ANALYSIS

HOMELAND MISSILE DEFENSE
RESPONDING TO A TRANSFORMED SECURITY ENVIRONMENT

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Introduction

The United States is approaching an inflection point on homeland missile defense that is sparking a debate over the future direction of the program and mission. As a result of rapid progress by potential nuclear adversaries, missile threats to the American homeland are quickly outpacing the current and planned capacity and capabilities of U.S. missile defenses. If the United States is to reserve this trend, it must decide how best to adapt its missile defense posture to better account for new technologies, advanced capabilities and a more volatile strategic environment.

There is growing unease about the ability of the homeland missile defense "program of record," narrowly focused on the development of a single new land-based interceptor, to stay ahead of the ICBM threat from North Korea and, in the likely near future, Iran. In the case of the former, the missile and nuclear threat is expanding faster than anticipated. Given the likely decade long development and fielding of the Next Generation Interceptor (NGI), this threat will almost certainly create a window of vulnerability by 2030. Equally important, the current missile defense program lacks the technology and capability development efforts that could contribute to countering the rising danger of coercive threats from Russia and China, as witnessed by Moscow's warnings that it is prepared to use nuclear weapons in its war on Ukraine to prevent defeat and the more oblique but still clear threats by Beijing to employ nuclear weapons in a Taiwan conflict.[1] The threat of such limited nuclear use , occurring below the threshold of large-scale attacks, is calculated to persuade U.S. leaders that the risks of responding to aggression are not worth the costs, including the prospect of further escalation.

This paper considers the timeframe of the next five years and beyond, identifying areas where the United States should re-focus its missile defense efforts to ensure the protection of the nation from both rogue state missile attack and peer state coercive threats. Regarding the latter, although the Biden Administration has stated its intention to do everything possible to strengthen deterrence against such threats, it has ruled out defending against

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[1] Alexander Khrebet, "Russia's Medvedev threatens to nuke US, UK, Germany, Ukraine if Russia loses occupied territories," *Kyiv Independent*, February 18, 2024, available at https://www.msn.com/en-us/news/world/russia-s-medvedev-threatens-to-nuke-us-uk-germany-ukraine-if-russia-loses-occupied-territories/ar-BB1itM67. Also see Matthew Kroenig, "Deliberate nuclear use in a war over Taiwan: Scenarios and considerations for the United States," Atlantic Council, September 2023, available at https://www.atlanticcouncil.org/wp-content/uploads/2023/10/Kroenig-Deliberate-Nuclear-Use-in-a-War-over-Taiwan.pdf.

Russian and Chinese missile attack on the U.S. homeland.[2] This position is based on the counterfactual view that deploying defenses, even moderately scaled defenses, against peer state threats would be destabilizing, possibly igniting an arms race. In fact, deploying defenses to undermine an adversary's contemplated resort to limited nuclear use, thus averting the risk of nuclear coercion, would add significantly to deterrence and stability.

To outline a path that could achieve this goal, the paper first identifies significant trends within the arsenals of U.S. principal rivals characterized by: 1) an enduring hostility with regional opponents such as North Korea and Iran who continue to move forward with their nuclear weapons program while developing increasingly capable longer-range missiles; and 2) an intensifying geopolitical rivalry with Russia and China, both of whom are demonstrating a propensity for confrontation that includes the prospect of nuclear weapons threats in order to force the United States to accept increased risk when responding to aggression.

The paper then outlines program and capability steps that can be pursued to bring missile defenses into alignment with a steadily deteriorating security environment. Every administration proclaims that protecting the American people from missile attack is their first priority. But this commitment can only be realized if major changes are made to the U.S. missile defense posture. To move in this direction, the United States must reorient its missile defense strategy to pursue new capabilities to deter and defeat attacks against the homeland. This is achievable. It does not require major technological breakthroughs or massive budget outlays. It requires, above all else, a change in policy. In this regard, the paper seeks to inform the ongoing debate over the future of the homeland missile defense mission by offering a range of measures decision makers should take.

An Erratic Post Cold War Legacy

Homeland missile defense has always been impacted by politics and ideology. President George H.W. Bush, building on President Reagan's Strategic Defense Initiative, initiated the development of the GPALS (Global Protection Against Limited Strikes) program in 1991. It consisted of a combination of ground-based and space-based interceptors and sensors intended to provide layered protection against threats of up to 200 warheads launched from any source. The Clinton Administration cancelled all programs designed to develop more advanced defenses. It declared the ABM Treaty, which prohibited the defense of the U.S. homeland, to be the "cornerstone of strategic stability."

The foundation of today's approach to missile defense was set more than twenty years ago by the George W. Bush Administration. President Bush withdrew the United States from

[2] See, for example, Executive Office of the President, Office of Management and Budget, "Statement of Administration Policy H.R. 2670—National Defense Authorization Act for Fiscal Year 2024," July 10, 2023, available at https://www.whitehouse.gov/wp-content/uploads/2023/07/H.R.-2670-NDAA.pdf. The White House reiterated its "strong" opposition to potential congressional legislation to expand homeland missile defense policy "in a way that would signal intent to develop U.S. homeland missile defenses to counter large intercontinental-range, nuclear missiles threats such as those fielded by the People's Republic of China (PRC) and Russia."

the ABM Treaty in 2002, in accordance with the provisions of the Treaty, and achieved initial operational deployment in 2004 of the Ground-Based Mid-Course Defense system (GMD) with ground-based interceptors (GBIs) at Fort Greely, Alaska and Vandenberg Air Force Base, California. The stated goal was to develop and deploy missile defenses to defend against threats from rogue states, especially North Korea. The threat was assessed to be small numbers ("handfuls") of relatively unsophisticated missiles. At the time, Russia and China were not considered potential adversaries.

Each successive administration has stated its commitment to "stay ahead" of the rogue state threat to prevent an attack on American soil, but none has taken the measures needed to do so. The Obama Administration, while declaring defense of the homeland against missile attack to be its top priority, ended most of the interceptor and sensor programs designed to develop the next generation of capabilities needed to stay ahead of the threat. This included the Multiple Kill Vehicle (MKV), the Kinetic Energy Interceptor (KEI), the Precision Tracking Space System (PTSS), and the Airborne Laser (ABL) weapon system. It also cancelled the Bush Administration's plan for a so-called "third GBI" site in Europe as well as its own program, the SM3-IIB, intended to counter intercontinental-range ballistic missiles (ICBMs) launched from regional adversaries such as Iran. The result was an actual reduction in the planned size of the GBI force. The Obama Administration, like the Clinton Administration, saw U.S. missile defense capabilities as a potential bargaining chip to entice Russia to reduce its offensive capabilities.

The Trump Administration also declared homeland defense to be a priority but did not substantially improve U.S. capabilities beyond continuing the Obama Administration's plan to field a newer ground-based interceptor.[3] Like its predecessors, the Biden Administration has emphasized the commitment to defending the nation against the expanding North Korean missile threat but has taken no new measures to uphold that commitment. Reports also suggest missile defenses may again come into play as a bargaining chip if, in the now unlikely event, Moscow agrees to arms control negotiations beyond New START.

Also significant is what each administration chose not to do:

- All have adopted a policy of intentionally designing GMD to avoid any capability to defend against Russian and Chinese attacks on the U.S. homeland. Deliberately ruling out defense against Russian and Chinese strategic forces has all but eliminated the pursuit of new and innovative technology and capability pathways. No distinctions have been made between defending against a massive attack and more limited threats such as those made over Ukraine and Taiwan.
- All have failed to implement "spiral development"—that is, developing and incorporating new technologies on a systematic and continual basis—to stay ahead of the rogue state threat. Since the initial deployment in 2004, only sporadic and incremental improvements have been made to the GMD system.

[3] The Trump Administration continued to carry forward the Obama Administration's effort to build a new "front end" for the GBI known as the Redesigned Kill Vehicle (RKV). When the RKV encountered technical issues in 2019, it was cancelled and a new missile and kill vehicle, the Next Generation Interceptor, became the program of record system.

- All have failed to invest meaningfully in advanced technology development efforts required to adapt the homeland defense posture to evolving threats. This is especially true for capabilities such as space-based interceptors and directed energy weapons. These areas have been treated largely as "science projects" rather than as promising technologies to counter real-world threats.

The Shifting Threat and Geopolitical Context

Today's security environment is undergoing a perilous transformation. It is characterized by deepening military cooperation among autocratic powers who are increasing the numbers and sophistication of existing missile systems, adding new types of missiles, and integrating these weapons into their strategies for confrontation and conflict with the United States and its allies.

One pacing trend is North Korea. Its ballistic missile arsenal is growing in numbers and sophistication, outpacing projections.[4] Over the last several years, Kim Jong Un has presided over multiple military parades in which the most prominent weapons on display have been ICBMs with the ability to strike the American homeland. These include at least eleven Hwasong-17 missiles on transportable erector launchers and five additional launchers with cannisters reportedly representing mockups of solid fueled long-range missiles under development. In 2023 alone, North Korea conducted five flight tests of its ICBMs, including the Hwasong-15 and Hwasong-17 liquid-propellant ICBMs as well as its new solid-propellant road-mobile ICBM, the Hwasong-18. Once fielded, these new missiles will represent a major advancement in the threat as their greater mobility, aided by the development of solid rocket boosters, will further complicate the already difficult challenge of destroying them "left of launch."[5] In turn, their improved survivability will place even greater reliance on the ability to destroy these missiles "right of launch."

The numbers and types of missiles observed are a further indication that the North is expanding its force to undermine American defenses and hold the homeland at risk.[6] Accompanying this growth in missile capabilities is a rapid increase in the North's nuclear weapons arsenal. Kim JongUn has directed that the weapons program should have first priority and should grow at the maximum speed, an order that is now codified in that state's constitution.[7] A recent RAND report assesses that the North may have the capability to

[4] John Grady, "NORTHCOM: U.S. Needs New Ballistic Missile Interceptor by 2028 to Keep Pace with North Korea," *USNI News*, March 25, 2022, available at https://news.usni.org/2022/03/25/northcom-u-s-needs-new-ballistic-missile-interceptor-by-2028-to-keep-pace-with-north-korea.

[5] On December 18, 2023, North Korea successfully launched a solid fuel, road mobile Hwasong-18 ICBM—with an assessed range of close to 10,000 miles.

[6] Christy Lee, "Experts: North Korea's New ICBM Poses Challenges to US Missile Defense," *VOA*, March 16, 2022, available at https://www.voanews.com/a/experts-north-korea-s-new-icbm-poses-challenges-to-us-missile-defense-/6487640.html.

[7] Jon Herskovitz, "North Korea Amends Constitution to Enshrine Permanent Growth of Nuclear Arsenal," *Time*, September 27, 2023, available at https://time.com/6318150/north-korea-exponential-growth-arsenal-constitution/.

expand its stockpile to some 200 weapons by the end of the decade.[8] If so, the North Korean stockpile could approach that of the UK or France.

The expansion of the North's long-range missile and space launch capabilities, which is being aided by Russian assistance,[9] puts new pressure on U.S. defenses to protect the homeland. These defenses were designed two decades ago for a smaller and less advanced threat, not the larger force being built by North Korea today. Put simply, unless additional advanced capabilities are pursued beyond the current program of record, the threat from North Korea will further outpace the U.S. ability to defend against it.

A second pacing trend that will add to this challenge is Iran, a virtual nuclear weapon state today, reportedly with the ability to produce several nuclear bomb's worth of fissile material in a matter of weeks.[10] Possessing the largest missile force in the Middle East and building on its space launch vehicle program, which it is using to advance its ICBM program, the Iranian long-range nuclear missile threat will likely arise quickly when the regime takes the political decision. Its partnerships with North Korea and Russia leave little doubt that Tehran, like Pyongyang and Moscow, will seek to acquire the ability to hold American cities hostage.

The third trend is the prospect of Russian and Chinese limited coercive nuclear threats to constrain the ability of the United States to assert its security interests. Both countries are developing strategies for confrontation that include the threat of limited nuclear escalation to deter U.S. intervention or to compel the United States to disengage to bring an end to a crisis or conflict on advantageous political-military terms. Moscow's doctrine of applying nuclear force early and in an incremental manner, sometimes referred to as "escalate to win" or "escalate to deescalate," and Beijing's threats of nuclear use in a Taiwan crisis, are creating tighter linkages between regional conflicts involving those states, and nuclear coercive threats to the U.S. homeland employed to shape the escalation of potential hostilities. Russia is of particular concern. It envisions the prospective escalation to nuclear strikes—but below the threshold of large-scale attacks to avoid eliciting a reciprocal U.S. response—to force Washington to halt its involvement in an ongoing conflict with Russia. Moscow is carrying out this strategy today with coercive nuclear signaling to induce fear and impede the freedom of political and military action on the part of the United States and its allies.

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[8] Bruce W. Bennett, Kang Choi, Myong-Hyun Go, Bruce E. Bechtol, Jr., Jiyoung Park, Bruce Klingner, Du-Hyeogn Cha, *Countering the Risks of North Korean Nuclear Weapons,* RAND Corporation, April 2021, available at https://www.rand.org/content/dam/rand/pubs/perspectives/PEA1000/PEA1015-1/RAND_PEA1015-1.pdf.

[9] On September 13, 2023, Kim Jong Un met Russian President Putin at the Vostochny space launch facility in the Russian Far East. Asked whether Russia would help North Korea build its satellite launch capabilities, Putin replied, "That's why we came." See Guy Faulconbridge and Soo-Hyang Choi, "Putin and North Korea's Kim discuss military matters, Ukraine war and satellites," *Reuters*, September 13, 2023, available at https://www.reuters.com/world/nkoreas-kim-meets-putin-missiles-launched-pyongyang-2023-09-13/.

[10] One recent assessment concludes that Iran possesses sufficient weapons-grade uranium to construct its first nuclear weapon within a week and a total of six within a month. See "The Iran Threat Geiger Counter: Reaching Extreme Danger," *Institute for Science and International Security,* February 2024, available at https://isis-online.org/uploads/isis-reports/documents/Iran_Threat_Geiger_Counter_February_2024_FINAL.pdf.

As China moves toward nuclear parity, accompanied by the rapid expansion of its long-range strategic weapons, it is also likely to incorporate into its strategy a larger role for limited nuclear use. Recent Chinese military writings discuss the utility of "controlled use" of small-yield nuclear weapons for the purpose of "warning and deterrence."[11] The transformation, in terms of size, diversity and sophistication, of Beijing's nuclear missile force will allow its leadership, in future hostilities over disputed islands in the South China Sea, Taiwan, or its support for the North in a war on the Korean Peninsula, to wield coercive threats of limited nuclear escalation calculated to compel an end to a militarized crisis or conflict on terms favorable to China.

Both of these trends undercut the viability of the current U.S. policy approach to missile defense—one that is increasingly out of alignment with the shifting dynamics of great power confrontation and its implications for homeland defense. If these threats are to be reliably deterred and countered, U.S. missile defense policy and posture must be fundamentally changed. If not, the result will be the accelerating obsolescence of U.S. defenses resulting in an inability to protect the nation. If U.S. adversaries, both rogue and peer states, believe they can hold the United States hostage, they may feel they have a green light for aggression.

Prospective Measures to Align Missile Defense to the New Security Environment

Against the backdrop of a strategic environment that has worsened over the past two decades, it is prudent to "relook and refresh" the requirements for homeland missile defense. This should include the examination of new and alternative concepts and capabilities to harness current and emerging technologies necessary to defend against missile attack well beyond 2030.

In this connection, there are two interrelated lines of effort to align the defense of the United States with the security environment it now confronts. The first is to identify a set of relatively *quick fixes* the United States could make over the next several years to the current missile defense posture to halt its decline and strengthen its ability to effectively defeat missile threats by North Korea and potentially Iran. The second is to set out follow-on measures that can provide a capability to defend against the evolving missile arsenal of regional adversaries while also denying Russia and China confidence that they could blackmail the United States by threatening limited nuclear strikes.

Under these circumstances, missile defenses could fortify deterrence, in concert with nuclear forces, by undermining the confidence of adversaries that they could readily achieve the political and military objectives of a limited attack. For rogues, this lack of confidence may convince the leadership that the risk of a failed attack, combined with the certainty of U.S. retaliation, outweighs any potential gain. For peers, sowing unpredictability and doubt

[11] Department of Defense, *Military and Security Developments Involving the People's Republic of China* 2023, p. 112, available at https://media.defense.gov/2023/Oct/19/2003323409/-1/-1/1/2023-MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA.PDF.

into their planning for limited attack could compel the leadership to choose either to back away from a decision to initiate or escalate hostilities or to increase the attack size to a level that could resemble a much larger attack with the attendant risk of escalation to a large-scale nuclear exchange. In short, defenses provide deterrence and denial benefits at the lower end of the escalation and limited conflict spectrum while nuclear forces would continue to threaten intolerable costs at the higher end.

For purposes of this assessment, the high end of "limited" ballistic missile threats is defined as up to 200 warheads delivered on no more than 20 long-range ballistic missiles. The capability to defend against ballistic missile attacks up to this size could provide protection against: (1) any likely full-scale North Korean attack; (2) any likely full-scale near simultaneous attack by North Korea and Iran; (3) coercive strikes by Russia or China acting alone; and (4) coordinated coercive attacks by Russia and China acting together.

Initial Fixes

There are a number of steps that can be implemented over the next several years that would help ensure the GMD system retains its ability to counter current threats while hedging against any delay in the development of the NGI program or an unforeseen expansion of North Korea's or Iran's ICBMs. These measures center on evolving GMD towards an *expanded mixed interceptor fleet* of improved GBIs, and new NGIs when it does become available, rather than replacing GBIs with NGIs, as has been often envisioned. There are several elements to this approach.

First, the United States should maintain its extant GBI interceptor inventory, which continues to provide protection benefits. Despite the lack of DoD urgency in enhancing their capability, today's GBIs contribute to interceptor capacity (i.e., numbers) essential to defending against North Korea's growing ICBM arsenal. Moreover, the ability of the GBIs to defeat ICBMs is improving as they are integrated with newer and more capable sensors such as the Long-Range Discrimination Radar (LRDR) in Alaska. LRDR provides enhanced warhead discrimination, precision tracking and warhead kill assessment to the GBIs that make them more effective against incoming missiles.

Additionally, GBI's potential to intercept more capable ICBMs will be further augmented as the Space Force begins deploying the Proliferated Warfighter Space Architecture consisting of a multi-layered missile tracking satellite network. This network will provide persistent global detection, warning, and precision tracking of advanced missile threats, including hypersonic weapons launched on ballistic missiles, generating fire-control quality data to allow interceptors to engage hostile missiles. In support of this effort, the Space Development Agency (SDA) is expected to begin launching developmental satellites in 2026 that could, by the end of the decade, provide improved tracking and fire control support to the GMD system from space sensors. Such action is overdue and should be supported by adequate resourcing, including stable funding.

Second, MDA is currently making minor system upgrades to GBIs through the Service Life Extension Program (SLEP). These, however, are limited to maintaining the reliability of

certain components for the older and less capable GBI configurations carrying kill vehicles known as CE-I. A more beneficial SLEP plan would be to upgrade all 44 GBI kill vehicles to the latest interceptor system configuration, designated as CE-II Block 1. Today, MDA is funding only a portion of the GBI fleet with these upgrades which, as demonstrated in recent flight tests, improve the performance of the interceptors against evolving missile threats.[12] The production line for the CE-II kill vehicle would likely need to be restarted, but that appears to be feasible within the timeframe considered here. Bringing the entire GBI fleet up to the newest configuration extends its role in support of homeland defense well beyond 2030.

Third, DoD should take a fresh look at the requirement for an additional missile defense interceptor site located on the East Coast. It has been recognized for some time that the deployment of a third GBI site could provide additional time, or battlespace, beyond the Ft. Greely and Vandenberg sites, equating to more "shot opportunities" for GBIs to defeat potential Iranian ICBMs targeting the eastern United States. Moreover, resources associated with building a site on the East Coast would be less than developing a new missile field in Alaska if transportable launchers are used rather than fixed underground silos that add to construction costs. DoD has examined the transportable concept in the past and concluded it is viable. Transportable GBI launchers also provide additional flexibility to relocate interceptors to southern locations in the United States if needed, for example, to counter missile threats approaching from southern trajectories like China's Fractional Orbital Bombardment System (FOBS).[13]

Lastly, the United States can upgrade the sea-based SM-3 IIA missile to serve as an "underlayer" to the GMD system, which could provide dozens of additional interceptors to augment the protection of the homeland. While the SM-3 IIA interceptor does not compare in capability to the GBI, it can usefully complement the GMD system in times of national emergency. Aegis ship-based SM-3 IIAs, operating as an "underlayer" to the GMD system, would provide a "mobile surge" capacity during a conflict, expanding the number of interceptors available to protect the United States. In 2020, DoD tested a modified SM-3 IIA against a missile target and demonstrated the feasibility of destroying an ICBM. However, the Biden Administration terminated MDA's plans to complete the development of the program in 2021 over likely policy concerns that Russia would oppose an expansion of U.S. homeland defenses.[14]

All of the proposals identified above build on current programs or plans examined by DoD in recent years. As for funding, the costs must be placed in their proper context. Today,

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[12] Missile Defense Agency, *Homeland Missile Defense System Conducts Successful Intercept of Target*, December 11, 2023, available at https://www.mda.mil/news/23news0006.html.

[13] Chandelis Duster, "Top military leader says China's hypersonic missile test 'went around the world'," *CNN Politics*, November 18, 2021, available at https://www.cnn.com/2021/11/17/politics/john-hyten-china-hypersonic-weapons-test/index.html#:~:text=China's%20test%20of%20a%20hypersonic,attack%20on%20the%20United%20States.

[14] Admiral Hill, Director of MDA stated at the time that there were no technical barriers to SM-3 IIA as an underlayer to GMD, but Biden Administration officials made clear "there are some very serious policy implications, and so we want to make sure that we get the policy angles right." Jen Hudson, "How will the Pentagon close the homeland missile defense gap?" *Defense News*, August 9, 2021.

MDA spends about 30 percent (~$3.5B) of its annual budget on activities in direct support of homeland missile defense. This represents less than one-half of one percent of DoD's total budget. Resourcing the activities above, even if it increased MDA's yearly funding for homeland missile defense by 50 percent, would amount to less than one percent of DoD's total budget.

Follow On Measures

While the above measures offer options to remedy shortfalls in the current posture against evolving missile threats from rogue states, they are likely insufficient to undermine Russia's and China's calculations over possible limited nuclear use. As Russia's war in Ukraine demonstrates, nuclear coercion is an instrument that will be wielded by strategic rivals seeking to prevail in crises and conflicts in the coming decades. The ability to defeat limited strikes on the homeland would help erode the capacity and hence the credibility to threaten such strikes in the first place.

There are a range of initiatives and investments that could provide future decision makers options to counter Russian and Chinese coercive threats. These include both sensor and advanced intercept capabilities.

As the United States reshapes its broader military space architecture, it has an opportunity to create a more resilient and comprehensive foundation for sensors to augment the effectiveness of today's missile defenses while also supporting advanced systems to defeat more complex future threats. The most significant enhancement to the GMD system over the next decade, beyond the investments already described, will likely be achieved through the fielding of space-based sensors. Space is the only domain capable of providing persistent and global observation for precise tracking of ballistic and maneuvering hypersonic missiles and discrimination (between warheads and decoys), regardless of the origin of launch.

Defeating the emerging advanced rogue state and limited peer missile threats requires precise tracking and discrimination. The Space Force's plan to build satellite prototypes by 2026 to track ballistic and hypersonic missiles from medium earth orbit offers for the first time the ability for persistent tracking of complex threats.

Regarding development of space sensors that can distinguish warheads from decoys in the mid-course phase of flight, there currently are no significant programs underway beyond minor experiments to test sensors onboard unmanned aerial vehicles (UAVs). Efforts to develop a discrimination space sensor (DSS) have suffered from a chronic lack of funding and sustained program support over the past ten years. For this to change, DoD must treat the issue of discrimination as an essential component of the missile defense mission and develop a durable R&D program focused on maturing DSS technology over the next decade. The ability to do so is a key technology enabler in countering more complex missile threats.

As part of a transition beyond the legacy of a missile defense sensor architecture based largely on the surface of the earth, the United States also should better leverage airborne platforms for enhanced missile tracking. For example, over the next decade, the United States

and its allies will field and operate several thousand 5th generation tactical fighters like the F-35 that possess sensors capable of detecting and tracking the infrared (IR) signatures of boosting missiles at extended ranges. While the Air Force may be reluctant to take on an additional mission for the fleet, DoD should nevertheless require that this tracking data be incorporated into both homeland and regional missile defense architectures. Furthermore, MDA has tested sensors on UAVs to track boosting missiles; and DoD is investigating the use of drones to track hypersonic weapons.[15] However, steps must be taken to pursue an integrated sensor network, in which airborne platforms augment the space-based missile tracking constellation, as well as the extant ground-based radar network, thereby providing an additional layer of sensors to track missiles, including in the boost/ascent phase of flight.

More importantly, as the United States considers how to adapt to a threat environment that is almost certain to deteriorate over the next decade, it will be necessary to identify a path to a multi-domain missile defense framework with different mixes of interceptor technologies and systems. There are several broad areas that should be pursued in this regard.

Significant progress is being made outside of MDA, for example, in the development of autonomous airborne platforms, which show promise in support of the missile defense mission. These platforms are now demonstrating the ability to operate with extended range and endurance across multiple regions and at altitudes beyond the reach of enemy air defenses. At the same time, there are advances occurring in emerging high speed kinetic interceptor technology and directed energy weapons that may lead to new operational concepts to engage hostile missiles early in flight. For example, despite only modest funding, defensive hypersonic missile systems that could support a UAV boost phase mission are beginning to mature. DARPA has been supporting efforts to develop a new hypersonic interceptor prototype as part of its *Glide Breaker* program to engage the high-speed boost glide weapons China and Russia are building. MDA is also conducting a similar effort through its Glide Phase Intercept technology program for deployment on naval platforms, which can be deployed globally. Innovative application of autonomous airborne platforms combined with emerging high speed and long-range hypersonic interceptors offer the possibility of a new defensive boost/ascent-phase layer capable of thinning out adversary missile salvos.

High energy laser (HEL) technologies for air and missile defense also have advanced in recent years despite the lack of attention they have received within MDA. The Army, Navy and Air Force have been developing 300-kilowatt range HELs. The Army and Air Force, for example, are now testing 300-kilowatt range ground-based laser systems while the Navy is examining a ship-based variant. When fielded, these weapons offer new opportunities to protect the homeland against advanced long-range cruise missiles of the type Russia and China are developing to reach targets within the United States.[16]. More importantly, recent

[15] Courtney Albon, "'SkyRange' uncrewed aircraft to speed hypersonic testing by 2024," *C4ISRNET*, September 16, 2022, available at https://www.c4isrnet.com/unmanned/2022/09/16/skyrange-uncrewed-aircraft-to-speed-hypersonic-testing-by-2024/.

[16] *Fact Sheet: 2022 National Defense Strategy* (Washington, D.C.: Department of Defense), March 28, 2022, available at https://media.defense.gov/2022/Mar/28/2002964702/-1/-1/1/NDS-FACT-SHEET.PDF.

progress in high energy lasers for the air and cruise missile defense mission is beginning to advance the technology base for more powerful lasers in the megawatt class that would be necessary to counter incoming ballistic missiles.[17] Progress to further mature the technology will, however, require investments in research and development to scale laser power to the megawatt class.

Despite decades of reluctance spanning multiple administrations, the development of space-based defenses is indispensable to achieving a mix of cost-effective capabilities that can be scaled to defeat the emerging complex threats from rogue and peer states. Simply expanding current programs will not be effective in the long term. Space is unique in its ability to provide global coverage of missile launches with multiple opportunities to intercept warheads as they transit to their targets. Additionally, space-based defenses can engage a broad range of offensive missiles, including ballistic missiles, hypersonic weapons launched from ballistic missiles, and FOBS. They may also be able to defend the network of U.S. military satellites, which are increasingly vulnerable to Russian and Chinese counterspace weapons. In this context, a space layer can work synergistically with land- and sea-based defenses to create a highly effective, multi-domain, layered defense to complicate and undermine the offensive attack planning calculus of U.S. rivals.

Much has changed since the United States last examined space-based kill capabilities in a homeland defense architecture. Since then, there have been extraordinary improvements in commercial technology and non-missile defense sectors applicable to space defenses. For example, marked progress has been made in crucial areas underpinning space-based kinetic energy (KE) interceptors, including precise sensor tracking, micro processing capability, space communication networks, miniaturization of satellite components, artificial intelligence to support the operation of large satellite constellations, and substantially reduced space launch costs**.** These disparate advanced technologies will need to be more tightly integrated into U.S. missile defense R&D efforts if space-based defenses are to be successfully deployed.

Overcoming the Traditional Resistance to Effective Defenses

Any serious consideration of space defenses will be opposed by those who have long argued that such weapons will lead to a "destabilizing militarization of space." However, space is already an arena marked by steadily expanding Chinese and Russian military space and counterspace operations. Both treat space as a war fighting domain integral to any campaign to inhibit U.S. intervention and power projection. In order to disrupt and degrade U.S. operations in space, they continue to invest heavily in counterspace systems, including terrestrial-based lasers/directed-energy weapons, on-orbit grappling satellites, and space-based kinetic anti-satellite (ASAT) missiles that can destroy satellites from low earth to

[17] For example, DoD is funding industry efforts to develop HEL technology that exceeds 500 kilowatts. Sydney J. Freedburg, "'Mind-Boggling': Israel, Ukraine are Mere Previews of a Much Larger Pacific Missile War, Officials Warn," *Breaking Defense*, April 17, 2024.

geosynchronous orbits.[18] Recent reports of Russia's development of an ASAT weapon which may have a nuclear payload to generate electromagnetic pulse (EMP) effects is but the latest indication that strategic rivals are preparing for combat operations in space.[19] The strategic context of space defenses has thoroughly shifted over the past decade. As the senior official responsible for space policy in the Pentagon has remarked, "…space is essential to how we compete and fight in every domain… [it is] essential to the U.S. way of war."[20] Just as the United States is adapting and reshaping its broader space strategy, it must also overcome self-imposed and obsolescent policy barriers denying it access to the unique benefits a space defense layer could make to deterring and if necessary defeating limited nuclear missile attacks.[21]

Additionally, in considering an expanded missile defense posture, especially one that includes defensive interceptors deployed in space, it will be argued from some quarters in the defense establishment that the United States should embrace alternative approaches to countering long-range missile threats to the homeland. This is particularly evident in recent narratives suggesting that greater emphasis ought to be placed on approaches favoring "left of launch/attack operations" rather than on active missile defense.[22] Improving the ability to conduct prompt, precise, kinetic attack operations, as well as non-kinetic missions such as cyber-attacks, against enemy missiles before they can be launched, could provide an additional tool to cope with mounting threats. However, shifting to a homeland missile defense strategy that fails to keep pace with even the North Korean ICBM threat, while instead increasingly relying on a left of launch approach, has significant limitations that increase the risk of failure to defend American cities from nuclear attack.

During the Cold War, the United States investigated without success various left of launch techniques to detect, track, and kill Soviet road-mobile and rail-mobile ICBMs once they departed their staging areas. The challenge of targeting mobile missiles was further highlighted during the 1991 Gulf War with Iraq. The U.S.-led coalition conducted some 3,000 left of launch air sorties against Iraqi mobile short-range ballistic missiles (SRBMs). It failed

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[18] David Vergun, "Official Details Space-Based Threats and U.S. Countermeasures," *DOD News*, April 26, 2023, available at https://www.defense.gov/News/News-Stories/Article/Article/3375577/official-details-space-based-threats-and-us-countermeasures/.

[19] Julian E. Barnes, Karoun Demirjian, Eric Schmitt and David E. Sanger, "Russia's Advances on Space-Based Nuclear Weapon Draw U.S. Concerns," *The New York Time*, February 14, 2024, available at https://www.nytimes.com/2024/02/14/us/politics/intelligence-russia-nuclear.html.

[20] Remarks by John F. Plumb, Assistant Secretary of Defense for Space Policy, cited in David Vergun, op. cit.

[21] See for example, *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States*, October 2023, available at https://www.ida.org/-/media/feature/publications/a/am/americas-strategic-posture/strategic-posture-commission-report.ashx. The Bipartisan Commission found that the U.S. "must look at new approaches to achieving U.S. missile defense goals, including the use of space-based and directed energy capabilities, as simply scaling up current programs is not likely to be effective" (p. 67).

[22] See for example, Executive Office of the President, Office of Management and Budget, "Statement of Administration Policy S. 4543—James M. Inhofe National Defense Authorization Act for Fiscal Year 2023," available at https://www.whitehouse.gov/wp-content/uploads/2022/10/S4543-NDAA-SAP.pdf; Jon Harper, "Pentagon's Hicks wants more focus on cyber, EW capabilities for missile defense," *FedScoop.com*, May 6, 2022, available at https://fedscoop.com/pentagons-hicks-wants-more-focus-on-cyber-ew-capabilities-for-missile-defense/.

to achieve a single successful strike. While the United States is rightly making investments in the prompt strike weapons and Intelligence, Surveillance and Reconnaissance (ISR) required to find, track, and kill mobile missiles, the left of launch mission will remain challenging for the foreseeable future. Potential opponents are heavily investing in long-range missiles which are more survivable as a result of their mobility and faster to deploy due to their solid-propellant technology. They are also improving methods of concealing the location and operation of these weapons through measures such as proliferated underground facilities and randomized launch locations spread across large swaths of territory. This makes timely intelligence warning and missile geo-location, which are essential for effective pre-launch targeting, problematic.

The utility of left of launch operations is further circumscribed by the inevitable political constraints that arise from the condition that the best opportunity to kill an adversary's ICBMs is before the conflict commences when missiles are presumably at known locations. Once ICBMs start to "flush" from their staging areas it will be, in the words of the senior military commander in the Indo-Pacific, "incredibly hard" to locate and destroy them prior to launch.[23] This can place an almost insurmountable burden on a president, both domestically and internationally, to initiate pre-emptive military action prior to the onset of open hostilities. Other prominent non-kinetic left of launch tools, including cyber operations intended to disrupt an adversary's ability to fire his missiles, raise a different set of challenges. For example, it may not be known if the "malware campaign" against an enemy's missile force has been detected and blocked. The ability to reliably assess the efficacy of this tool in degrading an adversary's missiles may only be possible *after* it begins launching ICBMs. There is a near incalculable uncertainty built into such operations, which carries the risk that such measures could fail. For these reasons, even as the kinetic and non-kinetic left of launch capabilities improve, the United States will continue to need effective and advanced missile defenses as a central component of its counter-missile strategy.

Lastly, opposition to the revised approach to missile defense outlined in this article will also come from those who have for decades opposed any effective defense of the U.S. homeland on the theoretical grounds that such defenses will pose a near existential threat to Russia's and China's nuclear forces, resulting in a "destabilizing" nuclear arms race. This contention is not supported by the facts.[24]

First, Russia possesses, and China will in the not-too-distant future, a large and sophisticated strategic weapons posture that is capable of overwhelming U.S. missile defenses, even in an expanded form. This is due to the sizable and growing number of

[23] Remarks by Adm. John Aquilino, head of the U.S. military's Indo-Pacific Command, cited in Elizabeth Palmer, "North Korea test launches apparent long-range missile designed to carry nuclear warhead, hit U.S. mainland," *CBS News*, December 18, 2023, available at https://www.cbsnews.com/news/north-korea-missile-launche-icbm-hwasong-us-mainland-range-south-korea-japan/.

[24] See, for example, Mattew Costlow, "The Missile Defense 'Arms Race' Myth," *Strategic Studies Quarterly*, Spring 2021, pp. 3-9, available at https://www.airuniversity.af.edu/Portals/10/SSQ/documents/Volume-15_Issue-1/Costlow.pdf.; David Trachtenberg, Michaela Dodge, and Keith Payne, *The "Action-Reaction" Arms Race Narrative vs Historical Realities*, (Fairfax, VA: National Institute for Public Policy, March 2021), available at https://nipp.org/wp-content/uploads/2021/04/Action-Reaction-pub.pdf.

platforms and diverse types of weapons within their nuclear arsenals. These include long-range bombers and cruise missiles, hypersonic boost glide vehicles, land and sea-based intercontinental-range ballistic missiles, fractional orbital bombardment weapons and trans-oceanic undersea missiles that can be launched from multiple directions and multiple domains.

Second, Russian and Chinese objections to U.S. missile defenses must be placed in a more balanced context. Both Russia and China are pushing forward with a variety of active defense capabilities which are organized around the nation-wide integration of multiple air and missile defense systems to degrade an adversary's strategic air breathing systems and ballistic missiles. Moscow's strategic air and missile defense programs go back decades. Russia continues to develop and field nationwide air and missile defenses to counter advanced cruise missiles, ballistic missiles of all ranges, and hypersonic weapons. Russia has seen value in defending itself, including a limited capability against nuclear threats, both to enhance deterrence of a U.S. attack and to preserve the ability to respond effectively to such an attack. Similarly, China appears to recognize the deterrence and damage denial utility of national air and missile defenses and is making notable strides in this area.[25] Beijing's broad efforts, which include the development of exo- and endo-atmospheric kinetic energy warheads and the recent testing of a mid-course interceptor, are consistent with the aim of acquiring a layered missile defense system. Additionally, because of a decade-long commitment to the development of defensive capabilities to blunt threats to its homeland, China now "possesses one of the largest forces" of advanced strategic air and cruise missile defense systems in the world.[26]

These developments suggests that Russia and China envision a *national* role for air and missile defense within their broader military strategies for conflict directed at augmenting their ability to discourage an American retaliatory response and, should deterrence fail, to provide a measure of protection and damage limitation to their respective homelands. Moreover, neither country seems particularly concerned about "destabilizing" the strategic balance with the United States. Nor do either country's missile defense activities appear driven by the size and character of U.S. strategic forces, which have declined in size and not expanded in capability over the last three decades.

The recommendations for U.S. missile defenses outlined above would be doing nothing more than acknowledging the importance of protecting the homeland against limited threats regardless of their origin, a position long understood by Russia and, more recently it appears, China.

[25] Department of Defense, *Military and Security Developments Involving the People's Republic of China* 2023, op. cit.
[26] Ibid.

Conclusion

Both Russia and China, as well as regional rivals, are fielding ever more lethal missiles as they seek to both coercively deter, as well as prepare for conflict with, the United States. In so doing, they are outpacing the current and planned homeland missile defense posture. To redress the danger posed by these developments, it is essential to reject decades-old policies and legacy requirements underpinning homeland missile defense. To this end, the United States should be prepared to re-focus its approach to missile defense along a path that ensures, not an impenetrable shield, but rather an effective capability to protect the nation against the long-range missile threat from rogue states as well as limited peer state missile threats.

This should be accompanied by the pursuit of new and innovative concepts and capabilities to harness current and emerging technologies necessary to defend against missile attacks into and well beyond 2030. The assessment offered here identifies a range of program and capability steps that would provide future decision makers effective and affordable options to establish a more comprehensive, layered and resilient defense posture to protect the American people against the threat of nuclear missile attack.

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