review analogous systems and current U.S. mobilization methods. For this analysis, we used as a comparison the U.S. Patriot missile, which is longer, wider, and heavier than nearly all the cruise missiles considered here. The Army has determined the Patriot's minimum engagement package and identified a standard loading plan for C-5 and C-17 aircraft, so it can serve as a beginning point for planning estimates. The actual loads for any given mission would naturally be slightly different, as they would depend on mission-specific characteristics. The U.S. Army has established that the Patriot's minimum engagement package—which consists of two launchers, each with four missile canisters, eight total resupply missile canisters, radar and C2 systems, and all the personnel and equipment needed to fully operate the system—could be delivered with the use of five C-5s or seven C-17s.[10] Fast boats could also deliver these assets. As such, getting ASM systems into place during a crisis should be straightforward.[11]

With respect to procurement, the global market for anti-ship cruise missiles is wide-reaching and complex. With dozens of missiles available from nearly as many manufacturers and countries, there are a number of avenues through which one may procure missiles. The missiles highlighted in this report were chosen because of their capabilities and assumed availability. While cost information is available for all of the systems we considered, for our purposes, it is sufficient to note that missiles of these types are widely available for purchase and that creating a force structure to employ them would not require a major research and development effort.

Defense Relations and the Potential for Building Partner Capacity

Most of the nations upon which the United States would rely for access in this concept are strong partners or allies. However, Indonesia is arguably the most important for this strategy and has not traditionally been a close U.S. partner. Furthermore, while Indonesia currently accepts security assistance from the United States, it also is developing stronger relations with China. Building partnerships and, more importantly, persuading countries such as Indonesia to allow the use of ASMs on their territory may be the biggest challenges to carrying out the strategy outlined in this analysis. In a strategic context short of a direct conflict involving these countries and China, such assent may be difficult to attain because it would pose significant risks for the countries that agreed to cooperate.

That said, developing U.S. experience with ASMs would create opportunities for security cooperation with several Asian nations. Security cooperation is a mainstay of U.S. efforts to increase the capacity of partner nations, ensure access to territory, and influence other nations' behavior. Given the importance of the first island chain, it is no surprise that most nations there have these systems. Whether they can employ them effectively and whether they would

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[10] Headquarters, U. S. Department of the Army, *Patriot Battalion and Battery Operations*, Washington, D.C., Field Manual 3-01.85, July 2010.

[11] We note, however, that they would also require other support systems, such as for security and logistics, which would add to the strategic lift requirement.

do so as part of a coalition effort are important questions. Yet, because the U.S. military does not have such systems, it is currently limited in how it can help build partner capabilities for their use. As a result, it may not be able to adequately influence the plans of allies and partners to deploy and employ them in concert with U.S. plans and efforts if they were needed to respond to Chinese threats.

Toward an Air-Sea-Land Concept

The Navy and Air Force may currently possess the capacity to contest Chinese maritime freedom of action in Asia without land forces. However, doing so would require using expensive systems that would, if successfully targeted by Chinese forces, be difficult to replace. An inexpensive truck-mounted missile launcher in an Indonesian jungle is considerably more difficult to locate and attack than an expensive naval warship patrolling the approaches to the Strait of Malacca—and yet both could contribute to blockade objectives. Furthermore, the demand for naval assets to control the sea lines of communication to U.S. bases in the Western Pacific and perform other missions in times of conflict would be significant. Land-based ASMs could help relieve some of these demands on the Navy (and Air Force). Additionally, positioning many ASM systems throughout the first island chain would very significantly increase the PLA's targeting requirements, stressing its C2 systems and causing it to spread valuable intelligence, targeting, and attack assets over many possible firing positions across an arch of islands that is thousands of miles long rather than focusing on a few well-defined targets. Arguably, this would significantly decrease the effectiveness of PLA anti-access assets and increase the effectiveness of other U.S. and coalition efforts.

The current AirSea Battle concept understandably places significant emphasis on the Navy and Air Force's capability to counter foreign A2AD threats. This report illustrates that creating an ASM capability in the U.S. ground forces could significantly dilute the A2AD threat and present a corresponding U.S. capability to an aggressor state that sought to project power over water. In short, developing and employing ASMs in the U.S. force structure would provide capabilities that could have a strategic effect.

Additionally, with such capabilities, the U.S. armed forces would be better prepared to work with Asian partners on developing their own ASM capabilities (as part of security cooperation and security force assistance efforts). Without such capabilities, it would be difficult to impart these skills and develop the relationships and access that come with these partnership activities.

Finally, capabilities such as those presented here will become increasingly accessible to nations and, perhaps, nonstate actors. Armed, unmanned systems (aerial and under water) could have similar effects to ASMs. Keeping these capabilities out of the hands of rogue actors will likely be an important task—one that could be used to build ties with China in the form of nonproliferation regimes, because both China and the United States would have a large stake in such efforts.

Conclusions

Land-based ASMs are readily available on the world's arms markets, inexpensive, and able to provide significant additional capabilities to U.S. forces. Their employment would require multinational and joint concepts and approaches, as well as support from other service assets, such as sensors, intelligence, and C2 systems. But the capabilities they could provide a multinational force would free up the Navy and Air Force for missions other than controlling maritime traffic (military or commercial) near land chokepoints. These capabilities would also significantly complicate the PLA's C2, intelligence, and targeting requirements and would raise the risks and cost of a conflict for China (and other nations that depend on maritime freedom of action or wish to project power overseas). Having such capabilities in the inventory would further U.S. efforts to provide security cooperation assistance to partner nations, could help deter conflict, and could contribute to victory in a future conflict by increasing flexibility and expanding the set of tools available to U.S. commanders to implement plans.