

Missile Defense for Great Power Conflict: Outmaneuvering the China Threat

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Abstract

China is modernizing its military to establish regional hegemony in the near term and global preeminence in the far term. The People's Liberation Army's crown jewel is its massive arsenal of missiles capable of ranging the US homeland and critical US bases that underpin US military power projection. To meet this challenge, it is imperative that the United States adapt its missile defense policy and strategy and leverage new technology to increase the capability of US missile defenses, and it must do so with a sense of urgency and purpose.

China's concerted military ascendance over the past two decades—taken with its provocative behavior in its near-seas region, as well as its moves to become an authoritarian single-party system at home—demonstrates that Xi Jinping is not choosing a future of peaceful coexistence with the United States and our allies. China does not respect the sovereignty of other nations, nor does it share the US and US ally commitment to open access to international waters. Rather, China seeks to gain regional hegemony in the Indo-Pacific in the near term and eventually to replace the United States as the global preeminent power.¹ To implement its national ambitions, China has invested in an array of military capabilities. But the heart of China's military ascendance is its missile force. In 2015, Xi Jinping unveiled the most substantial People's Liberation Army (PLA) reforms in at least three decades. As part of those reforms to make the PLA more lethal, it elevated China's missile force to a full service by establishing the PLA Rocket Force (PLARF).²

The PLA has deployed thousands of ground-based ballistic and cruise missiles that can reach US bases and forces throughout the region. Most of these missiles are deployed on the Chinese mainland, but the PLA has

also deployed missiles on China's artificial islands in the South China Sea.³ Of particular concern, approximately 95 percent of the missiles in the PLARF are in the 500 to 5,500 km range, meaning that critical US bases throughout Japan are within range of thousands of advanced ballistic and cruise missiles and are vulnerable to attack.

Based on these new realities, it is imperative that the United States adapt its missile defense policy and architecture and more heavily incorporate missile defense as we strive to establish effective deterrence and defense should deterrence fail. A missile defense architecture that leverages modern technology and meets the challenges posed by China's current and future missile force must prioritize a substantial increase in the number of air and missile defense systems for the regional context and also include those for defense of the US homeland.

Most importantly, though, the missile defense architecture must thoroughly incorporate the space domain by using not only space sensors to track ballistic and nonballistic missile threats and to enable a shorter intercept time but also a space-based intercept platform to complement—not replace—the spectrum of ground- and sea-based systems. Such an architecture would seek to give the United States a more effective ability to destroy Chinese missiles in their midcourse phase and, for the first time, the means to destroy enemy missiles in their boost phase. Building out these capabilities in the space domain to complement current systems will require leveraging new technologies and investing hefty resources. However, there are promising technologies ready for testing now, and the financial cost, considering its payoff, is entirely reasonable.

Through its missile force, the PRC can coerce and blackmail the United States even in a time of peace. Chinese missiles threaten to push the United States out of the Indo-Pacific region, limit US movement, and preclude certain decisions—including coming to the aid of allies—by raising the cost of defensive military intervention. The Chinese military currently enjoys coercive power over the United States and would otherwise gain should we fail to act. To increase its freedom of action, the United States must seek to close the gaps and vulnerabilities that the PLA has sought to exploit, and it must do so with a sense of clear purpose and urgency.

The United States has come a long way in developing and deploying credible missile defenses against rogue actors and integrating them into our strategic posture. The Trump administration has built onto the work of the Obama and Bush administrations and has sought to elevate missile defense in the context of strategic competition with China and Russia. Despite these improvements, current efforts to meet modern challenges

fall woefully short. The Trump administration's *Missile Defense Review* (MDR) does not specify plans for adapting the missile defense architecture to bolster deterrence against China and defend the interests of the United States and its allies if deterrence fails. Moreover, while the United States has a space-based early warning capability and each of the last five administrations has included a space-based missile-tracking layer in its plans for missile defense, no administration has turned the idea into reality. US officials have repeatedly stressed the need to have a space-based tracking layer if we are to have any serious defense against Chinese missiles. Meanwhile, China continues to take advantage of US inaction.⁴

China's Missile Force: Advanced with Strategic Implications

For decades the United States has enjoyed uncontested military superiority over China in every operating domain. Illustrating this point, in 1996 China fired short-range ballistic missiles (SRBM) into the ocean near Taiwan in an apparent effort to compel Taiwanese voters to elect a government less friendly toward Taiwan independence. The United States signaled its support of Taiwan versus Chinese aggression by dispatching two aircraft carrier battle groups to Taiwan's surrounding waters. The Chinese military was unable to target them. At the time, China had only a small quantity of SRBMs with far more limited accuracy than today. PLA missiles could not reach US bases in Japan.⁵ By having the far superior military capability with out-of-reach aircraft carriers and key bases, the United States possessed a more credible deterrent against Chinese aggression. Today, the US ability to deter a Chinese attack is in question. China can reach US forces and has a massive missile force able to accurately range US regional and homeland targets.

US forces in the Indo-Pacific serve US interests in a variety of ways. Almost 30 percent of the world's maritime trade transits the South China Sea each year, including approximately \$1.2 trillion in US imports.⁶ The Indo-Pacific region is "a vital driver of the global economy and includes the world's busiest international sea lanes and nine of the ten largest ports. The Asia-Pacific is also a heavily militarized region, with seven of the world's ten largest standing militaries and five of the world's declared nuclear nations."⁷ Broadly, US forces in the region provide assurance to allies, deter shared adversaries, and guarantee that the United States maintains its ability to freely access the sea-lanes where so much international trade passes. Now, those US air bases and assets in the Indo-Pacific have become so vulnerable they have perhaps become tempting targets for Chinese attack.

Central to China's strategy to solidify its regional hegemony is its missile force designed to prevent the United States from intervening in the Indo-Pacific. Understandably, this capability is of acute concern to not only the United States but also US allies and partners.⁸ In addition to its 90 intercontinental ballistic missiles (ICBM)—which include missiles that can reach most locations in the United States and have a multiple independently targetable reentry vehicle (MIRV) capability—China is fielding a massive, diverse, and technologically advanced regional offensive missile force that can hit US forces, allies, and partners. According to the director of the Defense Intelligence Agency, Lt Gen Robert P. Ashley, Jr., in 2018 “China launched more ballistic missiles for testing and training than the rest of the world combined.”⁹

The PLARF fields missiles with various ranges, including the DF-26 IRBM—capable of conducting precision strikes against targets on land or at sea, potentially as far away as Guam—and antiship ballistic missiles with the ability to hit aircraft carriers. As part of its long-term plans to modernize its “strategic deterrence capability,” the PLARF is developing new types of missiles to evade ballistic missile defenses.¹⁰ Even before any indication of a regional conflict, China is likely to preempt the United States' ability to respond on behalf of a partner or ally by hitting US bases in the region. A preemptive Chinese missile strike against US air bases and assets is consistent with China's missile force doctrine, and satellite imagery seems to show that the Chinese have practiced doing so.¹¹ Sugio Takahashi, chief of the Policy Simulation Office, National Institute for Defense Studies, and Eric Sayers, adjunct senior fellow at the Center for a New American Security, state,

The result is a China more confident in its conventional military prowess and the continued erosion of regional strategic stability. The United States relies on a series of naval and air bases in Japan at Kadena, Sasebo, Iwakuni, Yokosuka, Misawa, and Andersen in Guam to generate offensive combat power. By targeting these critical nodes and other naval assets in the theater in a quick, sharp strike, China could move to paralyze American power projection and present the United States and the alliance with a *fait accompli*. If this trend continues, Beijing could conclude that [China] can deter U.S. military intervention and may find the option to use force to achieve its objectives in a place like Taiwan, or the Senkakus,¹² more appealing.¹³

Even if the Chinese did not preemptively strike US bases or military assets in the region, with their near uncontested ability, the United States could assess that intervening on behalf of a partner or ally simply would

not be worth the risk and cost—thereby relegating it to a bystander.¹⁴ If left unanswered, the Chinese missile force can prevent the United States from fulfilling its alliance obligations, shut out the United States from critical sea-lanes, and lord this power over the United States to compel Washington to behave in ways that help the Chinese and harm American interests. Put simply, US forces in the Indo-Pacific, like US forces in Europe, undergird America's superpower status. By holding US forces at risk, even China's medium-range conventional missiles—though tactical in nature—have strategic implications.

Most of China's missile investments are in traditional ballistic missiles. As the former Pacific Command chief, Adm Harry Harris, told the Senate Armed Services Committee in March 2018, "We are at a disadvantage with regard to China today in the sense that China has ground-based ballistic missiles that threaten our basing in the western Pacific and our ships. We have no ground-based capability that can threaten China because of, among other things, our rigid adherence, and rightfully so, to the treaty that we sign onto, the INF [Intermediate-Range Nuclear Forces] treaty."¹⁵ Because the INF Treaty prohibited the United States from building that particular capability, it inadvertently contributed to China's incentive to outmatch the United States by amassing a large number of this category of weapons. In February 2019, however, the Trump administration announced that due to Russian noncompliance with that treaty, the United States was suspending participation in the agreement and would formally withdraw in six months. On 2 August 2019 the United States formally withdrew from the INF.¹⁶

In addition to investing in expanding the number and ability of traditional ballistic missiles, China is devoting considerable work and resources to its hypersonic weapons—including hypersonic cruise missiles and hypersonic glide vehicles (HGV).¹⁷ HGVs travel at a minimum of five times the speed of sound and with complex, unpredictable flight patterns. An HGV is launched high, begins to glide, and then flies lower in the atmosphere as it closes in on its target. Because of their trajectory and size, ground- and sea-based sensors may lose the track of these missiles. Additionally, HGVs can perform sharp maneuvers to remain out of detection ranges of known radar systems, making them a formidable threat for which the United States has no credible defense. In August 2018, China successfully tested the Starry Sky-2 (Xingkong-2), which China described as traveling at hypersonic speeds.¹⁸ The undersecretary of defense for research and engineering, Michael Griffin, told the Senate Armed Services Subcommittee on Emerging Threats and Capabilities last year that

China has fielded or can field, is close to fielding, hypersonic delivery systems for conventional prompt strike that can reach out thousands of kilometers from the Chinese shore and hold our carrier battle groups or our forward-deployed forces on land that we have bases, can hold those power groups at-risk.

We, today, do not have systems that can hold them at-risk in a corresponding manner, and we do not have defenses against those systems.

Should they choose to employ them, we would be, today, at a disadvantage. It is among my very highest priorities to erase that disadvantage, creating our own systems to hold them at-risk and to provide defense.¹⁹

China's efforts to establish regional hegemony to defend its erroneous territorial claims have chipped away at the US military advantage. Its military capabilities already strain the ability of the United States to operate in certain areas near China.²⁰ If the United States does not recognize and appreciate the threat China poses with its missile force and fails to work assiduously with allies to regain the strategic advantage before a wartime scenario, it will be too late. The United States is by default ceding to China the ability to deny it access to the Indo-Pacific, therefore forfeiting the mantle of preeminent Pacific power and, with it, global superpower status.

Adapting Missile Defenses for Twenty-First-Century Conflict

The current vulnerability of US bases abroad and of the US homeland is unacceptable and puts the United States at a strategic disadvantage. The United States should seek to correct this, thereby bolstering the credibility of deterrence versus China. Fortifying against threats will require a mix of both defensive and offensive missiles—including deploying ground-launch missiles, which have distinct operational and cost benefits. There is a growing chorus of support for the argument that there is wisdom in the United States deploying intermediate-range land-based missiles from US and allied territory. Thomas G. Mahnken, president and CEO of the Center for Strategic and Budgetary Assessment, suggests that

deploying these missiles will help prevent the nightmares that keep Pentagon officials up at night. Such weapons, capable of denying China the use of littoral waters, would be a powerful deterrent to Chinese aggression. In the event of war, these units should be able to disrupt and delay a Chinese attack long enough for air and naval forces to arrive and stymie the assault. By demonstrating the ability to halt aggression, these forces would deter Chinese leaders from attempting it in the first place.²¹

Offensive capabilities have many advantages, especially when it comes to cost. But the United States must also prudently invest more heavily in

missile defense capabilities to capitalize on technological advances that help meet the security dynamics of the twenty-first century in a way that bolsters deterrence. Missile defense has a large role to play in deterrence. To be clear, it is not necessary to create an impenetrable missile defense shield for defenses to be effective for deterrence. Deterrence by denial requires convincing the adversary that its odds of successfully achieving a desired outcome are too low relative to the cost and risk of launching an attack and failing to achieve the desired military objective. In other words, missile defense need only be effective enough to create doubt in the mind of the adversary about the success of the attack. Of course, the more the United States can convince adversaries that defenses are credible, the more the adversary might hesitate to attack.

Missile defense can also safeguard critical assets, or at least limit the damage of an attempted strategic attack so that a counterstrike is possible. In doing so, it helps to maximize the options for US responses to an attack. Additionally, a more robust defense of strategic assets would raise the number of offensive missiles an adversary would need to get through to its desired target, thereby taking away the “potshot” option, so to speak. Moreover, unlike offenses, US defenses do not have to tailor their military impact to proportionality. The stronger they are, however, the better. If deterrence fails, missile defenses also have value in that they are inherently de-escalatory and contribute to escalation management during a conflict. By having the ability to protect US strategic assets and to limit damage of a potential attack, strong missile defense also gives the US increased decision time when determining a retaliatory response. As so aptly stated by Brad Roberts, director of the Center for Global Security Research at Lawrence Livermore National Laboratory, “Ballistic missile defense helps to put the burden of escalation in an emerging crisis onto the adversary, thus helping to free the US and its allies from escalation decisions that might seem premature.”²²

We can imagine a plausible scenario in which lacking defenses tempts aggression; if, for instance, the United States does not have the ability to intercept an HGV (and currently we do not), China might calculate that it can attack US assets on Guam with HGVs, thereby successfully hobbling the United States’ capability to intervene in a larger regional war. Consider a Chinese attack on US bombers. China could assess that destroying the deployed US nuclear bombers is an effective way to complicate or even eliminate politically feasible response options for the United States. It might rationalize that without proximate, proportional options that would have a de-escalatory effect, the United States might simply

decide that the best option is to sue for peace. Or China could determine that the United States would respond to a conventional attack against vulnerable strategic targets with conventional weapons against Chinese nonstrategic targets, and that the targets of those attacks are worth sacrificing. It is still possible, however, that the US would respond to a preemptive strategic attack—even if carried out by Chinese conventional weapons—with nuclear weapons. Across Republican and Democratic administrations, the US has conspicuously and correctly reserved that right so as not to communicate to adversaries that the United States is more tolerant of conventional attacks even with strategic consequences, which could inadvertently incentivize one.²³ Still, what matters is what the adversary *believes* the United States would do, setting up a potential Chinese miscalculation that could result in a disastrous conflict. But if the United States has a credible ability to protect carriers and US deployed assets on US territories and in Japan—for example, by intercepting increasingly complex ballistic and cruise missiles and even highly capable HGVs—and China *believes* this, that perception would powerfully contribute to deterrence and defense if deterrence fails. It is one thing to be on the receiving end of a US retaliatory strike after knocking out a crucial target, but it would be another thing entirely to be on that receiving end after having launched an unsuccessful attack against US strategic interests and gaining little or nothing at all.

Likewise, even though a Chinese attack against targets on the US homeland is far less likely than an attack against US forces and assets in the regional context, the advancements of missile defense and modern technology should be leveraged to close vulnerabilities. Building up and configuring the US homeland missile defense architecture such that China would not be sure it could successfully land a few ICBMs on US soil only decreases the likelihood that China would attempt it. Modern missile defense must seek to more thoroughly disabuse China of the notion that it could easily accomplish a successful first strike. If deterrence fails, missile defense will limit the damage of the attack and allow the United States more options to respond with offensive weapons undamaged by the attack and to carry out the military campaign successfully—ending the war on terms most favorable to the United States. A missile defense strategy that rightfully integrates attack operations would then seek to destroy an adversary's missiles or its ability to launch them. If done successfully, this approach gives US defensive systems a greater advantage as they have fewer missiles to track, discriminate, and intercept.

Therefore, both in the regional and homeland contexts, missile defense has a major role in deterrence. For this reason and others, it is also a stabilizing force. This is, of course, not a new idea. A 1989 Department of Defense report said of the Reagan administration's Strategic Defense Initiative, "Strategic defenses, by having the capability to destroy ballistic missiles and nuclear warheads before they reach their targets, would reduce the confidence Soviet leaders have in their ability to launch a first strike and destroy the forces we would use to retaliate. Lacking confidence that they could destroy our retaliatory forces, and faced with the threat of enormous damage to their nation if we retaliate, Soviet leaders would not risk an attack."²⁴ This concept of bolstering the credibility of deterrence by strengthening defenses has been mostly eschewed in favor of the concept of mutual vulnerability—a Cold War construct based on ideas that do not apply well to the modern, complex threat landscape. Moreover, modern technology now gives the United States greater opportunity to tailor defenses to modern threats. To its credit, the US document that lays out the current missile defense strategy—the 2019 MDR—delineates the stabilizing effect of missile defense and acknowledges the contribution missile defense should make to deterrence. Note, however, that it still falls short of calling for a defense of the US homeland from anything more than rogue states.

Missile defense contributes directly to tailored U.S. deterrence strategies for regional missile threats and for rogue state ICBM threats to the U.S. homeland. Missile defenses can undermine potential adversaries' confidence in their ability to achieve their intended political or military objectives through missile threats or attacks. An adversary's uncertainty regarding the effectiveness of its attack plans, combined with the prospect of an effective U.S. response to aggression, provides strong incentives for adversary restraint if ever contemplating missile attacks. By shaping an adversary's decision calculus in this way, missile defense diminishes the perceived value of missiles as tools of coercion and aggression, thus contributing to deterrence.²⁵

Adapting Policy for US Missile Defense

US national policy is to "maintain and improve an effective, robust layered missile defense system capable of defending the territory of the United States, allies, deployed forces, and capabilities against the developing and increasingly complex ballistic missile threat with funding subject to the annual authorization of appropriations and the annual appropriation of funds for National Missile Defense."²⁶ Congress amended the 1999 National Missile Defense Act in 2016, clarifying that the United States is to build a robust layered missile defense system rather than a system designed

to defend against a “limited” attack. Seeming to build on the momentum of this more expansive policy directive, the 2019 MDR also broadened the mission of the US missile defense architecture and strategy.

The 2019 MDR, unlike the 2010 *Ballistic Missile Defense Review* (BMDR) *Report*, emphasizes the missile threats from Russia and China with a special focus on their regional missile threats. It notes that the DOD is continuing to upgrade highly capable systems like Terminal High-Altitude Area Defense (THAAD) and the Aegis weapons system and its associated SM-3 interceptors, along with improving variants of the multimission SM-6. Unfortunately, the report leaves out useful details about how the United States intends to build out or configure those systems to handle the increasingly challenging operating environment in the Indo-Pacific region. The BMDR states that the United States still relies on US nuclear deterrence to dissuade a strategic attack from peer competitors.²⁷ However, it does not preclude the United States from building out the system to also improve homeland defense against Chinese and Russian missiles, thereby strengthening deterrence—an idea the report claims to embrace, even if not explicitly in the context of peer threats against the US homeland. Moreover, as previously discussed, missiles that threaten US forces, assets, and allies abroad—while tactical in kind—still have strategic effect. Because of the nature of the developing missile threat and dynamic US interests, the line between what is “strategic” and “tactical” is increasingly blurred. Additionally, defensive systems that claimed to have merely a regional defensive capability also contribute to homeland defense, and some even outrightly overlap regional and homeland interceptors. One such example is the SM-3 Block IIA missile interceptor—long hailed as able to defend against only medium-range missile threats—that will likely be tested against an ICBM-class target in 2020.²⁸

The MDR highlights the importance of US homeland defense and points to the addition of 20 new ground-based interceptors (GBI) that will augment its protection specifically from rogue state ICBMs. The additional GBIs will bring the total of deployed GBIs to 64 as early as 2023. The review also notes that the ground-based midcourse defense (GMD) system, while explicitly scaled to handle the kinds of ICBM threats from North Korea and Iran, will seek to intercept an ICBM “from any source” if the country was under attack.²⁹ It does not provide a solution to better prepare the homeland defense system to defend against even an accidental or unauthorized attack from China, let alone a plan to scale the system to bolster deterrence when considering the possibility of a Chinese missile raid.

Of particular note, Alaska still has room for 40 more GBIs; the DOD has already conducted environmental impact studies to determine candidate locations for a third interceptor site should the United States decide to increase the capacity beyond 64. The Trump MDR also notes continued investment in GMD to increase its reliability, which includes upgrading the Exoatmospheric Kill Vehicle and improving sensors. The report states that in the event of a crisis, the United States could surge capabilities to provide greater protection. To that end, it lists the possibility of deploying traditionally regional defenses such as THAAD, Patriot, or the SM-3 Block IIA to ease the burden on the GMD system.³⁰ The MDR also states that the F-35 Lightning II, able to track and destroy cruise missiles today, could be modified with an “interceptor capable of shooting down ballistic missiles in their boost phase.”³¹ This concept of operations, however, does not provide a persistent defensive option and should not be considered a replacement for a true boost-phase missile defense component to a layered architecture. Even if the F-35 could fulfill that role, the report does not direct its development, and the concept remains aspirational.

Lastly, and most importantly, the MDR emphasizes the advantages offered by space-based missile defense systems, the space-based threats posed by US adversaries, and how the United States must adapt the space domain to its advantage. It recognizes that, for US defenses, space-based sensors “can monitor, detect and track missile launches from locations almost anywhere on the globe—they enjoy a measure of flexibility of movement that is unimpeded by the constraints that geographic limitations impose on terrestrial sensors, and can provide ‘birth to death’ tracking that is extremely advantageous.”³² The report rightfully notes their necessity in defending against hypersonic glide vehicles and hypersonic cruise missiles.

Going further beyond the explicit contents of the MDR, President Donald Trump laid out his vision for US missile defense when rolling out the MDR. The most forward-leaning of the president’s remarks was the following:

We will recognize that space is a new warfighting domain, with the Space Force leading the way.

My upcoming budget will invest in a space-based missile defense layer. It’s new technology. It’s ultimately going to be a very, very big part of our defense and, obviously, of our offense. The system will be monitored, and we will terminate any missile launches from hostile powers, or even from powers that make a mistake. It won’t happen. Regardless of the missile type or the geographic origins of the attack, we will ensure that enemy missiles find no sanctuary on Earth or in the skies above.³³

Notably, the MDR did not state that the goal of the United States is to work toward a capability such that “regardless of the missile type or the geographic origins of the attack . . . enemy missiles find no sanctuary on Earth or in the skies above.”³⁴ Neither did it state anything that would conflict with that.

Rather, the report specifies that the United States will not permit limits or constraints on “capabilities needed to protect the homeland against rogue missile threats. Accepting limits now could constrain or preclude missile defense technologies and options necessary in the future to effectively protect the American people.” It went on to state that “U.S. missile defense capabilities will be sized to provide continuing effective protection of the U.S. homeland against rogue states’ offensive missile threats. The United States relies on nuclear deterrence to address the large and more sophisticated Russian and Chinese intercontinental ballistic missile capabilities, as well as to deter attacks from any source consistent with long-standing U.S. declaratory policy as re-affirmed in the 2018 NPR.”³⁵ Also of note, the language about defending the US homeland from a more sophisticated attack does not reject the possibility of establishing a more robust homeland defense against the kind of attack China could launch. The report merely states that the US strategic posture as currently constituted relies on nuclear deterrence.

The president’s remarks, paired with the MDR, raised more questions about the direction the United States was headed. A fair assessment of the MDR is that it lays out a strategy to build on the previous administration’s missile defense architecture. It expands the scope of missile defense in the near term while leaving open the possibility that the United States could make the policy decision to do what is necessary to provide a truly robust capability against, specifically, Chinese missile threats. The president’s budget request followed the MDR and showed that the United States does not plan to make significant qualitative changes to its missile defense strategy in the near term to strengthen deterrence and defend against China (or Russia). While policy documents, reports, and even presidential remarks that call attention to what would be needed to defend against China are welcome, words are not enough. Reports cannot deter attack or intercept missiles. Forward-leaning statements like the president’s can set the tone but are ineffective if the budget does not back those statements. What is required now is a dedicated, sustained, and foreseeable investment to—among other things—adapt and bolster US missile defenses for great power conflict.

Adapting Missile Defense

It is imperative the United States goes from merely talking about improving missile defense in a new era of competition with China to taking action. It must adapt its missile defense architecture to more adequately defend the US homeland and protect US bases and assets in the Indo-Pacific region from Chinese missiles. The United States must substantially improve the capability and reliability of the current system and build capacity on US territory. It would also be prudent to collaborate with allies to discuss possibilities for expanding missile defense cooperation and building partner capacity.

There are many areas deserving of investment to create a robust, tiered system of systems in the China context including increasing the inventory of THAAD and Patriot. The Aegis weapon system provides especially interesting opportunities for allies to deepen cooperation with the United States and develop a more robust homeland defense architecture. Japan, Australia, and South Korea already have Aegis ships.³⁶ Additionally, the United States should accelerate investment in a new kill vehicle program for GMD interceptors to increase probability of kill and ensure the testing program continues to prove reliable in increasingly complex threat scenarios. Doing so will bolster defense of the homeland, even against such unlikely but possible unauthorized or accidental launches from peer competitors.

But the program that could give the greatest qualitative boost to US missile defense—across regional and homeland defense systems—is an initial space sensor layer (SSL) that fits into a broader space-based architecture that complements military operations across domains.³⁷ The SSL would give the United States “eyes” necessary to see our enemy’s missiles from launch and track them until the missiles’ destruction in one form or another. A sensor in space is necessary for improving defenses against traditional threats that even less militarily capable enemies such as North Korea possess. Different sensors are required for ballistic and nonballistic missiles to detect ever-improving new decoys and countermeasures meant to confuse our current missile defense systems and the new Chinese missiles we cannot sufficiently track. With the right sensors, the SSL would immediately leverage the full potential of current US missile defense interceptors, greatly improving the capability of current defense systems against traditional ballistic missiles. While theoretically possible to cover the planet with thousands of better-hardened and defended ground- and sea-based sensors to track missiles and share data, practically, it would be impossible. As explained by Gen John Hyten, commander of US Strategic

Command, “there are not enough islands in the world to build a radar to defend every avenue, therefore, we have to go to space. And we can go to space, now in an affordable way with distributed constellations that can look down and characterize that threat in a global perspective, so we can see them wherever they come from. That’s the direction we need to go.”³⁸

Further explaining the utility of a SSL, General Hyten told an audience at the Hudson Institute in 2017 that when he was asked by Congress if we can improve the US missile defense capability he said, “We can do it by improving our sensor capabilities first. I think we need a space-based sensor capability as part of that to provide more ubiquitous global coverage.”³⁹ Together with a new interceptor, the SSL would offer the United States the ability to defend against HGVs. This is because a SSL would be able to detect and track a Chinese HGV from launch to death. While the United States will be able to rely on ground- and sea-based sensors to handle ballistic missile threats for the near term, it is impossible to defend against HGVs without the SSL.

In the Indo-Pacific, we should expect the Chinese to use electronic and cyber warfare against US radar and use attack operations that include missiles from various angles and with different flight patterns and targeting across domains, including antisatellite systems; therefore, considering how to make the US defensive architecture optimally resilient is key. A satellite layer consisting of many satellites in a variety of orbits contributes to resiliency. These satellites could be made agile and self-protective to increase their survivability. However, once an enemy begins an attack on the satellite architecture, the United States should begin its response and not wait for the entire layer to be destroyed. Additionally, lower orbits embedded with commercial satellites that belong to the United States as well as our adversaries would create a disincentive for a disabling attack since it would be simultaneously damaging to the enemy.

One concept the Pentagon did request that Congress allocate a small amount of funding for is a Defense Advanced Research Projects Agency (DARPA) effort to adapt commercial space technology for military use. DARPA plans to launch a small, experimental constellation of commercial satellites in low Earth orbit (LEO) carrying military payloads. The purpose is to get something deployed quickly, learn from the program, and try to decrease the cost of launch. Launch costs are the bulk of the expense of a space-based sensor layer.

Another promising concept is that of “space enabled intercept” (SEI), which would give a SSL the ability to communicate directly to the interceptor, thereby eliminating the ground station relay. This capability would

allow interceptors to engage at much longer ranges since course corrections can be made beyond the line of sight of ground stations and reduce the time from tracking to intercepting. These features would be valuable in the case of defending against HGVs since interceptors could engage in the HGVs' glide phase and continuously correct for their fast maneuvers. DARPA also plans to explore and prove applications with artificial intelligence or "smart" satellites that can collect, analyze, and disseminate data autonomously. As with the SEI concept, having smart satellites that can cue interceptors directly would dramatically reduce response time to detect and kill an enemy missile.⁴⁰

The advantages of a sensor layer in space are numerous. But it is not a silver bullet and should not be a complete replacement for land- and sea-based sensors. In the near future as well as in the long run, a multidomain suite of sensors is necessary for optimal resiliency and for disincentivizing an attack that targets sensors. Choosing not to move forward with an initial SSL concept in the next few years is choosing to remain blind to Chinese sophisticated missile systems. There is no near-term, more affordable substitute. Regardless of the configuration, if the United States is going to regain the strategic advantage against its enemies, it has to rely much more heavily on space sensors and therefore deploy a SSL.

Space-Based Kill Capability

In addition to deploying the SSL and exploring the concept of SEI, the United States ought to pursue the ability to destroy enemy missiles from space. This would give it several advantages over the Chinese. Broadly speaking, a space-based kill capability could provide the ability to intercept an incoming enemy missile early in its trajectory, before it could release decoys and countermeasures meant to confuse missile defenses. A space-based kill capability can provide boost and midcourse defense; it just depends on the number of space-based platforms and in which orbits. Because hit-to-kill technology is mature, we recommend pursuing it for space applications. Eventually, the solution to the vexing problem of the expense of missile defense systems relative to the cost of the offensive missiles they kill is leveraging directed energy. Directed energy would essentially allow the United States to engage incoming missiles as necessary and with an inexhaustible magazine, destroying enemy missiles before they reach their intended target. Continued research and development of directed energy in space for missile defense should continue in parallel with a more aggressive pursuit of kinetic intercept from a constellation of orbiting satellites.

A space-based interceptor (SBI) layer would simply add a layer in the already-layered architecture, filling gaps in our ground- and sea-based missile defense and creating depth of fire to protect critical US areas and assets of greatest strategic value and risk of attack. It would substantially augment our current defenses by offering an opportunity to thin an enemy salvo in the midcourse phase of flight before it begins its descent toward the target. Having a space-based missile intercept layer would satisfy the necessary conditions for credibly countering China's most complex missile threats, most of all by complicating the enemy's calculations. Deterring an initial act of aggression will always be one of the greatest payoffs from the investment in SBIs.


The concept has been around for decades, as have its critics. But the criticisms of SBI carry much less credibility today compared to when they were offered in the 1980s. For starters, the multipolar threat environment with diverse and complex missile threats unacceptably outmatches US defenses. Moreover, it is now technically feasible for the United States to deploy a test bed in the next several years to prove the concept can be implemented for intercepting various kinds of missile threats. The United States validated technical feasibility in the 1990s, and technology has only gotten dramatically better since. For the most part, even those who oppose the concept do not oppose it based on technical feasibility; rather, one of the main criticisms of SBIs is that the concept is simply "cost prohibitive." Opponents of SBIs often cite the highest cost estimates, in the hundreds of billions of dollars.

In reality, the cost would be much lower. In August 2018 the undersecretary for research and engineering, Michael Griffin, told reporters that the "idea of space-based interceptors has been in some ways the victim of unrealistically high, uninformed cost estimates" and naively judged "to cost much more than I believe that they would cost if one actually got down to business."⁴¹ More recently, he provided an estimate for a space-based layer that would cost in the range of tens—as opposed to hundreds—of billions of dollars. In addition, the technology and manufacturing advances in the last several years would dramatically lower the risk of fielding these capabilities. Leveraging the lower launch costs of today, the use of peer-to-peer networks, and the remarkable advances in artificial intelligence and computer processing would allow a truly robust and more cost-effective space-based capability. The numbers remain theoretical until the United States moves forward with architectural designs and cost assessments.

After cost, the other frequent criticism of SBIs is that they would be “destabilizing” and cause peers to build up their offensive forces to get around the new defensive measures. In fact, reality proves the opposite. We have entered a new missile age where adversaries are heavily investing in missiles to exploit US vulnerabilities to coerce, blackmail, and threaten US freedom of navigation as well as to limit US response options in the event they attack US allies. There is no evidence that the absence of SBIs has dissuaded adversaries from investing in missiles in quantity and sophistication; to the contrary, where there is a thinner layer of defense capability, there is evidence US adversaries are seeking to exploit the vulnerability and are rapidly acquiring missile defense systems of their own. As noted in the MDR,

China is aggressively pursuing a wide range of mobile air and missile defense capabilities, including the purchase of S-400 systems from Russia, each with four interceptor missiles, and is developing additional theater ballistic missile defense systems. China also has announced that it is testing a new mid-course missile defense system. Further, China is developing a suite of antisatellite weapons, continues to launch “experimental” satellites that conduct sophisticated on-orbit activities to advance counterspace capabilities, and has conducted multiple ASAT tests using ground-launched missiles.⁴²

In response to the possibility of great power conflict in the twenty-first century, the United States must take a fresh look at its defensive systems. Just as the Chinese have elevated their missile force to the status of their other services, so should the United States elevate the investment and importance of missile defense to reflect the new era of great power competition.

By leveraging new technologies and hit-to-kill technology and investing in directed energy, missile defense will become less costly in the offense-defense comparison. The United States can increase the credibility of its deterrence and defense with a more reliable and capable missile defense architecture, including current sea- and land-based defensive systems complemented by a space-based sensor, space-enabled intercept, and space-based intercept layer. A robust missile defense system that accounts for the Chinese missile threat would help the United States defend its ability to access the Indo-Pacific, cooperate with its allies in enforcing national boundaries, and generally preserve the peace. Failing to do so could, by default, mean forfeiting regional hegemony to China in the near term and the status of global preeminent power in the far term. 

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