Atlantic Council

‘First, we will defend the homeland’:

The case for homeland missile defense

By Robert M. Soofer

With contributions from Kari Anderson, James McCue, Tom Karako, Mark J. Massa, Alyxandra Marine, and Jonathan Rosenstein

Atlantic Council

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Executive summary

"First, we will defend the homeland," proclaims the *2022 National Defense Strategy of the United States* (NDS) on its initial page.[1] Indeed, the United States goes to great lengths to protect the nation from military threats, terrorists, cyberattacks, and other potential dangers. US Northern Command (USNORTHCOM) stands guard against land, air, and sea attacks; the intelligence community tracks and warns of potential dangers; and the Homeland Security Act of 2002 specifically established the US Department of Homeland Security (DHS) to secure the nation against the many threats it faces. Yet, the nation falls short in fully protecting against an ever-growing number, diversity, and sophistication of long-range missile threats. This does not make sense.

How should the United States defend its homeland from missile attacks? In the post-Cold War era, US defense policymakers have settled on an answer articulated most recently by the *2022 Missile Defense Review* (MDR): staying ahead of the North Korean missile threat through "a comprehensive missile defeat approach" while relying on "strategic deterrence … to address and deter large intercontinental-range, nuclear missile threats to the homeland from the People's Republic of China (PRC) and the Russian Federation (Russia)."[2] There are at least four reasons to believe that such an approach to homeland missile defense will no longer suffice for US national security goals.

Threats and challenges

First, the expansion of North Korea's intercontinental ballistic missile (ICBM) arsenal will likely drive an increase in the number of deployed US Ground-Based Interceptors (GBIs) as the United States tries to stay ahead of the threat. The Biden administration's intent to increase the number of GBIs by twenty starting in 2028 will spark a debate about whether US homeland missile defenses could upset strategic stability with Russia and China as these countries grow concerned about rising levels of US homeland missile protection, albeit intended against North Korea. Some analysts judge that the United States can rely on nuclear deterrence against North Korea, arguing that staying ahead of the North Korean threat is unaffordable—and will upset strategic stability with Russia and China.[3] Other analysts find that reducing US vulnerability to rogue nation missile threats is essential for a US grand strategy reliant on allies.[4] Allies might perceive a United States unwilling to protect itself against North Korea as unwilling to take risks on their behalf.

Second, the United States must now simultaneously deter two nuclear-armed great powers—Russia and China. A feature of this problem is a Russian and Chinese nuclear doctrine (supported by forces) that allows for the limited use of nuclear and conventional weapons to coerce the United States. According to some US experts, "Moscow and Beijing appear now to calculate that their respective threats to escalate to limited nuclear war will be sufficient to paralyze direct US opposition to their regional expansionism."[5] These forces may include dual-use capabilities to attack US nuclear forces, command-and-control, and national leadership.. The *2022 Nuclear Posture Review* (NPR) recognizes this problem, stating that the United States must prepare to deter large-scale and limited nuclear use from its nuclear-armed adversaries, especially in light of the increasing reliance on the coercive threat of limited nuclear use in these states' strategies.[6] Likewise, the congressionally mandated Strategic Posture Commission, a bipartisan twelve-appointee group,[7] recommended in its October 2023 report that

1 US Department of Defense, *2022 National Defense Strategy of the United States of America*, first in the conjunct release [AD1183539] with the *2022 Nuclear Posture Review* and the *2022 Missile Defense Review* (Washington, DC: Office of the Secretary of Defense, October 27, 2022): 1, https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.PDF.

2 US Department of Defense, *2022 Missile Defense Review*, third in the conjunct release [AD1183539] with the *2022 National Defense Strategy* and the *2022 Nuclear Posture Review* (Washington, DC: Office of the Secretary of Defense, October 27, 2022): 1, https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.PDF.

3 Rep. Seth Moulton (D-MA) raised this concern at the April 19, 2023, House Armed Services Committee Hearing on the President's Budget Request for FY 2024 missile defense activities.

4 US Department of Defense, *2022 Missile Defense Review*, 6.

5 Keith Payne, "Deterrence via Mutual Vulnerability? Why Not Now," Information Series, No. 536, *National Institute for Public Policy*, October 19, 2022, https://nipp.org/information_series/keith-b-payne-deterrence-via-mutual-vulnerability-why-not-now-no-536-october-19-2022/.

6 US Department of Defense, *2022 Nuclear Posture Review*, second in the conjunct release [AD1183539] with the *2022 National Defense Strategy* and the *2022 Missile Defense Review* (Washington, DC: Office of the Secretary of Defense, October 27, 2022): 7, https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.PDF.

7 "Armed Services Committees Leadership Announces Selections for Commission on the Strategic Posture of the United States," US Senate Committee on Armed Services, press release, March 16, 2022, https://www.armed-services.senate.gov/press-releases/armed-services-committees-leadership-announces-selections-for-commission-on-the-strategic-posture-of-the-united-states.

the "United States should develop and field homeland IAMD [integrated air and missile defense] capabilities that can deter and defeat coercive attacks by Russia and China."[8]

Another facet of the two-nuclear-great-power problem is the potential vulnerability of US nuclear forces to a combined or nearly sequential Chinese and Russian disarming nuclear first strike.[9] As China expands its nuclear forces, defense strategists must consider whether US nuclear forces suffice to deter two great powers, perhaps at the same time, under any conditions. The US ability to retaliate with nuclear weapons under any circumstances is essential. Layered, preferential missile defenses for US nuclear forces; national leadership; and nuclear command, control, and communications (NC3) would enhance US nuclear survivability. Such defenses, which would not provide significant protection for the population, could enhance deterrence by complicating Russian and Chinese first-strike plans.[10] Even short of a combined disarming strike, missile defense of the nuclear triad could increase the endurance of US nuclear forces in a limited nuclear exchange from one power, preserving sufficient nuclear forces to dissuade an opportunistic aggressor armed with nuclear weapons.

Finally, any assessment of expanding US homeland missile defense should consider Russia's and China's capabilities in this area. Russia and China claim a role for missile defense in their security strategies. Both are building defenses against cruise and ballistic missiles (including ICBM defenses). For example, Russian homeland missile defenses include sixty-eight nuclear-armed interceptors protecting the Moscow region and likely some portion of Russia's ICBM force. Russia's missile defenses are undergoing modernization with new interceptors. According to the US Department of Defense (DOD), China is pursuing a ballistic missile defense architecture with endo- and exo-atmospheric components, including a midcourse element "that may have capabilities against IRBMs [intermediate-range ballistic missiles] and possibly ICBMs"; further, the "PLA's cruise missile defense capability is more robust than that of its ballistic missile defenses."[11] Defense against US ICBMs and cruise missiles could provide Russia and China an asymmetric advantage that could impact the military balance in certain situations and complicate US limited options.

The argument in brief

This study advances the following argument:

First, the 2022 NDS clearly defines the requirement for homeland missile defense. Moreover, the strategy designates the defense of the homeland as the *first* priority, followed by deterring strategic attacks against the homeland.[12] More to the point, the 2022 MDR provides that missile defenses "are critical to the top priority of defending the homeland and deterring attacks against the United States."[13] This overarching policy reflects continuity with prior administrations.

Second, the threat driving that requirement is growing. According to senior administration officials, Russia and China are "fielding more advanced offensive missiles—ballistic, cruise, and hypersonic—in greater numbers to not only deter [US] involvement in a regional conflict but also to directly target the US homeland. The scale and scope of these multi-dimensional threats present significant risks to the American people and the homeland."[14] The North Korean ICBM threat continues apace and may include missiles with multiple warheads in the future. Senior US military commanders are starting to fear that currently planned missile defense capabilities will not be able to maintain the advantageous US position against North Korea and potentially Iran.

Third, the strategy behind these threats is clear. Potential adversaries will seek to exploit vulnerabilities in the "American way of war" by posing threats to the US homeland "in an effort to jeopardize the US military's ability to project power and counter regional aggression."[15] These states' intent also is to break the will of US political leaders who may be unwilling to fulfill commitments to allies if it means running extraordinary risks to the homeland.

8 Madelyn R. Creedon (chair) et al., *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States* (Washington, DC: US Strategic Posture Commission, October 2023), X, 72, 105, https://www.armed-services.senate.gov/imo/media/doc/americas_strategic_posture_the_final_report_of_the_congressional_commission_on_the_strategic_posture_of_the_united_states.pdf.

9 Brad Roberts (chair) et al., *China's Emergence as a Second Nuclear Peer: Implications for US Nuclear Deterrence Strategy*, *Center for Global Security Research*, Lawrence Livermore National Laboratory (Spring 2023), 52, 55, https://cgsr.llnl.gov/content/assets/docs/CGSR_Two_Peer_230314.pdf.

10 Preferential limited missile defense for US strategic forces was considered during the Cold War.

11 US Department of Defense, *Military and Security Developments Involving the People's Republic of China*, *2022 Annual Report to Congress* (Washington, DC: Office of the Secretary of Defense, November 29, 2022): 81–82, https://media.defense.gov/2022/Nov/29/2003122279/-1/-1/1/2022-MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA.PDF.

12 US Department of Defense, *2022 National Defense Strategy*, 7.

13 US Department of Defense, *2022 Missile Defense Review*, 5.

14 John Plumb, "Missile Defense in an Era of Strategic Competition" (prepared remarks by Assistant Secretary of Defenses for Space Policy John Plumb for the 16th Ronald Reagan Missile Defense Conference, April 16, 2024), US Department of Defense, https://www.defense.gov/News/Speeches/Speech/Article/3743542/asd-space-policy-remarks-for-the-16th-ronald-reagan-missile-defense-conference/.

15 US Department of Defense, 2022 National Defense Strategy, 4.

Fourth, if left unaddressed, these threats to the homeland could significantly narrow US decision-making and curtail a president's freedom of action during crisis and conflict. Adversaries know that the United States depends on its allies and partners to maintain its "global strategic advantage," and that allies, in turn, depend on US security commitments.[16] Russia and China hope to weaken US alliance ties by creating doubts about US security commitments among its allies. Allies, fearing a weakening of US commitment due to an increasing US vulnerability to attack, could seek accommodation with challengers in their region or develop their respective nuclear weapons to deter these threats.

Fifth, the objective or purpose of US homeland missile defense is not to create an impenetrable missile shield for the American public, but rather to frustrate adversary strategies that rely on threatening missile attacks against the United States. Missile defense systems are meant to supplement the deterrence value provided by US nuclear forces and the prospect of an overwhelming conventional response to attacks against the homeland—not to replace deterrence by the threat of punishment. The objective of the missile defense system is to create enough doubt in the adversary's mind about the prospect of a successful attack that the adversary concludes such an attack is not worth the risk—especially alongside fears of enormous consequences. In other words, such an attack would be futile and fatal.

Sixth, to solve the missile problem, the United States incorporates other military means in its comprehensive missile defense and defeat strategy. In addition to active defenses meant to intercept warheads after launch, the United States will employ means to stop an adversary from successfully launching its offensive missiles when possible. In this way, "offensive measures add credibility to our defensive efforts and reduce the possibility of continued attacks."[17] This comprehensive approach compensates for any shortcomings in the missile defense architecture, so the United States need not rely only on active defenses.

Seventh, modest, though important, improvements to current homeland defenses are available over the next five years to address these threats if policymakers choose to do so. More advanced technologies for missile defense and defeat are on the horizon and could be exploited with sufficient funding. Increasing the funding for homeland missile defense—to a full one percent of the annual defense budget—may be sufficient to achieve the missile defense objectives discussed in this study.

Eighth, arguments against expanding US homeland missile defense because it could stoke an arms race with Russia and China need to be put in perspective. Not only are Russia and China pursuing their own homeland air and missile defenses against limited US missile strikes (Russia deploys more homeland defense interceptors than the United States), but it is counterfactual to assume that US missile defenses will provoke an "action-reaction" arms race. Quite the opposite has occurred: following the US withdrawal from the 1972 ABM Treaty in 2002, US and Russian nuclear arsenals declined by two-thirds. The New Strategic Arms Reduction Treaty (New START), in effect since February 2011, took numbers even lower. Nevertheless, the United States should work with Russia and China to make its missile defense plans as transparent as possible.

To summarize, the missile threat to the homeland is real and growing and, if left unaddressed, could seriously undermine US grand strategy and the very basis of national defense strategy. Since the objective of missile defense is to supplement and enhance deterrence by complicating attacker plans—rather than comprehensive population protection—the defensive architecture does not need to be leak-proof. Rather, a layered architecture with certain key attributes, based on existing and future technology, can provide an affordable defense to restore the basis for US defense strategy while reassuring allies.

A change in policy

The principal recommendation of this study is to update US homeland missile defense policy to remove the false distinction between rogue-state and major-power missile threats and to eliminate sole reliance on nuclear retaliation to deter Russian and Chinese limited coercive missile attacks against the homeland. Improving the survivability of US nuclear forces and nuclear command-and-control also should be a policy objective. Likewise, the distinction in policy for addressing ballistic, cruise, and hypersonic glide threats no longer makes sense: If the United States is going to defend against Russian cruise missiles (which is current policy), then Washington should defend against Russian ballistic missiles and hypersonic glide vehicles (HGVs).

The objective of homeland missile defense is not an impregnable missile defense shield for the country, but rather sufficient defenses to counter adversary missile threats of coercion—to enable US regional defense strategy—and defenses adequate to ensure the survivability and endurance of US nuclear retaliatory forces and nuclear command-and-control against any combination of adversaries. This requires some tailoring of the missile defense mission depending on the strategy objectives and missile capabilities of potential adversaries.

The study outlines three categories of threats or scenarios for which missile defense must provide a solution: first, there are the smaller and possibly undeterrable threats presented by accidental and unauthorized launches as well as by countries such as North Korea that have limited nuclear capabilities; the second category is limited Russian and Chinese missile threats meant to coerce the United States (to provoke but not enrage); finally, there is the larger scale (but still limited) preemptive at-

16 US Department of Defense, *2022 National Defense Strategy*, 2.

17 Plumb, "Missile Defense in an Era of Strategic Competition."

tack against US nuclear forces and command-and-control designed to prevent nuclear retaliation.

Accordingly, it should be US policy to:

Stay ahead of the North Korean long-range missile threat through a strategy of layered missile defense combined with offensive measures to prevent launches before they occur;

Deploy a layered missile defense system to thwart Russian and Chinese coercive strikes (as well as unauthorized or accidental launches), sized to about one hundred Russian or Chinese warheads, including missiles armed with HGVs. The objective is not to replace nuclear deterrence provided by US nuclear forces, but to strengthen deterrence by invalidating Russian and Chinese limited coercive threats.

Enhance the survivability of US nuclear forces and nuclear command-and-control through a layered missile defense composed of GBIs, Standard Missile (SM) 3 block IIA missiles deployed on land and at sea, Terminal High-Altitude Area Defense (THAAD) missiles for preferential terminal defense of US nuclear forces, and requisite defenses against cruise missiles;

Protect critical US civilian and military infrastructure against air- and sea-launched cruise missile attacks by Russia and China to the extent feasible and necessary to allow the United States to stay in the fight; and

Increase funding for research and development of next-generation missile defense capabilities to stay ahead of the threats, including improved space-based sensors, space-based interceptors (SBIs), and directed-energy capabilities.

Homeland defense system design

There is far too much stress placed on the efficacy of the Ground-based Midcourse Defense (GMD) system with its GBIs and radars for the defense of the homeland. Originally intended to undergo regular upgrades after its initial deployment in 2004, modernization of the GMD system has failed to keep pace with advancing missile threats. Moreover, the GMD system was never meant to stand alone against the threat—but rather as part of a layered approach that contemplates defenses in other phases of flight to compensate for the GMD system's shortcomings and to provide additional intercept opportunities.

Layering is essential to a successful missile defense architecture (See Figure 1). This approach improves overall effectiveness by intercepting warheads during different phases of flight and with different interceptor missiles supported by a range of radars and sensors. Intercepts at each layer "thins the herd" for the following layers. Attacking warheads containing countermeasures that may fool the defense in one layer may prove useless in another. Multiple layers greatly complicate the calculations of the attacker, while reducing the technical requirements for any given interceptor, because no single layer must work perfectly.

Though layered missile defense has been a long-standing mission of the US Missile Defense Agency (MDA), only GBIs protect the homeland today. In the near term, the SM-3 and THAAD missiles can bolster homeland protection by providing additional shot opportunities against incoming warheads that penetrate the GBI defense, but these systems have not been integrated with the GMD system. Sensor support from satellites under development can substantially improve the viability of layered missile defense early in the next decade by helping to distinguish between real warheads and countermeasures. When viewed from the attacker's perspective, a layered missile defense system presents a very difficult challenge that cannot be solved simply with increased numbers.

The recommended near-term steps are meant to be a bridge to follow-on technologies necessary to create a next-generation missile defense capability to defend the homeland.

The DOD must also place more emphasis on investing in future, revolutionary capabilities, such as space sensors, SBIs, and non-kinetic options (such as directed energy) to outpace adversary capability development. Another option that has been considered over the years is the development of an air-launched weapon that could engage threat missiles early in their trajectory.

MDA also needs to get back into the technology business. The MDA's technology budget has been dismal over the past four to five years. Notably, in Fiscal Year (FY) 2024 MDA's science and technology (S&T) budget was at a historical low, below one percent of their Total Obligational Authority (TOA). Sticking to only incremental improvements will not defeat rapidly evolving threats. The DOD should make high-priority technology investments to prove out the Discriminating Space Sensor (DSS) concept on orbit and rapidly field the capability, per the US Space Development Agency (SDA) model. Other pursuits should include an SBI testbed demonstration alongside increased investments in directed energy, more robust funding for advanced discrimination techniques, as well as technological investments in lighter-weight, lower-cost interceptors to make kinetic interceptor options more affordable.

Addressing Russian and Chinese concerns

Russia and China will react negatively to any expansion of US homeland missile defenses, even if intended only to address the North Korean missile threat. The extent of that reaction is unknowable, despite past rhetoric. If history is any guide, an arms race is not the guaranteed result. Russia could have expanded its nuclear forces when the United States withdrew from the Anti-Ballistic Missile (ABM) Treaty in 2002, yet Moscow chose not to do so. Instead, the United States and Russia reduced their respective deployed strategic nuclear forces by some two-thirds. Some have argued that Russia's new novel nuclear systems and China's new ICBM silos are meant to hedge against future US missile defenses. Yet, other expe-

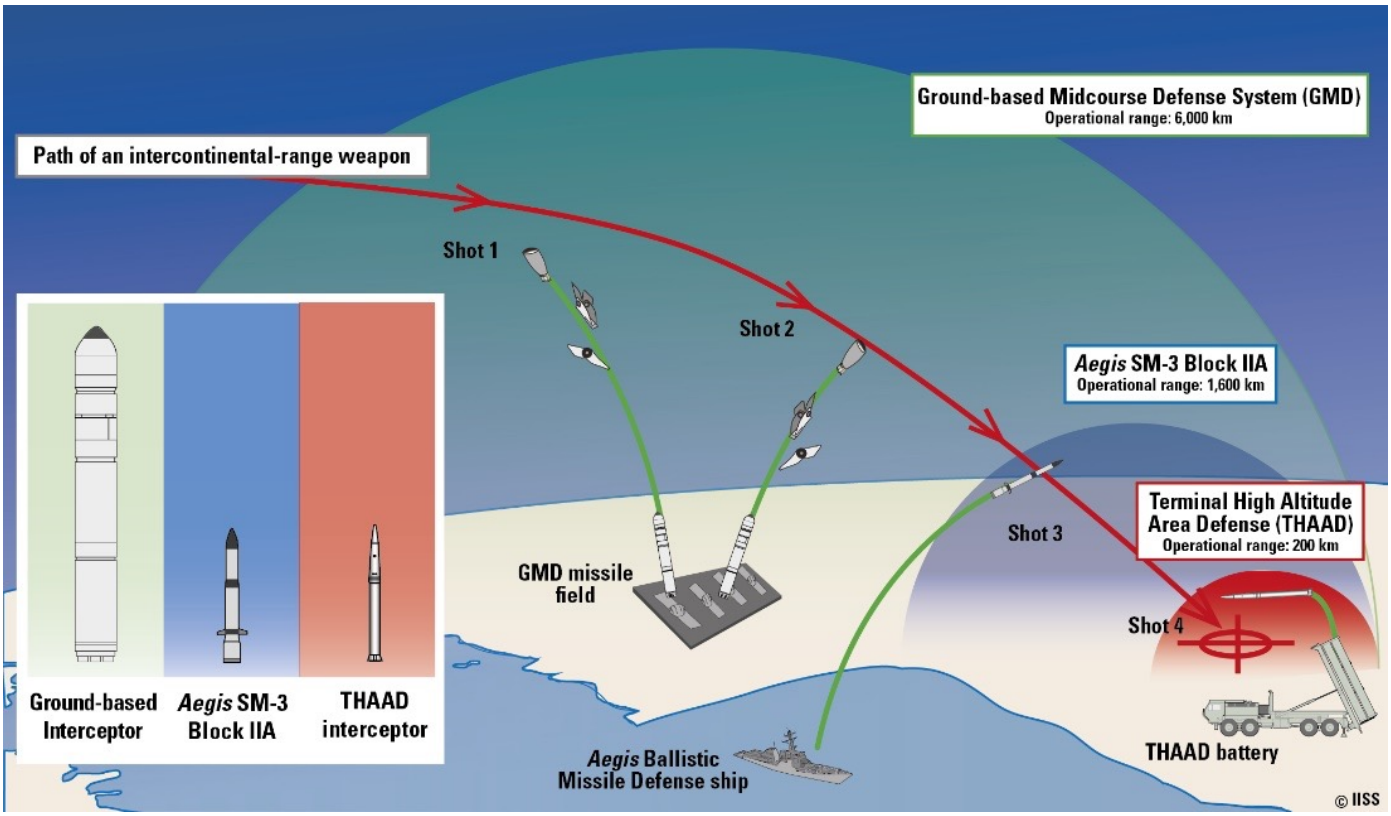


Figure 1: Notional Near-Term Layered Missile Defense Concept. ©2021, The International Institute for Strategic Studies, originally published in Strategic Comments: "The strategic implications of layered missile defence." Reproduced with permission.

rienced US researchers reason that political, rather than strategic, imperatives explain these actions.[18]

Russia's and China's vocal objections to US missile defenses often reflect strategic posturing rather than genuine security threats. Both nations have invested heavily in their missile defense systems and possess substantial offensive capabilities, suggesting their concerns are more about maintaining geopolitical influence than reacting to a direct threat. Rather than grow their nuclear forces, Russia and China could choose to expand their existing homeland defense coverage to a level comparable to future US deployments, putting them on an equal footing with the United States while avoiding an offensive arms race. Regardless, the United States could consider sharing its intentions and missile defense plans in a more formal way with Russia and China.

The politics of missile defense

Russian and Chinese criticism will not be the only stumbling block to pursuing the recommendations in this study. The challenges of securing funding, developing and integrating new technology, and building congressional support will be daunting. It is not by accident that twenty years after withdrawing from the ABM Treaty, the United States has only forty-four homeland defense interceptors to show for it. To be sure, senior leadership commitment and focus will require direction from the president and, through him or her, the secretary of defense.

Costs will be significant, but a reasonable starting point for this report's recommendations is an additional $4–5 billion per year above the approximately $3 billion allocated for homeland missile defense within the MDA budget. Combined, this would amount to about one percent of the defense budget for the number-one national defense priority. Providing a layered defense over the next five years would not require developing new technology—only increased procurement and integration of interceptors, radars, and battle management systems currently in service. Procurement of additional THAAD and SM-3 missiles, as determined by the threat, is feasible and necessary for regional and homeland defense.[19] Other musts to consider include additional long-lead funding to procure Next Genera-

18 Rose Gottemoeller, "Russia Is Updating Their Nuclear Weapons: What Does That Mean for the Rest of Us?" Carnegie Endowment for International Peace, January 29, 2020, https://carnegieendowment.org/posts/2020/01/russia-is-updating-their-nuclear-weapons-what-does-that-mean-for-the-rest-of-us?lang=en.

19 The Trump administration, in fact, had prepared a $3.5 billion five-year spending plan to integrate, test, and procure SM-3 and THAAD missiles and associated sensors but was set aside by the incoming administration. Robert M. Soofer, private papers (unclassified), "Layered Homeland Defense Summary, FY 2021–26."

tion Interceptors (NGIs) beyond the first twenty and added funding for research and development of next-generation missile defense systems that lead to deployment decisions toward the end of the decade.

Congressional debate is inevitable. House Armed Services Committee Republicans want to go beyond the planned sixty-four homeland defense interceptors and regard SBIs as part of the solution, whereas some Democratic members seem wary of any significant expansion of homeland defenses for fear of starting an arms race with Russia and China. Moreover, there appears to be little appetite for additional significant missile defense funding in the appropriations process unless total defense spending receives a commensurate boost.

Most importantly, the future course of US homeland missile defense will depend largely on the next president. One of the most consequential shifts in US missile defense policy occurred when then-President George W. Bush made the decision to withdraw the United States from the ABM Treaty and begin fielding GBIs in 2004 to address the rogue state ICBM threat. Today, the missile threat to the homeland is growing, not just from North Korea, but also from Russia and China, which have military doctrines that include the threat of limited missile strikes against the US homeland. Considering these new threats and the priority to defend the homeland, the next administration will want to consider whether planned missile defense capabilities are sufficient for the task. The ability of the United States to assure its allies and deter and, if necessary, prevail in great-power conflict depends on it.

List of acronyms

ABL – Airborne laser

ABM – Anti-ballistic missile

AFB – Air Force base

ALBM – Air-launched ballistic missile

ALCM – Air-launched cruise missile

ALPS – Army Long-range Persistent Surveillance

AN/TPY – Army/Navy Transportable Radar Surveillance

ASAT – Anti-satellite

ASW – Anti-submarine warfare

ATA – US Intelligence Community's Annual Threat Assessment

AWACS – Airborne Warning and Control System

BMD – Ballistic missile defense

BMDR – Ballistic Missile Defense Review

BMDS – Ballistic Missile Defense System

CCP – Chinese Communist Party

CGSR – Center for Global Security Research

CMD-H – Cruise missile defense for the homeland

CONOPS – Concepts of operation

CRS – US Congressional Research Service

C2BMC – Command-and-control, Battle Management and Communication

DHS – US Department of Homeland Security

DOD – US Department of Defense

DPAL – Diode-pumped alkali laser

DPRK – Democratic People's Republic of Korea (North Korea)

DSP – Defense Support Program

DSS – Discriminating Space Sensor

EP – Electronic protection

EMP – Electromagnetic pulse

EW – electronic warfare

FAA – US Federal Aviation Administration

FOBS – Fractional orbital bombardment system

FY – Fiscal year

FYDP – Future Years Defense Program

GAO – US Government Accountability Office

GBI – Ground-Based Interceptor

GEO – Geostationary Earth orbit

GLCM – Ground-launched cruise missile

GMD – Ground-Based Midcourse Defense

GPI – Glide Phase Interceptor

HASC – US House Armed Services Committee

HBMD – Homeland ballistic missile defense

HBTSS – Hypersonic and Ballistic Tracking Space Sensor

HCM – Hypersonic cruise missile

HGV – Hypersonic glide vehicle

HMD – Homeland missile defense

HPM – High-power microwave

IAEA – International Atomic Energy Agency

IAMD – Integrated air and missile defense

IBCS – Integrated Air and Missile Defense Battle Command System

ICBM – Intercontinental ballistic missile

USINDOPACOM – US Indo-Pacific Command

IR – Infrared

IRBM – Intermediate-range ballistic missile

IRGC – Iranian Revolutionary Guard Corps

JADC2 – Joint All-Domain Command-and-control

JCPOA – Joint Comprehensive Plan of Action

JLENS – Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System

LACM – Land-attack cruise missile

LEO – Low-Earth orbit

LOW – Launch on warning

LR – Long-range

LRDR – Long-Range Discrimination Radar

MaRV – Maneuvering reentry vehicle

MDA – US Missile Defense Agency

MDR – Missile Defense Review

MEO – Medium-Earth orbit

MFOV – Medium field of view

MIRVs – Multiple independently-targetable reentry vehicles

MOBS – Multiple orbit bombardment system

MRBM – Medium-range ballistic missile

MRV – Multiple reentry vehicle

MSE – Missile Segment Enhancement

MX – LGM-118 Missile (formerly known as "Missile, Experimental")

NASAMS – National Advanced Surface-to-Air Missile System

NATO – North Atlantic Treaty Organization

NCG – Nuclear Consultative Group

NC3 – Nuclear command, control, and communications

NDAA – National Defense Authorization Act

NDS – National Defense Strategy

New START – New Strategic Arms Reduction Treaty

NFU – No first use

NGI – Next-Generation Interceptor

NMD – National missile defense

NNSA – US National Nuclear Security Agency

NORAD – North American Aerospace Defense Command

NPR – Nuclear Posture Review

NPT – Nuclear Nonproliferation Treaty

NSC – US National Security Council

NSS – National Security Strategy

OPIR – Overhead persistent infrared

OTHR – Over-the-horizon radar

OUSD(R&E) – Office of the Under Secretary of Defense for Research and Engineering

PAC – Patriot Advanced Capability

PBR – President's Budget Request

PBV – Post-boost vehicle

PLA – Chinese People's Liberation Army

PLAAF – People's Liberation Army Air Force

PLAN – People's Liberation Army Navy

PMRF – Pacific Missile Range Facility, Hawaii

PRC – People's Republic of China

PWSA – Proliferated Warfighter Space Architecture

R&D – Research and development

RKV – Redesigned Kill Vehicle

ROK – Republic of Korea (South Korea)

RV – Reentry vehicle

SALT – Strategic Arms Limitation Talks

SAM – Surface-to-air missile

SASC – Senate Armed Services Committee

SBI – Space-based interceptor

SBIRS – Space-Based Infrared System

SBT – Sea-Based Terminal

SBX – Sea-Based X-band radar

SCO – US Department of Defense Strategic Capabilities Office

SDA – US Space Development Agency

SDI – Strategic Defense Initiative

SFS – Space Force station

SKA – Space-based kill assessment

SLBM – Submarine-launched ballistic missile

SLCM-N – Nuclear-armed sea-launched cruise missile

SLEP – Service life extension program

SLV – Space-launch vehicle

SM – Standard Missile

SODCIT – Strategic operations for the destruction of critically important targets

SORT – Strategic Offensive Reductions Treaty

SPC – US Congressional Strategic Posture Commission

SPY – Search Protect Radar

SRBM – Short-range ballistic missile

SSBN – Nuclear-powered ballistic missile submarine

SSGN – Nuclear-powered guided-missile submarine

SSPK – Single shot probability of kill

STSS – Space Tracking and Surveillance System

S&T – Science and Technology

TEL – Transporter-erector-launcher

THAAD – Terminal High-Altitude Area Defense

TLAM/N – Nuclear-armed Tomahawk Land-Attack Missile

TNT – Trinitrotoluene

TOA – Total Obligational Authority

UAV – Uncrewed aerial vehicle

UEWR – Upgraded Early Warning Radar

USNORTHCOM – US Northern Command

USSTRATCOM – US Strategic Command

USSR – Union of Soviet Socialist Republics (the Soviet Union)

VKS – Russian Aerospace Forces

VLS – Vertical launch system

WFOV – Wide field of view

WMD – Weapon of mass destruction

Section one: Introduction

"First, we will defend the homeland," proclaims the *2022 National Defense Strategy of the United States* (NDS) on its very first page. Indeed, the United States goes to great lengths to protect the nation from military threats, terrorists, cyberattacks, and other potential dangers. US Northern Command (USNORTHCOM) stands guard against land, air, and sea attacks; the intelligence community tracks and warns of potential dangers; and the Homeland Security Act of 2002 specifically established the US Department of Homeland Security (DHS) to secure the nation against the many threats it faces. Yet, the nation falls short in fully protecting against an ever-growing number, diversity, and sophistication of long-range missile threats. This does not make sense.

How should the United States defend its homeland from missile attacks? In the post-Cold War era, US defense policymakers have settled on an answer articulated most recently by the *2022 Missile Defense Review* (MDR): staying ahead of the North Korean missile threat through "a comprehensive missile defeat approach" while relying on "strategic deterrence … to address and deter large intercontinental-range, nuclear missile threats to the homeland from the People's Republic of China (PRC) and the Russian Federation (Russia)."[20] There are at least four reasons to believe that such an approach to homeland missile defense will no longer suffice for US national security goals.

First, North Korea's expanding nuclear arsenal places upward pressure on the US homeland missile defense architecture and will likely continue to do so beyond the existing missile defense program of record. Second, missile defense contributes to nuclear deterrence by enhancing the survivability of US nuclear retaliatory forces in the face of the United States' ongoing challenge to simultaneously deter two great-power rivals with nuclear arsenals in the same order of magnitude as the United States. Third, conventional—or even nuclear—missile strikes on the US homeland are likely to play into the counter-power-projection and escalation control strategies of Russia and China (defined later as "coercive" strategies). Finally, Russia and China are both expanding their respective missile defense capabilities, with uncertain implications for US strategic forces planning, including missile defenses, as well as arms control.

If the United States is to expand its homeland missile defense posture to not only keep pace with a growing North Korean nuclear missile threat but also address the missile threats posed by great-power competitors, then US analysts will need to consider a variety of possible technologies and architectures with a focused range of capabilities. Appropriate sensors, when fielded, must detect the wider range of missile threats presented across a range of different attack vectors (e.g., south-facing). Sensors and interceptors will need the capacity to acquire targets in evermore complicated threat clouds (that is, the range of warheads and decoys that any one missile can eject). And the ability to field layers of interceptors, where and when needed, capable of boost-phase, midcourse, late exo-atmospheric, and even terminal defense, will also be essential. Each element of such architectures would require evaluations for effectiveness, cost, impact on strategic stability, and fungibility across different attack scenarios, among other factors.

Complicating this issue is the long-standing conceptual debate over the value of homeland missile defense. One school of thought—extending back to the 1972 Anti-Ballistic Missile (ABM) Treaty—suggests that homeland missile defense creates incentives for arms racing because each side would need to build up its offensive nuclear forces to maintain its "assured destruction" capability against the other. Another school of thought argues that even limited missile defenses can enhance deterrence by complicating an adversary's nuclear first-use or first-strike plans; without confidence in disarming the adversary, leaving both sides with no rationale for employing nuclear weapons. The debate has extended to US allies as well, with some viewing US homeland missile defense as strengthening US nuclear guarantees by lessening the vulnerability of the United States, while others see it as "decoupling" the United States from their security predicament. These points of view persist even today and will factor into any reconsideration of US homeland missile defense policy.

The case for re-examining homeland missile defense policy

The changing security environment calls for a reexamination of homeland missile defense policy. The US determination to stay ahead of the North Korean threat while also contemplating the value of missile defense for the broader integrated deterrence strategy against the two nuclear great powers has returned homeland missile defense policy to the forefront of the strategic defense debate.

First, the expansion of North Korea's intercontinental ballistic missile (ICBM) arsenal will likely drive an increase in the number of deployed midcourse US Ground-based Interceptors (GBIs) as the United States tries to maintain the effectiveness of its defenses in the face of an expanding threat. The Biden administration's intent to increase the number of GBIs

20 US Department of Defense, *2022 Missile Defense Review*, 1.

US President Richard Nixon and Soviet Premier Leonid Brezhnev sign the ABM Treaty and SALT agreement in Moscow, 1972. Source: Richard Nixon Presidential Library.

by twenty—from forty-four to sixty-four—starting in 2028 will drive a debate about whether US homeland missile defenses could upset strategic stability with Russia and China as these countries grow concerned about rising levels of US homeland missile protection, albeit intended against North Korea. Some analysts judge that the United States can rely on nuclear deterrence against North Korea, arguing that staying ahead of the North Korean missile threat is unaffordable—and will upset strategic stability with Russia and China.[21] Other analysts find that reducing US vulnerability to rogue-nation missile threats is essential for a US grand strategy reliant on allies.[22] These analysts note that allies may perceive a United States unwilling to proactively protect itself against North Korea as unwilling to take risks on allies' behalf. Likewise, US homeland defenses would likely communicate to Pyongyang that the United States remains tightly coupled to its extended deterrence allies South Korea and Japan—enhancing deterrence.

Second, the United States must now simultaneously deter two nuclear-armed great powers—Russia and China. A feature of this problem is a Russian and Chinese nuclear doctrine (supported by forces) that allows for the limited use of nuclear weapons to coerce the United States. According to some US experts, "Moscow and Beijing appear now to calculate that their respective threats to escalate to limited nuclear war will be sufficient to paralyze direct US opposition to their regional expansionism."[23] These forces may include dual-use capabilities to attack US nuclear forces, command-and-control, and national leadership.. The *2022 Nuclear Posture Review* (NPR) recognizes this problem, stating that the United States must prepare to deter large-scale and limited nuclear use from its nuclear-armed adversaries, especially in light of the increasing reliance on the coercive threat of limited nuclear use in these states' strategies.[24] More recently, Gen. Gregory Guillot, then a lieutenant general and the nominee to become the new commander of USNORTHCOM and the North American Aerospace Defense Command (NORAD), told Congress in July 2023 that the US Department of Defense (DOD) should consider expanding current national missile defense policy to also counter a limited attack on the United States by Russia or China.[25] Deterring limited nuclear or conventional strikes on the US homeland, including small-scale coercive attacks by Russia and China, requires a combination of appropriate nuclear and conventional forces and missile defenses. The 2022 MDR notes that missile defenses can help the United States deter

21 Rep. Seth Moulton (D-MA) raised this concern at the April 19, 2023, House Armed Services Committee Hearing on the President's Budget Request for FY 2024 missile defense activities.

22 US Department of Defense, *2022 Missile Defense Review*, 6.

23 Payne, "Deterrence via mutual vulnerability? Why not now."

24 US Department of Defense, *2022 Nuclear Posture Review*, 7.

25 Jason Sherman, "NORTHCOM Nominee: US Should Consider Means to Defeat Limited Russia, China ICBM Attack," *Inside Defense*, July 26, 2023, https://insidedefense.com/daily-news/northcom-nominee-us-should-consider-means-defeat-limited-russia-china-icbm-attack.

Gen. Gregory M. Guillot, commander of US Northern Command and North American Aerospace Defense Command, testifies before the House Armed Services Committee in Washington, DC March 21, 2024. Source: EJ Hersom/US Department of Defense.

or defend against limited nuclear use, effectively taking small-scale nuclear coercion off the table.[26]

The missile threat to the homeland—both nuclear and conventional—is growing. According to Gen. Glen VanHerck, the commander of USNORTHCOM and NORAD from August 2020 to February 5, 2024, US great-power competitors and rogue states alike pose kinetic and non-kinetic threats to US homeland infrastructure and are only increasing their ability to do so.[27] Army Secretary Christine Wormuth went even further: "If we got into a major war with China, … They are going to go after the will of the United States public."[28] Moreover, VanHerck's March 2023 comments to the House Armed Services Committee put Russia as the principal homeland threat, with cruise missiles across domains (e.g., air, sea, and ground) capable of holding at risk US civilian and military infrastructure like. These capabilities include the AS-23a/Kh-101 air-launched cruise missile (ALCM) and the Severodvinsk nuclear-powered guided-missile submarine (SSGN) with dual-capable cruise missiles, including the Tsirkon hypersonic cruise missile (HCM). China, too, has begun to develop similar capabilities that could target US decision-making, force flow, and national will in wartime.[29]

Third, another facet of the two-nuclear-great-power problem is the potential vulnerability of US nuclear forces to a combined or nearly sequential Chinese and Russian disarming nuclear first strike.[30] As China expands its nuclear forces, defense strategists must consider whether US nuclear forces suffice to deter two great powers, perhaps at the same time, under any conditions. The US ability to retaliate with nuclear weapons under any circumstances is essential. Layered, preferential missile defenses for US nuclear forces; national leadership; and nuclear command, control, and communications (NC3) would enhance US nuclear survivability. Such defenses, which would not provide significant protection for the population, could enhance deterrence by complicating Russian and Chinese first-strike plans.[31] Even short of a combined disarming strike, mis-

26 US Department of Defense, *2022 Missile Defense Review*, 6.

27 *Full Committee Hearing: US Military Posture and National Security Challenges in North and South America*, 118th Cong. (March 8, 2023) (testimony by Gen. Glen D. VanHerck, commander USNORTHCOM and NORAD), US House Armed Services Committee, https://armedservices.house.gov/hearings/full-committee-hearing-us-military-posture-and-national-security-challenges-north-and-south.

28 American Enterprise Institute, opening remarks by US Secretary of the Army Christine Wormuth at the event: "Not Just an Air and Maritime Theater: The Army's Role in the Indo-Pacific," February 27, 2023, https://www.aei.org/events/not-just-an-air-and-maritime-theater-the-armys-role-in-the-indo-pacific/.

29 US House Armed Services Committee, *Full Committee Hearing: US Military Posture* (VanHerck, 2023).

30 Roberts et al., *China's Emergence as a Second Nuclear Peer*, 52, 55.

31 Preferential limited missile defense for US strategic forces was considered during the Cold War. See US Congress, Office of Technology Assessment, *MX Missile Basing*, September 1981, https://ota.fas.org/reports/8116.pdf; and *Report of the President's Commission*

sile defense of the nuclear triad could increase endurance in a limited nuclear exchange from one power, preserving sufficient nuclear forces to dissuade an opportunistic aggressor.

Detailed analysis of the two-nuclear-peer problem facing the United States is just beginning, with early indications evincing a possible role for missile defense. An influential March 2023 paper from the Center for Global Security Research recommends an assessment of "fielding limited cruise and ballistic missile defenses to protect select assets, such as critical NC3 nodes in comparison with other means of enhancing survivability and endurance."[32] And as noted in the Executive Summary, the Strategic Posture Commission recommended in its October 2023 report that the "United States should develop and field homeland [integrated air and missile defense] capabilities that can deter and defeat coercive attacks by Russia and China."[33]

Finally, any assessment of expanding US homeland missile defense should consider Russia's and China's capabilities in this area. Russia and China claim a role for missile defense in their security strategies and are building defenses against cruise and ballistic missiles (including ICBM defenses). For example, Russian homeland missile defenses include sixty-eight nuclear-armed interceptors protecting the Moscow region and likely some portion of Russia's ICBM force. Russia's missile defenses are undergoing modernization with new interceptors. The new S-500 system will be capable in the future of intercepting long-range ballistic missiles.[34] According to the DOD, China is pursuing a ballistic missile defense architecture with endo- and exo-atmospheric components, including a midcourse element "that may have capabilities against IRBMs and possibly ICBMs"; further, the "PLA's cruise missile defense capability is more robust than that of its ballistic missile defenses."[35] Moreover, because Russia and China are likely to be closer to the operational battle, their regional missile defenses also provide homeland defense, unlike those of the United States. Defense against US ICBMs and cruise missiles could provide Russia and China an asymmetric advantage, as an expansion of Russian and Chinese homeland air and missile defenses would likely impact the military balance in certain situations, complicating US limited options.

Report organization

The opening section of the report sets the stage by evaluating current homeland missile defense policy for strategic logic, coherence, and relevance to the current and emerging strategic environment. An examination follows on how homeland missile defense can supplement US nuclear deterrence rather than replace it. The thesis of this report is that a missile defense and defeat strategy, one that effectively hinders an adversary's confidence and expectations in its ability to succeed in striking the United States, would bolster and strengthen deterrence based on offensive threats of retaliation. In other words, an adversary's use of nuclear weapons would be futile (because it would not achieve the intended outcome of the attack) and fatal (because the United States would surely respond to such an attack with its surviving nuclear forces).

Key to the broader argument is the notion that missile defenses do not have to provide flawless protection to have a deterrent effect—instead, the objective is to create doubt and uncertainty about the benefits of the attack in the mind of the adversary. Russia and China are unlikely to attack US cities in an initial nuclear attack because the United States would likely respond in kind. The more likely initial attack would be a limited strike against military targets or critical infrastructure, designed to coerce US capitulation rather than enrage the United States into a massive nuclear response. The other potential strategic purpose behind an initial attack would be to prevent US nuclear retaliation by destroying US nuclear forces and nuclear command-and-control—a so-called disarming first strike. In these cases, the United States does not require comprehensive missile defenses—just enough to complicate the attack. The study then applies this broader argument to the cases of Russia and China.

This paper also examines the potential growth in North Korean long-range missile threats to determine whether current US plans for expanding its Ground-based Midcourse Defense (GMD) system, along with missile defeat activities, is sufficient to stay ahead of the North Korean threat. The paper then assesses the benefits of homeland defense against North Korea compared with the potential risks associated with alternate approaches for deterring Pyongyang and assuring Seoul and Tokyo, as well as the converse risks of upsetting strategic stability with Russia and China. The section concludes with a net assessment with recommendations for US homeland missile defense policy and defensive posture.

The following sections then assess Russian and Chinese doctrines for limited nuclear employment as well as their capabilities under development for this purpose (and specifically directed against the US homeland). The two-sided question addresses: How does limited nuclear use against the United States figure into the Chinese and Russian theory of victory, and what should be the US strategy and force posture for countering this strategy, with a focus on preferential homeland ballistic missile defense (HBMD)? The report assesses whether various limited US missile defense deployments could disrupt Russian and Chinese doctrines that rely on limited nuclear

on Strategic Forces, April 1983, 9–10, https://www.cia.gov/readingroom/docs/CIA-RDP85M00364R001101620009-5.pdf.

32 Roberts et al., *China's Emergence as a Second Nuclear Peer*, 70.

33 Creedon et al., *America's Strategic Posture: The Final Report*, X, 72, and 105.

34 "Chinese and Russian Missile Defense: Strategies and Capabilities," US Department of Defense, fact sheet, July 28, 2020, https://media.defense.gov/2020/Jul/28/2002466237/-1/-1/1/CHINESE_RUSSIAN_MISSILE_DEFENSE_FACT_SHEET.PDF.

35 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2022), 81–82.

threats to coerce the United States into not reinforcing its allies during crisis or conflict or destroying the infrastructure necessary to do so. Relatedly, the study examines whether a limited defense of US nuclear retaliatory forces could improve the survivability of those forces and thereby lessen the requirements for additional US nuclear weapons to counter the expansion of Russian and Chinese nuclear capabilities. In other words, rather than build more US nuclear weapons to cover targets presented by China's expanding nuclear arsenal, the United States can devalue those forces by ensuring they cannot disarm the United States in a large-scale nuclear attack.

The study then devotes four sections to examining how the strategy objectives for homeland missile defense relate to various combinations of missile defense interceptors and sensors and the overarching architecture necessary to accomplish defense objectives. The report focuses on the key concept of layered missile defenses to provide a more effective and affordable means to defend against missile threats, compared to the current approach that depends solely on the long-range GBI. The study makes recommendations on those nascent missile defense technologies, useful to address the challenges identified by this paper, that merit additional technical research and development. The study dedicates a separate section to cruise missile defense of the homeland, given the somewhat separate requirements for sensors, effectors, and missile defeat for that attack mode.

The report then devotes a section to Russian and Chinese homeland missile defense doctrines and capabilities that, at the very least, debunk those countries' long-standing objections to US homeland missile defense. It also offers a preliminary assessment of the implications for US strategy should Russia and China continue to expand their nascent homeland missile defense capabilities while the United States maintains its vulnerability to some of those same threats.

Policy implications

Congress continues to grapple with legislation to expand US IAMD protection for the homeland, and it is an issue that will not go away. At least one of the two presidential candidates in the 2024 US presidential election (at the time of this writing) proposes a next-generation missile defense system for the protection of the nation. To be sure, nuclear and missile threats are growing—and how to address those threats will be a constant source of evaluation and debate.

This study recommends an expanded role for homeland missile defense because Russia and China are developing capabilities and doctrine to strike the US homeland during regional conflict to prevent US support of allies. The objective of such missile defenses is not absolute protection for the American people, but rather to enhance deterrence by creating doubt in the mind of the Russian or Chinese leadership that the purpose of their attacks will succeed. This doubt of a successful attack, along with the very real prospect of US retaliation, contributes to deterrence at the outset. It is this redefinition and clarification of the purpose for homeland missile defense that rests on the same foundational premise of strategic nuclear offensive weapons and may provide the basis for consensus on a new missile defense policy that both addresses the expanding missile threat and still holds the possibility of avoiding a costly arms race.

A key driver of this study is the fear that the growing US vulnerability to missile strikes, whether from small or major nuclear powers, will weaken deterrence of regional conflict because adversaries and allies may increasingly wonder whether the United States will be willing to run risks to secure its regional interests. If this is the case, then lessening the exposure of the United States to these threats could enhance the credibility of US extended deterrence and grand strategy more broadly.

Section two: US homeland missile defense policy

Introduction

United States missile defense policy today lacks coherence. There are different policies for homeland and regional missile defense, and, within homeland missile defense policy, distinctions exist for the type of missile threats (ballistic, cruise, and hypersonic glide) and the type of attacker (rogue state or major power). In an ideal world, the drivers of missile defense policy should be threat assessment and the contributions of missile defense to the broader national defense strategy. However, in reality, other factors intrude, including assumptions about technology, differences in deterrence theory, implications for arms control, and ideologically held positions about missile defense passed on from the earliest days of the Cold War. Moreover, geopolitical and adversary capability growth has outpaced US technology development and acquisition, contributing to the mismatch between policy and reality.

Underlying and driving these different policies has been a long-standing fundamental disagreement over the strategic benefits and risks of defending the nation against long-range nuclear-armed missiles. Writing in 1973, renowned nuclear strategist Bernard Brodie observed that "the ABM question touched off so intense and emotional a debate within this country as to be virtually without precedent on any issue of weaponry."[36] While those same emotions and arguments persist today, the question for this study is whether changes in the geopolitical and threat environment are such that the United States must "move the needle" on expanded roles for homeland missile defense.

This section provides a summary and update of the missile defense policy debate since the end of the Cold War, examines the current policy for homeland missile defense for strategic logic and consistency with the emerging threat, and touches on the role that Congress plays in the debate over homeland missile defense policy. (Section Three assesses the specific role for missile defense in US defense and deterrence strategy.) This study argues that the expanding missile threat to the homeland from small and major nuclear powers justifies a change in policy to allow defense of the homeland against any missile threat posed by any potential adversary. Later sections address the size and type of missile defenses necessary to support this policy.

A review of US homeland missile defense policy after the Cold War

With the collapse of the Soviet Union, the priority of US missile defense shifted from a Cold War focus on the Soviet Union and China to building defenses to address emerging threats to the homeland posed by smaller, more unpredictable regional actors—"rogue powers," in the popular vernacular. The 1999 National Missile Defense (NMD) Act is the foundation and anchor for the post-Cold War US missile defense policy. The legislation set a national policy to "deploy as soon as is technologically possible an effective national missile defense system capable of defending the territory of the United States against limited ballistic missile attack, whether accidental, unauthorized, or deliberate."[37] This shift in US policy resulted from the assessment that the threats facing the United States and its allies following the collapse of the Soviet Union, particularly the 1998 North Korean Taepodong test, require a more tailored approach to deterrence and a new set of defense tools to maintain it. In highlighting the insufficiency of offensive capabilities alone to deter the spectrum of threats facing the United States, the Bush administration in 2003 publicly articulated the view that "the strategic logic of the past may not apply to these new [rogue state] threats, and we cannot be wholly dependent on our [offensive] capability to deter them."[38]

Furthermore, the United States worried that adversaries could employ threats of ballistic missiles armed with weapons of mass destruction (WMDs) to intimidate and deter Washington from supporting allies and friends in the face of aggression. US officials concluded that, to counter such threats, the United States must devalue missiles in the eyes of its adversaries as tools of extortion, blackmail, and aggression. Under these circumstances, missile defenses would serve to blunt the utility of missile-backed political coercion by denying hostile states the ability to constrain US freedom of action abroad by threatening the US homeland. By diminishing the anticipated coercive and military effectiveness of an opponent's missile attack plans, the United States would strengthen deterrence.

This approach remains the foundation of US homeland missile defense policy. Since 1999, every administration, including the Biden administration, has elaborated policies within the framework of the NMD Act centered around the defense of the United States against nuclear-armed, long-range ballistic missiles from regional adversaries. This reflects the enduring judgment within US policy circles that nuclear deterrence may not be fully reliable in preventing these unpredictable and unstable nuclear states from seeking to threaten a missile attack or employ such weapons in a crisis or conflict. At the same time, each administration has also pursued specific policies

36 Bernard Brodie, *From Crossbow to H-Bomb* (Bloomington, IN: Indiana University Press, 1973), 305.

37 National Missile Defense Act of 1999, Pub. L. No. 106-38 (1999).

38 *National Policy on Ballistic Missile Defense*, White House, National Security Presidential Directive, May 20, 2003, https://irp.fas.org/offdocs/nspd/nspd-23-fs.htm.

Secretary of Defense Lloyd J. Austin III provides testimony at a House Armed Services Committee hearing on the Department of Defense fiscal 2025 budget request. Source: Chad McNeeley/Office of the Secretary of Defense Public Affairs.

seeking to reassure Russia and (to a lesser extent) China that the design and intent of US homeland missile defenses do not negate these states' strategic forces. The United States has consistently affirmed its policy, most recently in the 2022 MDR, that it relies on nuclear deterrence and the threat of retaliation to address the large and sophisticated Russian and Chinese nuclear ballistic missile capabilities.

In 2002, Bush directed the DOD to proceed with the fielding of an initial set of homeland missile defense capabilities, including ground- and sea-based interceptors supported by a variety of sensors, to begin operating in 2004–05. For the homeland, this took the form of the GMD system incorporating GBIs deployed in Alaska and California. The scope and scale of these deployment decisions—an initial force structure of forty-four GBIs—made clear the focus was on "limited" ICBM attacks to address the "new rogue state threats." Nowhere in early US policy did it suggest any intention to build defenses scaled to counter a large Russian strategic attack. It did state as a matter of policy, however, that such defenses would improve over time to remain effective against evolving missile threats.

The Obama administration elaborated its missile defense policy largely within this framework. As noted in the *2010 Ballistic Missile Defense Review* (BMDR), maintaining an advantageous homeland defense posture against limited ballistic missile threats, such as those emanating from North Korea and potentially Iran, has been the guiding principle of US missile defense policy across Republican and Democratic administrations since the end of the Cold War.[39] Two important points are worth noting here. First, the fielding of homeland missile defense capabilities, initiated under Bush and sustained by his successor, former President Barack Obama, supplied a force size that allowed the United States to reliably provide a high level of protection against any potential small ICBM threat from rogue states. During this period, prospective rogue state ICBM inventories, as far as the US intelligence community could ascertain, remained either in the developmental stage or were small. Second, the policy focus remained exclusively on *ballistic* missiles, as that is where the dominant threat came from. Obama also sought to highlight the importance of strategic stability in the missile defense context more explicitly than the Bush administration, which remained wary of the concept and its Cold War application to constrain missile defense efforts.

To stay ahead of the North Korean ballistic missile threat to the homeland, the Obama administration reversed its earlier decision to pause US GBI deployments at thirty and decided in 2013 to add another fourteen. The action was in response to evidence that the North Korean ICBM program was moving forward with the development of a new missile system, specifically, its exhibition of the Hwasong-13 ICBM at a parade in 2012. The Obama administration also initiated plans to enhance the GMD system with a redesigned kill vehicle (RKV) for the GBI, to boost each GBI's reliability and effectiveness.

The 2019 Trump administration MDR reaffirmed that "US homeland missile defense will stay ahead of rogue states' mis-

39 US Department of Defense, *2010 Ballistic Missile Defense Review* (Washington, DC: Office of the Secretary of Defense, February 2010), https://dod.defense.gov/Portals/1/features/defenseReviews/BMDR/BMDR_as_of_26JAN10_0630_for_web.pdf.

sile threats."[40] In light of anticipated growth in the size of North Korea's nuclear-tipped ICBM arsenal, and technical problems with the development of the RKV program, the Trump administration altered the acquisition approach to include a fully modernized interceptor (both rocket boosters and kill vehicle) called the Next-Generation Interceptor (NGI) alongside plans to supplement the forty-four GBIs deployed in Alaska and California with twenty NGIs. The 2019 MDR also pointed to a broader shift taking place in the threat environment, concluding that not only were nations continuing to improve and expand their ballistic missile capabilities, but they were also adding "new and unprecedented types of missiles" to their arsenals.[41] Considering this, the Trump administration renamed its review the *Missile Defense Review*—deliberately dropping the term *ballistic* to signal the wider scope of threats missile defense must henceforth address. With respect to Russia and China, the 2019 MDR stated, as the 2010 BMDR did, that the United States continues to rely on its nuclear forces to deter nuclear threats against the homeland.

A Ground-Based Interceptor (GBI) loaded into a silo at Fort Greely, Alaska, in July 2004. Source: US Missile Defense Agency

The Biden administration's 2022 MDR suggests more continuity than change for the role of missile defense within its deterrence strategy. Missile defenses represent a key "deterrence by denial" component within the administration's "Integrated Deterrence" framework. Active defense is part of a comprehensive "missile defeat" approach, which according to the MDR, complements the credible threat of direct cost imposition through nuclear and non-nuclear means. US Secretary of Defense Lloyd Austin has testified to Congress that missile defense against rogue state threats is a "central component" to keeping the homeland safe.

In support of this priority, the Biden administration continues to improve the GMD system, including the forty-four GBIs, through a service life extension program (SLEP). The DOD is also undertaking a major modernization of the GMD system to ensure it can effectively counter larger and more sophisticated rogue state ICBM threats in the future. This includes $1.7 billion in the FY 2025 budget toward the planned fielding of the twenty NGIs, expected to start in 2028.[42] Furthermore, as the forty-four GBIs move toward the end of their service life in the 2030s, senior Pentagon officials have testified that NGIs would be available to replace or backfill them, providing for a fully modernized missile defense system of sixty-four interceptors.

Congress and missile defense policy

Congress plays an important role in the formulation of missile defense policy. Lawmakers have constrained presidential ambitions at times, yet, in other instances, they have worked to force the hand of reluctant administrations to do more to protect the homeland against all long-range missile threats. From the start, congressional views on homeland missile defense, have reflected a fundamental divide in opinion and ambivalence about the merits and costs of such defenses. A 1969 Senate vote to fund the Safeguard ABM System, proposed by

40 US Department of Defense, *2019 Missile Defense Review* (Washington, DC: Office of the Secretary of Defense, January 2019), VII, 30, https://media.defense.gov/2019/jan/17/2002080666/-1/-1/1/2019-missile-defense-review.pdf.

41 US Department of Defense, *2019 Missile Defense Review*, II, IV, 6.

42 Robert Soofer, "Is the United States Falling Behind the North Korean ICBM Threat? Congress Needs Answers," Atlantic Council, April 11, 2024, https://www.atlanticcouncil.org/blogs/new-atlanticist/is-the-united-states-falling-behind-the-north-korean-icbm-threat-congress-needs-answers/.

the Nixon administration, required the vice president to cast the deciding vote and break the 50-50 tie. Partisan lines were much sharper during the second major missile defense debate prompted by former President Ronald Reagan's Strategic Defense Initiative (SDI) in 1983. The fate of the 1972 ABM Treaty was at stake in addition to the usual arguments for and against homeland missile defense, which took the debate up a steep notch. Republicans tended to favor homeland defense, while Democrats continued to defend the ABM Treaty.[43]

The end of the Cold War seemed to make compromise feasible. The first sign came in the form of the 1991 Missile Defense Act, which made it the goal of US policy to deploy at the "earliest possible date" an ABM Treaty-compliant missile defense system able to provide "a highly effective defense of the US against limited attacks of ballistic missiles."[44] (The ABM Treaty limited each side to two interceptor sites, with one hundred missiles each, and was meant not to provide a territorial defense of the nation.) It also called for any actions to be consistent with the goal of "maintaining strategic stability," and stated that nothing in the act should imply congressional authorization for development or testing of ABM systems in violation of the ABM Treaty. So, while the compromise seemed to move the needle forward on homeland missile defense, any resulting research and development must be within the framework of the ABM Treaty—the basis for an uneasy comprise that still begged the question: what to deploy and when?

The debate over homeland missile defense continued in Congress when, in August 1998, North Korea tested a three-stage rocket, catching the US intelligence community by surprise. The test provided the impetus for Republicans in Congress to increase efforts to accelerate the deployment of missile defenses and seemed to have a profound impact on the Clinton administration, forcing the administration to take more seriously the issue of homeland missile defense.[45] In January 1999, the Clinton administration announced allocating funding in its future years defense plan for deployment of a national missile defense system to comprise up to one hundred interceptors, while both houses of Congress passed by wide margins the 1999 Missile Defense Act, which declares that it is US policy to: (1) deploy as soon as technologically possible a National Missile Defense (NMD) system capable of defending US territory against limited ballistic missile attack (whether accidental, unauthorized, or deliberate), with funding subject to the annual authorization of appropriations and the annual appropriation of funds for NMD; and (2) seek continued negotiated reductions in Russian nuclear forces.[46] The commitment to homeland missile defenses gratified Republicans, while Democrats took comfort in the linkage to arms control.

Current missile defense policy

Since this study seeks to change homeland missile defense policy, it is useful to review that policy as a basis for further analyses. With respect to regional crises and conflict, it is the policy of the United States to defend US forces, allies, and partners against all missile threats (ballistic, cruise, hypersonic glide) from any country. Regarding the homeland, the United States will defend against air- and sea-launched **cruise missile** threats from any country but will only pursue defenses against **ballistic missiles** launched by rogue states, such as North Korea and potentially Iran. US homeland missile defenses are not intended to defend against Russian and Chinese ballistic missiles; instead, the United States relies on the threat of nuclear retaliation to deter such threats. This section will now examine the stated policy in more detail before assessing it.

Regarding theater or regional missile defense, the 2022 MDR prescribes an IAMD approach and states that:

> To strengthen regional defense and deterrence … the United States will continue to pursue Joint, Allied, and partner IAMD capabilities needed to maintain a credible level of regional defense capability for joint maneuver forces and critical infrastructure **against all missile threats from any adversary** in order to protect US forces abroad, maintain freedom of maneuver, and strengthen security commitments to our Allies and partners.[47]

Regarding ballistic missile defense of the US homeland, the 2022 MDR maintains the distinction between North Korean threats and those posed by Russia and China. For North Korea, the 2022 MDR explains that:

> As the scale and complexity of Democratic People's Republic of Korea (North Korea) missile capabilities increase, the United States will also continue to stay ahead of North Korean missile threats to the homeland through a comprehensive missile defeat approach complemented by the credible threat of direct cost imposition through nuclear and non-nuclear means.[48]

By contrast, for Russia and China, the 2022 MDR takes a different approach stating that:

43 For a good history of Congress's role in missile defense policy making, see Andrew Futter, *Ballistic Missile Defense and US National Security Policy* (New York: Routledge, 2013); and Amy Woolf, "National Missile Defense: Issues for Congress," Congressional Research Service report IB10034, April 28, 2000.

44 National Defense Authorization Act for Fiscal Years 1992 and 1993, Pub. L. No. 102-190, 231–32 (1991), https://www.congress.gov/bill/102nd-congress/house-bill/2100.

45 utter, *Ballistic Missile Defense,* 80; Woolf, "National Missile Defense," 2.

46 National Missile Defense Act of 1999, Pub. L. No. 106-38 (1999), https://www.congress.gov/bill/106th-congress/house-bill/4/text.

47 US Department of Defense, *2022 Missile Defense Review*, 1; emphasis added.

48 US Department of Defense, *2022 Missile Defense Review*, 1.

Chief of Space Operations Gen. John W. "Jay" Raymond, left, Secretary of the Air Force Frank Kendall and Air Force Chief of Staff Gen. CQ Brown, Jr. testify before the Senate Armed Services Committee on the Department of the Air Force's fiscal year 2023 budget request, Washington, D.C., May 3, 2022. Source: Eric Dietrich/US Air Force

> Though the United States maintains the right to defend itself against attacks from any source, GMD is neither intended for, nor capable of, defeating the **large** and sophisticated ICBM, air-, or sea-launched ballistic missile threats from Russia and the PRC. The United States relies on strategic deterrence to address those threats.[49]

Making a further distinction, the 2022 MDR spells out a different approach to the defense of the homeland against cruise missile threats. For cruise missile defense generally, the 2022 MDR states that:

> To deter attempts by adversaries to stay under the nuclear threshold and achieve strategic results with conventional capabilities, the United States will examine active and possible defense measures to decrease the risk from any cruise missile strike against critical assets, regardless of origin.[50]

On a closely related issue, air and cruise missile defense of the homeland, an April 2024 statement from the Office of the Assistant Secretary of Defense for Space Policy to the House Armed Services Committee Strategic Forces Subcommittee reminds:

> In September 2023, Secretary Austin issued policy guidance for Air and Cruise Missile Defense of the Homeland. The secretary's actions followed a comprehensive re-assessment … to pace homeland defense air activities to the growing multi-domain threat posed by the PRC while also accounting for the acute threat posed by Russia. In the near term … the Department is taking measures … that will improve our ability to detect and respond to such strikes and thereby decrease the risks from cruise missile strikes against US critical assets.[51]

Against the threat from hypersonic glide weapons, the 2022 MDR frames defenses as a regional issue, stating that:

> On regional hypersonic defense, the Department is currently engaged in the development of a future capability called the Glide Phase Interceptor, or GPI. GPI will supplement the Sea-based Terminal defense capability to provide a maritime layered defense against regional hypersonic threats.[52]

The entire 2022 MDR is framed through a comprehensive missile defeat approach, which "encompasses the range of activities to counter the development, acquisition, proliferation and actual use of adversary offensive missiles of all types, and to limit damage from such use."[53] Or, in the words of then-Assistant Secretary of Defense for Space Policy John Plumb, "Speaking more plainly, [comprehensive missile defeat] is any and all left-

49 US Department of Defense, *2022 Missile Defense Review*, 6; emphasis added.

50 US Department of Defense, *2022 Missile Defense Review*, 6.

51 John D. Hill, "Written Statement of Mr. John D. Hill, Deputy Assistant Secretary of Defense for Space and Missile Defense Policy, to the House Armed Services Committee Strategic Forces Subcommittee: 'Fiscal Year (FY) 2025 Budget Request for Missile Defense and Missile Defeat Programs'" (Washington, DC: Office of the Secretary of Defense, April 12, 2024), 7, https://armedservices.house.gov/sites/evo-subsites/republicans-armedservices.house.gov/files/04.12.24%20Hill%20Statement.pdf.

52 Plumb, "Missile Defense in an Era of Strategic Competition."

53 US Department of Defense, *2022 Missile Defense Review*, 1.

of-launch and right-of-launch means to stop an adversary from successfully using its growing array of offensive missiles."[54]

An assessment of current policy

Several aspects of current missile defense policy bear scrutiny for inherent inconsistency and potential lack of strategic logic, especially considering the expanding missile threat to the homeland.

Why is it appropriate to defend against Russian and Chinese cruise missile threats to the homeland but not ballistic missiles? Should the logic of defending against nuclear and conventional cruise missile strikes not also extend to ballistic missile strikes? Both threats have uses against critical infrastructure for coercive purposes and for attacking critical US nuclear command-and-control nodes and other nuclear bases and ports. If Russia and China were to contemplate limited coercive attacks against the US homeland (as this study explores in Section Four), then it is not clear why these states would be less inclined to use ballistic missiles as well as cruise missiles. China, for example, may be developing a conventionally armed ICBM that Beijing could use expressly for this purpose. Moreover, should the United States address the cruise missile threat—as included in current policy—then adversaries would likely seek to exploit the US vulnerability to ballistic missile threats. While one might question the value of defending against cruise and ballistic missile threats, which the study later discusses, defending against one and not the other makes no strategic sense.

Next, across Republican and Democratic administrations, all have understood that one of the most crucial roles for missile defense is to reassure allies. As noted recently in the 2022 MDR, "missile defense systems such as the GMD offer a visible measure of protection for the US while reassuring Allies and partners that the United States will not be coerced by threats to the homeland from states such as North Korea and potentially Iran."[55] But why only North Korea and potentially Iran? European NATO Allies and other allies, like Japan and South Korea, must also wonder whether the United States would run risks on behalf of their security should Russia or China escalate to the use of nuclear weapons against the US homeland, as is consistent with Russian nuclear doctrine and within China's capabilities. While the threat of US nuclear retaliation remains a strong deterrent to such attacks, reducing the vulnerability of the United States to limited Russian and Chinese nuclear attacks can serve to reduce the attractiveness of such attacks in the first place and strengthen the resolve of a future US president in the face of escalatory challenges and thereby provide increased reassurance to allies. If there are reassurance benefits to be had by protection from rogue state nuclear threats, then these benefits must also apply to major nuclear powers.

Finally, though current policy states that the United States will rely on strategic deterrence to address Russian and Chinese ICBM, air-, or sea-launched ballistic missile threats, the justification or rationale for this policy is not explicit in the 2022 MDR or any other strategy document or testimony produced by Biden administration defense officials. It is merely asserted. The 2022 MDR affirms that the US GMD system "is neither intended for, nor capable of, defeating the large and sophisticated" missile threats from Russia and China but does not explain the rationale behind that intent. One can only assume that it is the "large" and "sophisticated" nature of the threat that guides the decision not to defend against these threats.

There are other clues to the administration's rationale for excluding HBMD directed against Russia and China. In opposing a provision to broaden the scope of national missile defense policy, proposed in the FY 2023 National Defense Authorization Act (NDAA), the Biden administration argued that such language:

> Would signal intent to develop US homeland missile defenses to counter large intercontinental-range, nuclear missile threats such as those fielded by the PRC and Russia. Implementing the policy … would be both cost prohibitive and not technically executable. Also, establishing such a policy would undermine US strategic deterrence with the PRC and Russia and overturn two decades of well-established missile defense policy.[56]

The administration does not explain how such a policy would undermine strategic deterrence, nor is it clear why such a policy would be cost prohibitive and not technically executable. Cost and technology requirements would depend on the goals for the missile defense system: a very large leakproof defense of the nation's population could be technically infeasible and quite costly, but more modest objectives, such as deterring limited strikes or protecting nuclear command-and-control sites could be well within current technological prowess and affordable (as this study argues in Sections 7–9). The administration, in rejecting homeland defenses against Russia and China, assumes that the objective must be to "counter large intercontinental threats," but, in fact, the objective, as explained later in this study, can be more modest.

Still less clear is why the administration believes that defending against Russian and Chinese long-range ballistic missiles would undermine US strategic deterrence. One possible explanation comes from Rep. Seth Moulton (D-MA-06), the senior Democrat on the US House Armed Services Committee's Strategic Forces Subcommittee, who argues that pursuing ho-

54 Plumb, "Missile Defense in an Era of Strategic Competition."

55 US Department of Defense, *2022 Missile Defense Review*, 6.

56 Executive Office of the President, "Statement of Administration Policy: H.R. 2670 – National Defense Authorization Act for Fiscal Year 2024" (Washington, DC: Office of Management and Budget, July 10, 2023), 4, https://www.whitehouse.gov/wp-content/uploads/2023/07/H.R.-2670-NDAA.pdf.

meland defenses against near-peer nuclear powers would be "fundamentally destabilizing." He goes on to explain:

> The crazy logic of atomic peace is achieved through mutual vulnerability, where no major nuclear power would launch a nuclear attack because they know that the result would be a nuclear holocaust … If we were to try to render our adversaries' missiles incapable, they would simply develop new ones to defeat our defenses, as we have seen with the deployment of increasingly sophisticated maneuvering weapons to evade current US missile defense radars.[57]

This argument and strategic logic, addressed later in this study, may offer an explanation or rationale for the administration's stated policy not to defend against Russian and Chinese long-range ballistic missiles. Notably, previous administrations, including under Republicans, have adopted the same policy of not building missile defenses against Russia and China, though one cannot be certain it is for the same reasons chosen by Moulton and, presumably, the Biden administration.

Moulton's concern extends to the expansion of US defenses against North Korea as well, evidenced by his contention that:

> At some point, if we continue to expand our current arsenal of interceptors, we must ask not just how North Korea will respond, but how Russia and the CCP [Chinese Communist Party] will respond as they see a pathway for our missile shield to impact their deterrent as well. … At what point will this arms race provoke a response from Russia and the CCP?[58]

According to this logic, the United States should reconsider even pacing the North Korean ICBM threat for fear that doing so could spark an arms race with Russia and China. If this logic were to prevail, then it would be difficult to find support for defenses against the Russian and Chinese coercive threat, though the Congressional Strategic Posture Commission does recommend this course of action. House Armed Services Committee Republicans, however, believe current missile defenses are inadequate to address the growing missile threat to the homeland, tweeting on February 14, 2023, that "it needs to be the missile defense policy of the US to outpace the DPRK [Democratic People's Republic of Korea] threat to the homeland. It is clear that 44 Ground Based Interceptors are not enough. We need to accelerate Next Generation Interceptors [NGIs] and begin moving to space based defenses."[59]

Republicans, increasingly concerned about the growing missile threat to the homeland from Russia and China (as well as North Korea), came to believe the 1999 Missile Defense Act was too restrictive in its policy to build defenses against only a "limited ballistic missile attack." This led to a modification of the policy language to drop the modifier "limited" and instead "provide effective, layered missile defense capabilities to defeat increasingly complex missile threats in all phases of flight."[60] According to proponents of this modified language, this would allow and encourage research and development of missile defense systems against larger and more sophisticated Russian and Chinese missile threats—not only the missile threat posed by North Korea. Not all Members of Congress were comfortable with this formulation, for the language also includes the caveat that the United States will "rely on nuclear deterrence to address more sophisticated and larger quantity near-peer intercontinental missile threats to the homeland of the United States."[61] The Biden administration would no doubt interpret this provision as consistent with its current policy to stay ahead of the North Korean missile threat while relying on nuclear deterrence to address the Russian and Chinese long-range missile threat—in other words, asserting that the United States does not have to build defenses against Russia and China because it can rely on its nuclear forces to deter those threats.

In the final analysis, the long-standing debate concerning homeland missile defenses against Russia and China remains unresolved in Congress and between Congress and the Biden administration. The recommendation of the 2023 Strategic Posture Commission that "the United States should develop and field IAMD capabilities that can deter and defeat coercive attacks by Russia and China" could shift the nature of the homeland missile defense debate in Congress in favor of developing defenses against Russia and China, though it may be too early to tell.[62] In one sign of the shifting mood, the FY 2024 Defense Appropriations Act contains a provision directing the US Missile Defense Agency (MDA) to provide a report outlining technologies and investments across the future years defense program "which will allow MDA to keep pace with these [hypersonic and advanced ballistic missiles] advanced threats

57 Rep. Seth Moulton, "Opening Statement, FY24 Request for Missile Defense and Missile Defeat Programs," House Armed Services Committee Strategic Forces Subcommittee, April 19, 2023, https://democrats-armedservices.house.gov/_cache/files/f/c/fc6ed1c1-eb1c-463f-ae0b-cfbe41a838db/23109AC8232766CF49F1BFB2D4487579.20230418-moulton-str-hearing-statement.pdf.

58 Moulton, "Opening Statement."

59 Armed Services GOP (@HASCRepublicans), "It needs to be the missile defense policy …" X, February 14, 2023, 12:58 p.m., https://x.com/HASCRepublicans/status/1625555014411329536.

60 National Defense Authorization Act for Fiscal Year 2024, Pub. L. No. 118-31, 1663 (2023), https://www.congress.gov/118/plaws/publ31/PLAW-118publ31.pdf.

61 NDAA FY 2024, Pub. L. No. 118-31, 1663.

62 reedon et al., *America's Strategic Posture: The Final Report*, X, 72, and 105.

to the homeland."[63] Congress also directed, in the FY 2024 NDAA, a study examining the technical feasibility and cost of developing and deploying space-based interceptors (SBIs)—a capability well suited to defense against all long-range ballistic missiles, including those of Russia and China.

Conclusion

As this discussion of US missile defense policy from the end of the Cold War to today suggests, the existing homeland missile defense policy has been a convenient compromise between the advocates and critics of homeland missile defenses, or perhaps between different versions of homeland missile defense. The end of the Cold War and the hope of moving beyond great-power competition allowed policymakers to focus US missile defense requirements on the growing regional threats, such as North Korea. Today, however, the return of great-power competition with Russia and China and the expansion of North Korea's nuclear arsenal and ICBM force is likely to reopen that compromise—and with it, the long-standing debate over homeland missile defense: Is it destabilizing, or will it enhance deterrence?

63 See reporting language in the Fiscal Year 2024 Defense Appropriations Act titled "Homeland Defense to Counter Advanced Missile Threats," Department of Defense Appropriations Act, 2024, S.2597, 118th Cong. (2024), https://www.congress.gov/bill/118th-congress/senate-bill/2587#:~:text=This%20bill%20provides%20FY2024%20appropriations,included%20in%20other%20appropriations%20bills.

For the first time, a photo at the July 2024 Washington summit captures all 32 NATO member states' delegation groups together. Source: The White House

Section three: Homeland missile defense and US security

Introduction

Post-Cold War Republican and Democratic administrations, as evidenced by their respective MDRs, have well established the role of missile defense in US defense strategy. During crises and conflicts, missile defenses offer additional military options to help the White House and military leadership deter and, if necessary, counter adversary aggression and strategy. Missile defense is a contributor to integrated deterrence—not a standalone capability. Protection of the homeland, military forces, and other critical assets is meant to enable US military strategy and the achievement of war aims more broadly. Missile defenses contribute to and complement other military capabilities.

While the 2022 MDR is the focal point for analysis, the strategic value of missile defenses cannot be understood without reference to higher-order documents such as the NDS and the *National Security Strategy* (NSS). How missile defenses contribute to these first-order security and strategy principles and objectives should determine the priorities afforded to these defenses in a constrained defense budget. Put another way, US regional and homeland missile defense capabilities are an enabler of US grand strategy, complement other military capabilities necessary for deterrence and defense, play a critical role in defeating adversary strategies (or theories of victory), and ensure the survivability of US nuclear forces—the ultimate insurance policy against existential threats to the nation.

This section first examines the important role assigned to missile defense within the broader national security and national defense strategies—sometimes referred to as US grand strategy. It then elaborates on the benefits of missile defense in deterring aggression and fulfilling US theater and operational objectives during a war. Based on this assessment, this section draws some conclusions about the type and effectiveness of missile defenses needed to contribute to US strategy objectives. Complicating this assessment is the fact that missile defenses have viable uses in a theater or regional contingency (for the protection of allies, US forces, and key military forces and facilities), and these defenses also can work to protect the homeland against long-range missile threats. While US missile defense policy does distinguish between the objectives for homeland and regional missile defenses, this study argues that the military and strategic benefits provided by missile defense extend to both regional and homeland missile defense. For example, both regional and homeland missile defenses can undermine an adversary's confidence in the employment of missiles by introducing doubt and uncertainty into attack planning—whether these are conventionally armed medium-range missiles or nuclear-armed ICBMs attempting a disarming first strike.

Missile defense and US grand strategy

The Biden administration's NSS declares that "the post-Cold War era is definitively over and a competition is underway between the major powers to shape what comes next."[64] It is a challenge from "powers that layer authoritarian governance with a revisionist foreign policy" such that "the risk of conflict between major powers is increasing," and the "need for a strong purposeful American role in the world has never been greater."[65] To address this challenge and to achieve the US goal of a "free, open, prosperous, and secure international order," the United States "will build the strongest possible coalition of nations to enhance our collective influence to shape the global strategic environment."[66] Framed another way, the United States seeks to maintain favorable balances of power in key regions of the world for the protection of US vital national interests and its allies. But to do so, the United States recognizes that its alliances and partnerships around the world are its most important strategic asset in deterring aggression and that "we are stronger in each region because of our affirmative engagement in the others."[67]

If US grand strategy has as its base the support of allies for its execution, then it is axiomatic that allies must have confidence that the United States will come to their aid in times of great distress. The credibility of US security guarantees, therefore, influences whether allies will remain confident and work to strengthen the alliance or accommodate regional challengers for fear that the United States will not be there when it counts. If this is the case, then the United States must convince allies that it is willing to run risks on their behalf—risks that include, ultimately, nuclear threats to the US homeland. As these risks continue to increase—they are now from even small powers such as North Korea—it becomes harder to convince allies that the United States will be there in extremis.

64 President Joe Biden, *National Security Strategy* (Washington, DC: White House, October 2022), 6, https://www.whitehouse.gov/wp-content/uploads/2022/10/Biden-Harris-Administrations-National-Security-Strategy-10.2022.pdf.

65 Biden, *National Security Strategy*, 7–8.

66 Biden, *National Security Strategy*, 7.

67 Biden, *National Security Strategy*, 11.

Former US Defense Secretary Ash Carter and Former US Secretary of State John Kerry attend a bilateral meeting with South Korean Defense Minister Han Min Koo and South Korean Foreign Affairs Minister Yun Byung-se at the State Department, Washington, DC, October 2016. Source: Amber I. Smith, US Department of Defense

To be sure, the United States goes to great lengths—though troop deployments, exercises, demonstrations of will, and high-level consultations—to reassure allies of its alliance commitments, but the increasing vulnerability of the United States to nuclear missile threats (ballistic, cruise, and hypersonic glide) against its homeland certainly must be considered. A rising public opinion in South Korea in favor of acquiring its own nuclear weapons, for example, reflects this concern. As one conservative politician frames it, "Can the United States defend Seoul while risking New York turning into a sea of fire?" As if to recall that this is not a new situation, he adds, "Now is the time that we show our determination like de Gaulle's," who, in the early 1960s, asked whether the United States was willing to trade New York for Paris.[68] Likewise, the vice defense minister of Japan, during a briefing for reporters after a North Korean ICBM test in December 2023, noted that, based on this test, the new missile could range all of the United States.[69] When was the last occasion a major ally called attention to the increasing vulnerability of the US homeland? Clearly, the growing exposure of the United States to long-range nuclear threats has not gone unnoticed by allies. Indeed, many US allies have faced these threats recently from Russia during its re-invasion of Ukraine, while Chinese regional missiles continue to taunt US allies and partners in the Indo-Pacific.

Washington has long understood the critical relationship between protection of the homeland and the United States' ability to project military power on behalf of allies and US vital interests. The 2001 Quadrennial Defense Review, conducted by the DOD, is emphatic on this point and bears repeating here:

> Defending the Nation from attack is the foundation of strategy. As the tragic September terror attacks demonstrate, potential adversaries will seek to threaten the centers of gravity of the United States, its allies and its friends. As the US military increased its ability to project power at long-range, adversaries have noted the relative vulnerability of the US homeland. They are placing greater emphasis on the development of capabilities to threaten the United States directly in order to counter US operational advantages with their own strategic effects.[70]

As the following sections of this report argue, US adversaries, more specifically North Korea, Russia, and China, may believe that holding at risk the US homeland—with conventional, nuclear, or other WMDs—will weaken the US center of gravity and thereby US resolve in any conflict. That is a risky strategy, to be sure: the 9/11 terrorist attacks in 2001 did not weaken US resolve; quite the opposite. But, on other occasions, such as the 1983 bombing of the US Marine Corps barracks in Beirut, Lebanon (resulting in the loss of 241 service members), which led to the withdrawal of the US military presence in that country, the United States has reconsidered its policy and strategy ob-

68 Kim Seung-Yeun, "Deeping Russia-NK Ties Reignite Debate over South Korea's Nuclear Options," Yonhap News Agency, June 26, 2024, https://en.yna.co.kr/view/AEN20240626005000315. Note: The politician is Daegu Mayor Hong Joon-Pyo.

69 Soo-Hyang Choi and Kantaro Komiya, "North Korea Fires ICBM After Condemning US 'War' Moves," Reuters, December 18, 2023, https://www.reuters.com/world/asia-pacific/north-korea-fires-ballistic-missile-south-korea-says-2023-12-17/.

70 US Department of Defense, *Quadrennial Defense Review Report* (Washington, DC: Office of the Secretary of Defense, September 30, 2001): 14, https://history.defense.gov/Portals/70/Documents/quadrennial/QDR2001.pdf?ver=AFts7axkH2zWU-HncRd8yUg%3D%3D.

jectives based on perceived risks. It is those risks that adversaries will seek to exploit with missiles and other strikes against the homeland.

Missile defense and national defense strategy

It is no wonder, then, that protecting the homeland has consistently been the first priority of US defense strategy. The DOD in the 2014 Quadrennial Defense Review reflected a realization that "the homeland is no longer a sanctuary" and that "we must anticipate the increased likelihood of an attack on US soil."[71] That priority was maintained in subsequent reviews and assessments and reflects prominently on the first page of the 2022 NDS, which declares: "first, we will defend the homeland."[72] This priority is followed by "deterring strategic attacks against the United States, our allies and partners," which also has implications for missile defense..[73] Like prior US strategy documents, the 2022 NDS reiterates that the United States cannot meet today's challenges alone and that "mutually-beneficial alliances and partnerships are our greatest global strategic advantage—and they are a center of gravity for this strategy."[74] Again, this emphasis is further evidence that attending to growing allied concerns about increasing US homeland vulnerability must be a priority and is central to US strategy.

The NDS further implicates US homeland vulnerability by pointing out that "competitor strategies seek to exploit perceived vulnerabilities in the American way of war, including by … posing all-domain threats to the US homeland in an effort to jeopardize the US military's ability to project power and counter regional aggression."[75] Specifically, "the PLA [Chinese People's Liberation Army] seeks to target the ability of the Joint Force to project power to defend vital US interests and aid our allies in crisis and conflict," and that "Russia has incorporated these capabilities and methods into an overall strategy that, like the PRC, seeks to exploit advantages in geography and time backed by a mix of threats to the US homeland and to our allies and partners."[76] The methods referred to include nuclear threats to the homeland and long-range cruise missile threats.

Most importantly, according to the NDS:

> [T]he scope and scale of threats to the homeland have fundamentally changed … the PRC or Russia could use a wide array of tools in an attempt to hinder US military preparation and response in a conflict, including actions aimed at undermining the will of the US public, and to target our critical infrastructure and other systems.[77]

Similar warnings have been taken up by multiple US Northern Command leaders, as well as the Secretary of the Army, who warned that in "a major war with China, the United States homeland would be at risk … with both kinetic and non-kinetic attacks. … They are going to go after the will of the United States public. They are going to try to erode support for a conflict."[78] Taken together, the NDS warns that these capabilities "threaten to erode the United States' ability to deter aggression and to help maintain favorable balances of power in critical regions."[79]

Recognizing these threats, how, then, does the NDS suggest that the United States can deter them? The broad answer includes a combination of denial, resilience, and cost imposition. With respect to the homeland specifically, the NDS declares:

> [The] Department will take steps to raise potential attackers' direct and indirect costs while reducing their expected benefits for aggressive action against the homeland, particularly by increasing resilience. Nuclear attacks against the United States are to be deterred by modernized nuclear forces, while deterring regional nuclear threats include tailored combinations of conventional, cyber, space and information capabilities along with nuclear weapons.[80]

Although it is not explicitly stated by the NDS, raising the attacker's costs (through punishment) while reducing expected benefits (by denying the objectives of their attacks) illustrates the important role that missile defenses play in the broader US national defense strategy. In other words, deterrence and missile defense are complementary; resilience through missile defense helps make credible US threats of cost imposition (punishment) by reducing US vulnerability and the risks of escalation. Currently, adversaries enjoy a "free ride" against the US homeland, which may promote the belief by Russian and Chinese leadership that they can successfully coerce US leadership by threatening US population or critical infrastructure. Even a modest level of protection for the United States pre-

71 US Department of Defense, *Quadrennial Defense Review 2014* (Washington, DC: Office of the Secretary of Defense, March 4, 2014): 13, https://www.acq.osd.mil/ncbdp/docs/2014_Quadrennial_Defense_Review.pdf.

72 US Department of Defense, *2022 National Defense Strategy,* 1.

73 US Department of Defense, *2022 National Defense Strategy*, 1.

74 US Department of Defense, *2022 National Defense Strategy*, 2.

75 US Department of Defense, *2022 National Defense Strategy*, 4.

76 US Department of Defense, *2022 National Defense Strategy*, 5.

77 US Department of Defense, *2022 National Defense Strategy*, 5.

78 Dontavian Harrison, "Secretary of the Army Christine Wormuth's American Enterprise Institute (AEI) Transcript (February 27, 2023)," US Army, March 3, 2023, https://www.army.mil/article/264524/secretary_of_the_army_christine_wormuths_american_enterprise_institute_aei_transcript_february_27_2023.

79 US Department of Defense, *2022 National Defense Strategy*, 7.

80 US Department of Defense, *2022 National Defense Strategy*, 9.

sents adversaries the worst of both worlds: They must contemplate that their attacks will fail to achieve their objectives and that such attacks may provoke an unacceptable US response. Further, they must assign larger numbers of weapons to accomplish their desired effects, running greater escalation risks if the damage they inflict is greater than originally intended.

To summarize thus far, a central objective of US grand strategy is to maintain favorable balances of power in regions of vital interest. To do so, maintaining strong alliances is essential. The enduring support of allies, in turn, depends on the perception that the United States remains committed to their security and would run risks to its own security to fulfill those commitments. Adversaries recognize the vulnerability of the US homeland as a center of gravity to exploit with threatened attacks. It follows, therefore, that the first priority of US defense strategy is to protect the homeland. If, as it is increasingly evident, potential adversaries are expanding their missile arsenals to hold at risk the United States (with nuclear and conventional warheads), then lessening that vulnerability (and the perception of that vulnerability) through a comprehensive missile defense and defeat strategy is essential for US grand strategy. This logic applies to rogue states such as North Korea as well as great-power competitors with large and sophisticated long-range conventional and nuclear forces.

Likewise, allies will interpret the credibility and efficacy of US nuclear guarantees in the context of US interests and the risks associated with employing nuclear weapons against nuclear-armed adversaries. If allies perceive the United States as unwilling to defend its homeland against these threats, they may wonder whether the United States would be willing to protect them under similar circumstances. The 2022 MDR acknowledges this concern, stating that:

> [M]issile defense systems such as the GMD offer a visible measure of protection for the US population while reassuring allies and partners that the United States will not be coerced by threats to the homeland from states like North Korea and potentially Iran.[81]

Missile defense, integrated deterrence, and military operations

Having established the critical role of homeland missile defense in lessening the vulnerability of the homeland to missile strikes, the 2022 MDR emphasizes how missile defenses are a "core deterrence-by-denial component of an integrated deterrence strategy" meant to counter the continued use of missiles by adversaries "as a principal means by which to project conventional or nuclear power."[82]

Based on the 2022 MDR, missile defenses for the homeland:

- Add resilience to US conventional defenses and undermine adversary confidence in missile use by introducing doubt and uncertainty into strike planning and execution. In the regional context, protection of US and allied ports, bases, transportation nodes, and critical infrastructure allows the United States to continue military operations and flow in reinforcements. In the strategic nuclear context, the protection of US nuclear forces and nuclear command-and-control nodes makes it difficult, if not impossible, for the adversary nuclear attack planner to execute a disarming first strike with any confidence.
- Reduce the incentive to conduct small-scale coercive attacks, decreasing the probability of attack success, and raising the threshold for conflict. In instances in which the adversary contemplates limited conventional or nuclear attacks against US and allied forces in the region—or against the US homeland—such defenses reduce the likelihood of success and may require much larger adversary strikes that could force an escalation far beyond what the adversary is willing to risk.
- Reinforce US diplomatic and security posture to reassure allies and partners that the United States will not falter in fulfilling its global commitments. This might include deploying regional missile defenses to allied countries during crises but also applies to the defense of the US homeland, as stated previously. Safeguarding this role is vital for maintaining alliance cohesion, particularly during a crisis or conflict.
- Provide additional military options that help counter the expanding presence of missile threats and may be less escalatory than employing offensive weapons. A prime example of this is the defense of Israel against Iranian missile strikes in April 2024. Israel's retaliation was measured. But, if Israel had sustained serious damage without such defenses, then Israeli leadership likely would have, of necessity, retaliated more significantly against Iran. This wider retaliation could have forced a wider war between Israel and Iran at a time when Israel remains engaged in a campaign against Hamas in Gaza.
- Offer some damage limitation against missile strikes, expanding the decision-making space for senior leaders at all levels of conflict, preserving capability and freedom of maneuver for US forces in a conflict region. For example, keeping an airbase or seaport operational longer could provide additional and better options for military leaders conducting offensive strikes or reinforcing forces in the region.

Implications for homeland defense objectives and architectures

Defense of the homeland against missile attack contributes to US national security at the regional, strategic, and grand-strategic levels. The protection of US military forces and war-suppor-

81 US Department of Defense, *2022 Missile Defense Review*, 6.

82 US Department of Defense, *2022 Missile Defense Review*, 5.

ting critical military and transportation infrastructure in the homeland enables the execution of US war plans that depend on moving reinforcements into battle as soon as possible. At the strategic (national defense) level, missile defense protection for the homeland against an adversary's **limited** conventional or nuclear strikes removes that as a coercive tactic against the United States because adversaries would lack confidence that those limited strikes will reach their intended targets, while also having to worry of an escalatory response by the United States. Finally, homeland missile defenses play a critical role in a US grand strategy that depends on allies to protect its vital interests in key regions; reducing US homeland vulnerability demonstrates, to adversaries and allies alike, the US commitment to run risks on behalf of its vital interests and allies.

General considerations

From the discussion above, it is possible to derive certain general principles to guide the consideration of the type and scope of missile defenses necessary to provide the strategy benefits heretofore mentioned.

First, the objective is not to replace deterrence provided by other military forces or even US nuclear retaliatory capabilities. Rather, it is to strengthen the credibility of US nuclear threats and conventional force commitments by lessening (not eliminating) the potential vulnerability of the US homeland to missile threats. In this sense, missile defense and deterrence are complementary and mutually reinforcing.

Second, the objective or "strategic effect" is not the comprehensive protection of the homeland, but to create attack uncertainty or erode attacker confidence in the attack plans, thereby defeating the adversary's strategy. For example, an adversary might contemplate attacks against US sea- and airports of embarkation for reinforcements to slow a US response, alongside added political aims, such as loss of public support for the military campaign. In this example, protection would be for specified key ports rather than broad swaths of US territory.

Third, from these objectives, which drive the limited scope of the missile defense architecture, one can derive that the United States does not intend to undermine the Russian or Chinese nuclear second-strike capability.

Finally, these objectives for homeland missile defense lead to the crucial conclusion that even limited missile defenses can create fundamental strategic and deterrence effects. As such, one could reduce the scope, efficacy, and cost of the defense system required to generate the desired effects.

Missile defense and deterrence are complementary

Senior defense policymakers and strategists across Republican and Democratic administrations have long realized the complementary nature of deterrence and defense. One of the best such examples is in the 1999 congressional testimony of Walter Slocombe, the undersecretary of defense for policy in the Clinton administration, who on that day explained to the House Armed Services Committee the administration's plans to deploy defenses capable of protecting the US homeland against up to a few dozen North Korean ICBM warheads:

> Active defenses can play an important role in strengthening and complementing our overall deterrence policy. There is no contradiction between defenses and deterrence. At the core of deterrence is convincing an adversary that the assured negative consequences of an action greatly outweigh any potential positive results of that action. Thus, there are two sides to deterrence. The threat of retaliation drives home that the negative consequences would be huge. But it is also valuable for deterrence to reduce the chance that an attack would succeed in the first place; that is, to reduce the prospect of positive results. And missile defenses can do that.[83]

The Biden administration seems to share this view and explains that "missile defense and nuclear capabilities are complementary. US nuclear weapons present a credible threat of a robust response and overwhelming cost imposition, while missile defenses contribute to deterrence by denial."[84] Yet, the extent to which this strategic logic applies to Russian and Chinese nuclear ballistic missile threats to the homeland is unclear.

While this notion seems self-evident to most military planners, it has been a point of some debate between advocates and opponents of homeland missile defenses reaching back to the 1960s debate leading up to the 1972 ABM Treaty. One school of thought believes nuclear deterrence is best preserved through the maintenance of mutual vulnerability to nuclear counterstrikes—a theory of deterrence supposedly codified in the ABM Treaty. Yet there has always been an alternative view arguing that mutual vulnerability should not be the basis for deterrence—and that mutual vulnerability, by definition, makes it difficult for the United States to run risks on behalf of allies (thereby diminishing the credibility of extended deterrence). Adherents of the deterrence through mutual vulnerability school have drawn the conclusion that since it is necessary to "deter" (through the threat of retaliation), one, therefore, must not "defend."

The approach outlined in this study does not advocate a defense-only approach to military strategy. Rather, it argues that missile defenses—by increasing attacker uncertainty and reducing US vulnerability—contribute to the broader integrated deterrence approach by countering adversary strategy that increasingly relies on missile threats to the homeland to

83 *Hearing on US National Missile Defense Policy and the Anti-Ballistic Missile Treaty* [H.A.S.C. No. 106–33], US House Armed Services Committee (October 13, 1999) (testimony by Walter B. Slocombe, Undersecretary of Defense for Policy), 79, https://commdocs.house.gov/committees/security/has286000.000/has286000_0f.htm.

84 US Department of Defense, *2022 Missile Defense Review*, 5.

weaken US national will and prevent reinforcement of allies in a timely fashion.

Uncertainty's contribution to deterrence

Missile defenses do not have to work perfectly or be cost-prohibitive to have the intended strategic effect on adversaries—which is to convince them that conventional or nuclear missile attacks against the US homeland will not tilt conflicts in their favor—and that the consequences of these inconsequential attacks will make the attackers worse off or risk further intolerable escalation by the United States. The main objective, then, is to erase enemies' confidence in their success: either a large-scale preemptive attack against US nuclear retaliatory forces, or more limited strikes intended to coerce the United States at lower levels of the escalation ladder.

Uncertainty for deterrence is not a new concept. A few examples from the Cold War are instructive. Norman Augustine, a former undersecretary of the Army and distinguished aerospace executive, explains the advantage of uncertainty in this excerpt from a 1980s-era study on ballistic missile defense:

> Since deterrence is in the eye of the beholder, the cause of deterrence can be served merely by eroding the enemy's confidence in the success of an attack … Today a Soviet planner can calculate almost exactly how many reliable ballistic missiles are required to eliminate the strategic bomber bases, the command-and-control structure, the ICBM force, submarines in harbors, and so on. In contrast, a defense that can at the last minute be devoted in its full force to the protection of a specific subset of these assets makes high-confidence attacks difficult to carry out successfully, reduces the chances of silver bullet attacks against uniquely valuable targets, and makes survival strikes much less plausible.[85]

Henry Kissinger, former secretary of state and national security advisor (and architect of the 1972 ABM Treaty), in the 1980s, makes a similar point:

> Even granting as I do that a perfect defense of our population is almost certainly unattainable, the existence of some defense means that the attacker must plan on saturating it. This massively complicates the attacker's calculation. Anything that magnifies doubt inspires hesitation and adds to deterrence.[86]

As does Zbigniew Brzezinski, national security advisor to former President Jimmy Carter:

> A limited strategic defense … would have the key effect of introducing a high degree of randomness into any calculation of the consequences of a nuclear attack … this would enhance strategic deterrence and inhibit a Soviet conventional attack because it would provide the United States with the confidence needed for responding firmly on various levels of possible conflict.[87]

Contemplating a disarming first strike against the United States would be a huge gamble for any enemy. Yet, it is a gamble an enemy might take if convinced that the planned attack has a decent, calculated probability of success based on the number of weapons that could target key US nuclear forces and command-and-control. Injecting missile defenses into that calculation, regardless of presumed effectiveness, would raise so many doubts as to make that gamble too risky for the attacker. And for this purpose, missile defenses do not have to be perfect.

Homeland missile defense against two major nuclear powers

Today's nuclear deterrence problem is arguably more difficult than what the United States faced during the Cold War. Nevertheless, it is unlikely that the central principles of missile defense discussed above need reimagining.[88] As this report later explains in more detail (see Sections Six and Seven), there are two general conflict scenarios with Russia and China in which missile defenses may play an important role in the United States' broader integrated deterrence approach. The first concerns limited coercive strikes against the homeland by Russia and China, and the second involves larger-scale attacks against US nuclear forces by Russia, China, or a combination of the two, intended to prevent significant nuclear retaliation.

The deployment of even a modestly sized missile defense system can contribute to the deterrence of such attacks by creating uncertainty in the minds of the adversary leadership. Unable to calculate the odds of a successful attack and fearful of the resulting escalation, the adversary would likely choose restraint—or such is the hope. Without the complicating factor of missile defenses, the adversary still must make a difficult decision. However, with defenses, the problem would become appreciably more daunting to the adversary. In the first instance, the attacker cannot successfully calibrate an attack that is small enough to

85 Norman Augustine, in Ashton B. Carter and David E. Schwartz, *Ballistic Missile Defense* (Washington, DC: Brookings Institution Press, 1984), 371–72.

86 Zbigniew Brzezinski, ed., *Promise or Peril: The Strategic Defense Initiative* (Washington, DC: Ethics and Public Policy Center, 1986), 89–99.

87 Brzezinski, *Promise or Peril*, 65–66.

88 For examples of analyses along these lines see Creedon et al., *America's Strategic Posture: The Final Report*; Roberts et al., *China's Emergence as a Second Nuclear Peer*; Heather Williams et al., *Project Atom 2023: A Competitive Strategies Approach for US Nuclear Posture through 2035*, Center for Strategic and International Studies, September 29, 2023, https://www.csis.org/analysis/project-atom-2023.

coerce, yet not large enough to elicit a major nuclear response from the United States. In the second instance, the attacker is unsure of success in targeting US forces before they would disperse or launch against the attacker—a task made more difficult because the United States must maintain a strategic reserve capable of surviving a general nuclear exchange with the first adversary that would then be available against the second adversary. Limited, preferential defenses for US nuclear forces and nuclear command-and-control against Russian and Chinese attacks could help in this respect.

Impact on crisis stability and arms control

When assessing the role of enhanced missile defenses for the protection of the homeland, the discussion quickly turns to Russian and Chinese responses. While it is not unreasonable to ask how Moscow and Beijing might respond to expanded US homeland defenses, the answer to this question is harder to divine than most people imagine. There is no shortage of Russian and Chinese views—official and otherwise—to suggest that these countries will object to any expansion of US homeland missile defenses, as these states have done in the past for the expansion of virtually all US missile defense systems, including those theater missile defense systems deployed abroad to protect US forces, allies, and partners. Less appreciated, however, is the gap between what the Russians and Chinese say, and what they do or will do in response to US missile defense capabilities. Perhaps the best example of this "say-do" gap is the Russian reaction to the US withdrawal from the ABM Treaty in 2002. Based on Russia's complaints about US missile defenses during the Cold War (particularly the 1984 SDI), one would have expected Russia to respond to the US withdrawal by building up its nuclear arsenal. Instead, Russia joined the United States in reducing its nuclear arsenal by some two-thirds in the Moscow Treaty. If Russia were truly apprehensive about US homeland defenses, that would have been the time to expand, not contract, its nuclear forces.

In addition to the arms race stability argument, critics of homeland missile defense also suggest US missile defenses will increase incentives for a nuclear first strike during a crisis. Homeland missile defense, some argue, would make the Russians nervous during a crisis, fearing that the United States might strike first, believing that its missile defense system could deal with any resulting (and greatly weakened) Russian retaliation. The report goes into more later, but this is a highly unrealistic crisis scenario. US and Russian nuclear forces would be on alert, meaning the launch readiness of their respective nuclear forces compromise and eliminate the prospects for success of a surprise first strike from either side. Russia would gain nothing by launching first due to the protection of US nuclear forces afforded by the missile defense system. Not only would Moscow's attack fail to prevent retaliation, but Russia would suffer intolerable consequences.

Rather than revisit these arguments in comprehensive form, this study suggests a different way of thinking about the problem. The objectives for a US homeland missile defense system, as proposed in this study would, by definition and design, not be able to provide comprehensive protection for the US population—whether the United States struck first or second. With each of their second-strike capabilities intact, Russia and China would have little reason to begin an arms race to counter US missile defense deployments. Russia may continue to field in modest numbers the new novel nuclear systems it has developed (e.g., a long-range underwater nuclear torpedo and nuclear-powered and nuclear-armed cruise missile), but this would not add appreciably to the threat currently posed by Russia nor substantially impact the nuclear balance. Russia and China may also avail themselves of the homeland missile defense capabilities they currently have under development and deployed in small numbers to improve the survivability of their respective nuclear forces—but this would be a stable situation.

The central point is that the inherently limited nature of the proposed US homeland missile defense system could serve as a basis for assuaging Russian and Chinese concerns. Regardless of the likely success of such efforts, at the end of the day, the United States cannot allow Russia and China a veto over measures the United States deems necessary to assure its security and that of its allies. There may be unknown risks in going forward with expanded homeland defenses, but there are surely risks associated with maintaining the vulnerability of the United States to adversary missile strikes. A country unwilling to take measures to protect itself against these threats may be seen by adversaries and allies alike as unwilling to take risks during a crisis—this poses the greatest danger to deterrence.

Allies must also understand that US homeland missile defense makes Washington more likely—not less—to come to their aid and increases—rather than jeopardizes—strategic deterrence across the alliance. Historically, allies have manifested three primary concerns about US homeland missile defenses. First, allies have worried about strategic stability and arms racing. As explained above and throughout this report, those concerns are overblown and hypocritical (as Section Eleven explains). Indeed, as allies develop their homeland defenses against limited attacks, especially in Europe under the "Skyshield" initiative, it is becoming apparent that European capitals see a similar logic to what this study proposes.

Second, allies have long-standing concerns about decoupling, that is, the fear that an impervious defense of the US homeland would leave the United States less invested in the defense of its allies. The approach proposed here would do just the opposite, giving US political leadership increased confidence that it could run risks on behalf of allies and reduce the likelihood that adversary "cheap shops" could coerce Washington to abstain from intervening in defense of allies or sue for peace on terms unfavorable for allies.

Third, the United Kingdom and France worry that a marked improvement in Russian and Chinese strategic missile defenses

(perhaps driven by US developments in this area) could reduce the credibility of these states’ nuclear arsenals. It is in the national interest of the United States for the United Kingdom and France to have confidence in their nuclear deterrents, and the separate decision-making centers for nuclear use in these countries contribute to overall strategic deterrence. Regardless of the drivers of Russian and Chinese strategic missile defenses, the United States should work with its nuclear-armed allies to ensure they retain confidence in their strategic deterrence even as adversary strategic defenses improve.

Section four: Staying ahead of North Korea

Introduction

The long-range, nuclear-armed missile threat from North Korea is today the primary motivator for HBMD in the United States. To address the expanding North Korean ICBM threat to the US homeland, US HBMD will need to become more robust to contribute to comprehensive missile defeat. While it is difficult to judge from open sources, planned upgrades will make defenses significantly more capable against the current North Korean ICBM threat. Although the United States has in the past deterred adversaries and assured allies without the benefit of comprehensive population HBMD, doing so has costs in terms of proliferation and other measures needed to achieve assurance in the absence of HBMD. While the upgraded defenses will have a very limited latent capability against a small quantity of incoming ballistic missiles from Russia or China, the defenses proposed in this paper are insufficient to threaten these states' assured retaliation and seem unlikely to completely defeat their most likely modes of limited missile attack on the US homeland.

This study argues that the United States should maintain a population defense against North Korean ICBMs through comprehensive missile defeat because the costs of assurance and risks of proliferation would be too high in the absence of such an approach. Moreover, HBMD scoped to the North Korean ICBM threat delivers a vital contribution to the defense against coercive attacks and combined disarming strikes, as argued later in the paper.

This section begins by explaining the current US nuclear deterrence and missile defense strategy toward North Korea, assessing the growth of North Korean nuclear and missile capabilities, and evaluating whether current US strategy is sustainable. Next, it assesses the costs and disadvantages of relying solely on deterrence by punishment for North Korea. Finally, it examines the implications of a US HBMD system scoped to the evolving North Korean threat for strategic stability with—and defense against—Russia and China.

Can current US policy hold as the North Korean missile threat grows?

Current US nuclear deterrence and missile defense policy toward North Korea—to defend the entire US population through comprehensive missile defeat and to end the Kim regime in the event of any nuclear use—can be maintained even as North Korea's nuclear and ICBM arsenals expand, but doing so will require that planned upgrades to US HBMD proceed apace and may require exploration of new systems.

Current US nuclear deterrence and missile defeat policy for North Korea

The current US nuclear deterrence and missile defense policy toward North Korea is essentially a nuclear superiority approach. The United States threatens to terminate the Kim regime in the event of any nuclear weapons use. And Washington plans to use a combination of direct strikes on Pyongyang's missile launchers, available non-kinetic tools, and active missile defenses to counter any possible North Korean missile launch.

The United States makes a deterrence-by-punishment threat to North Korea that is unique among US tailored deterrent approaches. The 2022 NPR states that "any nuclear attack by North Korea against the United States or its Allies and partners is unacceptable and will result in the end of [the Kim] regime. There is no scenario in which the Kim regime could employ nuclear weapons and survive."[89] Making this pledge credible is quite a demanding task for the United States. Washington must threaten, even in response to limited nuclear use by North Korea (say, a North Korean nuclear attack on a South Korean naval vessel which kills only a few dozen sailors), to eliminate the Kim regime.

This is especially challenging since North Korea's nuclear strategy includes threatening intercontinental nuclear strikes on the US homeland to split the US alliance with Japan and South Korea, as well as possibly backstop limited nuclear use in the region, including for battlefield purposes. Pyongyang would also consider counter-value strikes on Japan and South Korea. Finally, North Korea has laid out a "fail deadly" posture, in which attacks on North Korean nuclear forces, nuclear command-and-control, or the Kim regime itself would trigger an "automatic" nuclear counterattack.[90] Since the stated US goal is regime elimination, then the Kim regime has no reason not to order an all-out attack. For the US threat to be credible, then, US forces must be able to eliminate the North Korean intercontinental nuclear threat through attack operations and active defenses.

In the words of the 2022 MDR, "as the scale and the complexity of [North Korea's] missile capabilities increase, the United States will also continue to stay ahead of North Korean missile threats to the homeland through a comprehensive missile defeat approach, complemented by the credible threat of direct cost imposition through nuclear and non-nuclear

89 US Department of Defense, *2022 Nuclear Posture Review*, 12.

90 James M. Acton and Ankit Panda, "North Korea's Doctrinal Shifts Are More Dangerous Than Missile Launches," *Foreign Policy*, November 4, 2022, https://foreignpolicy.com/2022/11/04/north-korea-nuclear-doctrine-more-dangerous-than-missile-launches/.

means."[91] Comprehensive missile defeat therefore includes counterproliferation efforts to impede Pyongyang's missile development and testing, so-called "left-of-launch" operations to destroy nuclear missiles and their associated equipment before ignition, and active missile defense to intercept North Korean weapons.

Through counterproliferation activities, the United States and its allies and partners work to constrain North Korea's WMD and ballistic missile programs by preventing Pyongyang's acquisition of technology relevant to these programs and imposing sanctions that punish proliferation and restrict the resources available. Economic sanctions on North Korea include limits or bans on its imports and exports of weapons and dual-use technologies, hydrocarbons, foodstuffs, textiles, luxury goods, and industrial products and components; prohibitions on North Korean nationals working abroad; and requirements to counteract vessels engaged in sanctioned activity; among other measures.[92] North Korea's global campaign to evade these sanctions is robust and is a major focus of US, allied, and partner counterproliferation efforts. Russia and China have played significant roles in allowing the DPRK to evade certain sanctions. Moreover, in April 2024, Russia vetoed the renewal of a key UN panel charged with detailing violations.[93]

Through left-of-launch operations, the United States would attempt to destroy North Korean ICBMs (and other nuclear missiles) before Pyongyang could launch them by using a range of kinetic and non-kinetic strike capabilities. Public discussion of those capabilities is limited, but, Guillot, in his March 2024 statement as the USNORTHCOM and NORAD commander to the US Senate Armed Services Committee (SASC), said, "It is a near certainty that homeland defense in the coming years will rely less on point defense and traditional kinetic defeat mechanisms in favor of area defense and left-of-launch effects that take full advantage of multi-domain capabilities."[94] There is speculation in the news media that some failures of Pyongyang's missile programs are attributable to US cyber and electronic interference.[95]

91 US Department of Defense, *2022 Missile Defense Review,* 1.

92 Sarah Heintz, Michael Shurkin, and King Mallory, *DPRK Sanctions: Countering DPRK Proliferation Activities*, RAND, April 29, 2019, https://www.rand.org/pubs/tools/TL332.html.

93 Kelsey Davenport, "Russia Ends North Korean Sanctions Panel," *Arms Control Today*, May 2024, https://www.armscontrol.org/act/2024-05/news/russia-ends-north-korean-sanctions-panel.

94 "Statement of General Gregory M. Guillot, United States Air Force, Commander, United States Northern Command and North American Aerospace Defense Command," US Senate Armed Services Committee, 118th Congress (March 14, 2024), https://www.armed-services.senate.gov/imo/media/doc/guillot_statement_31424.pdf.

95 See Alexis Lavi and Matthew Flug, "Failed North Korean Missile Tests: Faulty Engineering or a Covert US Offensive Plan?" The Diplomat, April 27, 2017, https://thediplomat.com/2017/04/failed-north-korean-missile-tests-faulty-engineering-or-a-covert-us-offensive-plan/; William J. Broad and David E. Sanger, "US Strategy to Hobble North Korea Was Hidden in Plain Sight," *New York*

US F-35 fighter jets from the 356th Expeditionary Fighter Squadron conduct combined training with the Republic of Korea Air Force, July 5, 2022. Source: US Indo-Pacific Command.

Attack operations on North Korean forces would be a whole-of-alliance activity. The Republic of Korea (South Korea) has a "kill chain" concept and plans to integrate strike forces (such as its ballistic missiles and F-35A strike fighters) into its own Strategic Command to carry out such attacks.[96] One US Marine Corps general suggested that ROK Strategic Command would plan to engage in "counter-nuclear operations, conventional nuclear integration, and conventional support to nuclear operations."[97]

A successful test flight of the SM-3 Block IIA missile in 2015 by the Missile Development Agency, US Navy, and Japanese Ministry of Defense in Point Mugu Sea Range, San Nicolas Island, California. Source: Ralph Scott/Missile Defense Agency.

Finally, the United States deploys a limited number of exo-atmospheric midcourse interceptors to actively defend against incoming North Korean ballistic missiles. The United States fields a force of forty-four silo-based GBIs capable of intercepting North Korean reentry vehicles (RVs) in the midcourse phase, that a variety of space-, land-, and sea-based sensors support. On November 16, 2020, the United States successfully shot down an ICBM-class target with the Standard Missile (SM) 3 block IIA missile, which was originally designed against intermediate-range ballistic missiles (IRBMs).[98] The SM-3 could therefore play a role in a layered defense of the US homeland from North Korean ballistic missiles. (See Section Nine for a more thorough explanation of the current US HBMD system.)

Current and projected North Korean nuclear-armed long-range missile threat to the United States

The 2022 NPR recognizes that North Korea presents a "persistent threat and growing danger to the US homeland and the Indo-Pacific region as it expands, diversifies, and improves its nuclear, ballistic missile, and non-nuclear capabilities. …"[99] And 2022 MDR elaborates that "North Korea continues to improve, expand, and diversify its conventional and nuclear missile capabilities, posing an increasing risk to the US homeland. …"[100] While North Korea's existing long-range nuclear missile arsenal would already stress US countermeasures, at least four factors in the development of North Korea's long-range nuclear force further complicate US comprehensive missile defeat and defense operations: solid fueling, multiple independently targetable reentry vehicle (MIRV) arming, countermeasures, and growth in launcher count.

North Korea has tested intercontinental missiles of increasing range and sophistication. In 2017, Pyongyang tested its first two ICBM-class missiles—the Hwasong-14 and -15—on lofted trajectories; both missiles are road mobile and liquid-fueled.[101] In 2022, Pyongyang conducted three lofted-trajectory tests of a

Times, March 4, 2017, https://www.nytimes.com/2017/03/04/world/asia/left-of-launch-missile-defense.html; David E. Sanger and William J. Broad, "Trump Inherits a Secret Cyberwar Against North Korean Missiles," March 4, 2017, https://www.nytimes.com/2017/03/04/world/asia/north-korea-missile-program-sabotage.html.

96 Josh Smith, "South Korea Doubles Down on Risky 'Kill Chain' Plans to Counter North Korea Nuclear Threat," Reuters, July 25, 2022, https://www.reuters.com/world/skorea-doubles-down-risky-kill-chain-plans-counter-nkorea-nuclear-threat-2022-07-26/.

97 Brian N. Wolford et al., "Recognizing the Increasing Importance of the US-ROK Alliance," podcast transcript, "Decisive Point" podcast, US Army War College, May 20, 2024, https://media.defense.gov/2024/May/30/2003475800/-1/-1/0/DP-5-7-WOLFORD-TRANSCRIPT.PDF.

98 "US Successfully Conducts SM-3 Block IIA Intercept Test Against an Intercontinental Ballistic Missile Target," US Department of Defense, press release, November 17, 2020, https://www.defense.gov/News/Releases/Release/Article/2417334/us-successfully-conducts-sm-3-block-iia-intercept-test-against-an-intercontinen/.

99 US Department of Defense, *2022 Nuclear Posture Review*, 5.

100 US Department of Defense, *2022 Missile Defense Review*, 3.

101 US Department of Defense, *2022 Missile Defense Review*, 3.

new ICBM dubbed the Hwasong-17.[102] The US Defense Intelligence Agency assessed this missile as "probably designed to deliver multiple warheads."[103] Most recently, North Korea paraded the Hwasong-18 solid-fueled road-mobile missile and then flight tested it three times in 2023.[104] Solid fueling is a major advancement for Pyongyang. It is generally very difficult to store or move liquid-fueled missiles while fueled, which often requires positioning them before fueling. The missile is highly vulnerable to attack operations during this hours-long process. A more widespread combination of mobility and solid fueling would likely degrade US missile defeat operations. North Korea is also developing countermeasures for its ICBMs, which would complicate US attempts at interception.

In addition to the improvement in the quality of the North's missiles, the quantity of the missiles and their attendant transporter-erector-launchers (TELs) is growing. In 2023, Pyongyang paraded eleven Hwasong-17 ICBMs.[105] Since the "publicly stated shot doctrine for the GMD [Ground-based Midcourse Defense] system is four to five interceptors per one incoming ICBM," that may indicate that the North could overwhelm existing US defenses (in a worst-case scenario in which all North Korean weapons worked as expected and the United States and allies were unable to strike before launch).[106] More importantly, perhaps, than the number of missiles paraded at one point in time is Pyongyang's ability to indigenously manufacture heavy TELs, a capability which had previously been a limiting factor, but which Kim Jong-Un highlighted in a recent visit.[107] (The North is also exploring rail-mobile launchers, which would further complicate US and allied attack operations. Shorter-range missiles are already armed on rail launchers.)[108]

Pyongyang continues its development and testing of space-launch vehicles (SLV), in violation of UN Security Council mandates. SLV testing helps the DPRK develop missile technology and test other components necessary for a successful ICBM strike. Russia is actively assisting North Korea in this effort.[109]

North Korea has steadily expanded its stockpile of fissile material, and nongovernmental experts assess a growth in the size of its nuclear arsenal. While there is no public US government estimate of North Korea's nuclear arsenal, a 2024 estimate from the well-regarded "Nuclear Notebook" lists fissile material sufficient for up to ninety warheads, of which fifty might be deliverable by missiles.[110] A Congressional Research Service (CRS) survey of open-source estimates reports a range of fissile material sufficient for twenty to sixty warheads.[111] In September 2023, Kim called for an "exponential" increase in Pyongyang's nuclear arsenal, a policy that the country's legislature endorsed in a constitutional amendment.[112] One RAND report estimates that Pyongyang could grow its nuclear arsenal to up to two hundred warheads by 2030.[113]

There are several key uncertainties in the degree of threat that North Korea's nuclear program will pose as it progresses. North Korea has never tested a RV for its ICBMs on a minimum energy trajectory, so it remains unclear if its nuclear weapons can survive reentry into Earth's atmosphere. (Several nongovernmental experts assess that Pyongyang would not face difficulty

102 Mitch Shin, "North Korea Confirms Hwasong-17 ICBM Test," *The Diplomat*, March 17, 2023, https://thediplomat.com/2023/03/north-korea-confirms-hwasong-17-icbm-test/.

103 Mary Beth D. Nikitin, "North Korea's Nuclear Weapons and Missile Programs," Congressional Research Service, December 19, 2023, https://crsreports.congress.gov/product/pdf/IF/IF10472/29.

104 Victor Cha and Ellen Kim, "North Korea Warns with Fifth ICBM Test," Center for Strategic and International Studies, December 19, 2023, https://www.csis.org/analysis/north-korea-warns-fifth-icbm-test.

105 Alexander Ward, "North Korea Displays Enough ICBMs to Overwhelm US Defense System against Them," *Politico*, February 9, 2023, https://www.politico.com/news/2023/02/08/north-korea-missile-capability-icbms-00081993. It is possible that Pyongyang is intentionally inflating its apparent number of TELs, reminiscent of Soviet military parades in which heavy bombers would circle Moscow to inflate Western observers' counts of their total strength. Ethan Jewell, "North Korea may Have More Mobile Launchers for Its ICBMs Than Previously Known," *NKNews*, April 27, 2022, https://www.nknews.org/2022/04/north-korea-may-have-more-mobile-launchers-for-its-icbms-than-previously-known/.

106 Fiscal Year 2024 Budget Request for Missile Defense and Missile Defeat Programs, Strategic Forces Subcommittee, House Armed Services Committee, 118th Congress, April 18, 2023, https://www.congress.gov/event/118th-congress/house-event/LC72450/text.

107 "North Korea's Kim Calls for Boosting Missile Launch Vehicle Production -KCNA," Reuters, January 4, 2024, https://www.reuters.com/world/asia-pacific/north-koreas-kim-calls-boosting-missile-launch-vehicle-production-kcna-2024-01-04/.

108 Joseph S. Bermudez, Jr., "What is the Significance of North Korea's Rail-Mobile Ballistic Missile Launcher?" Center for Strategic and International Studies, September 29, 2021, https://www.csis.org/analysis/what-significance-north-koreas-rail-mobile-ballistic-missile-launcher.

109 Robert G. Joseph and Peppino A. DeBiaso, "Homeland Missile Defense: Responding to a Transformed Security Environment," *Journal of Policy and Strategy* 4, no. 2 (2024): 37–51, https://nipp.org/wp-content/uploads/2024/06/Analysis-Joseph-DeBiaso-4.2.pdf.

110 Hans M. Kristensen et al., "North Korean Nuclear Weapons, 2024," *Bulletin of the Atomic Scientists* 80, no. 4 (2024): 251–71, https://www.tandfonline.com/doi/epdf/10.1080/00963402.2024.2365013?needAccess=true.

111 Nikitin, "North Korea's Nuclear Weapons and Missile Programs."

112 Kim Tong-Hyung, "North Korean leader urges greater nuclear weapons production in response to a 'new Cold War,'" Associated Press, September 28, 2023, https://apnews.com/article/north-korea-kim-cold-war-nuclear-72087705d2276860fbe4edd999930ba8.

113 Bruce W. Bennett et al., *Countering the Risks of North Korean Nuclear Weapons*, RAND, April 12, 2021, https://www.rand.org/pubs/perspectives/PEA1015-1.html.

doing so.)[114] For that matter, despite analysis of the capability of North Korean ICBMs, based on size and throw weight, to deliver multiple warheads and decoys, there has been no open-source documentation of Pyongyang testing multiple reentry vehicles (MRVs), post-boost vehicles (PBVs), MIRVs, or penaids. (In June 2024, North Korea claimed to have tested underlying technology for a MIRV; South Korean officials cast doubt on this claim.)[115] Preventing North Korea from testing these systems, in the view of some distinguished Korea watchers, should be a top priority for US policy toward Pyongyang.[116]

Even still, the current and ongoing developments in North Korea's nuclear weapons program are likely to pose severe challenges to the current US HBMD system.

It is worth noting the missile threats from North Korea that are unlikely to impact the US homeland in the timeframe of this study. North Korea fields a variety of cruise missiles, but does not possess the surface, submarine, or long-range aviation force necessary to threaten the US homeland with those weapons, and such developments are unlikely in the coming decade.

Similarly, at the time of writing, in June 2024, a North Korean missile test described as "hypersonic" failed midair. The range and mode of the missile were not immediately clear.[117] An April 2024 test of a short-range hypersonic glide vehicle (HGV) did not demonstrate key characteristics of a meaningful hypersonic capability.[118] North Korea has claimed to have armed its Hwasong-16b IRBM with an HGV, putting the US territories of Guam and Wake Island potentially in range.[119] While North Korea may develop some HGV capability in the coming decade, it is unlikely to pose a credible threat to the contiguous United States.

Finally, North Korea is also developing a submarine-launched ballistic missile (SLBM) capability. Pyongyang successfully tested its first SLBM, the Pukguksong-1, in 2016 and 2017, from a Sinpo-class diesel-powered submarine.[120] It also strains credulity that North Korea could, in the coming years, develop ballistic missile submarines capable of deterrence patrols in the Pacific and with sufficiently long-range SLBMs to threaten the contiguous United States.

It is possible that North Korea could pose a nuclear-armed fractional orbital bombardment system (FOBS) or multiple orbital bombardment system (MOBS) threat to the United States. Analysts have noted that existing North Korean satellites are in a similar orbit to planned Soviet FOBS.[121] Pyongyang would not likely worry about the escalatory implications or diplomatic consequences of placing a nuclear weapon in orbit. There is no indication at present that North Korea is pursuing such a capability.

A key uncertainty in the progress of North Korea's nuclear and long-range missile arsenal is the degree of restraint—or more likely encouragement—that Russia and China provide. North Korea supplies thousands of infantry soldiers, artillery, missiles, and other systems to Russia in support of its illegal war of aggression against Ukraine.[122] Pyongyang receives in exchange cash, battlefield testing experience for its kit, and diplomatic chits with Moscow that culminated in an upgraded bilateral relationship announced in June 2024.

Sufficiency of current and planned US HBMD against North Korea

Given current US nuclear deterrence and missile defense policy and North Korea's advancing nuclear and long-range missile capabilities, are the planned upgrades to US HBMD sufficient? It is not clear.

In the words of the 2022 MDR, "As North Korean ballistic missile threats to the US homeland continue to evolve, the United States is committed to improving the capability and reliability of the GMD system. This includes development of the Next Generation Interceptor (NGI) to augment and potentially replace the existing Ground-Based Interceptors (GBI)."[123] The United States is modernizing GMD through NGI—slated to be online by the

114 Kristensen et al., "North Korean Nuclear Weapons, 2024."

115 Choe Sang-Hun, "North Korea Says It Tested Multiple-Warhead Missile Technology," *New York Times*, June 26, 2024, https://www.nytimes.com/2024/06/26/world/asia/north-korea-missile-test.html.

116 Markus Garlauskas, "Proactively Countering North Korea's Advancing Nuclear Threat," Atlantic Council, December 23, 2021, https://www.atlanticcouncil.org/in-depth-research-reports/report/proactively-countering-north-koreas-advancing-nuclear-threat/.

117 Hyung-Jin Kim, "Suspected North Korean Hypersonic Missile Exploded in Flight, South Korea Says," Associated Press, June 26, 2024, https://apnews.com/article/north-korea-missile-launch-south-korea-2e5e567b5e556fa89093334501798712#.

118 Bruce W. Bennett, "Did North Korea Really Test a Hypersonic Missile?," *National Interest*, April 9, 2024, https://nationalinterest.org/blog/korea-watch/did-north-korea-really-test-hypersonic-missile-210482.

119 A. B. Abrams, "North Korea's New Hwasong-16B Hypersonic Glider Heralds a New Missile Era," Diplomat, April 13, 2024, https://thediplomat.com/2024/04/north-koreas-new-hwasong-16b-hypersonic-glider-heralds-a-new-missile-era/.

120 Missile Threat, "Pukguksong-1 (KN-11)," Missile Defense Project, Center for Strategic and International Studies, August 29, 2016, last updated April 23, 2024, https://missilethreat.csis.org/missile/kn-11/.

121 Peter Vincent Pry, *North Korea: EMP Threat, North Korea's Capabilities for Electromagnetic Pulse (EMP) Attack*, EMP Task Force on National and Homeland Security, June 6, 2021, https://apps.dtic.mil/sti/trecms/pdf/AD1135779.pdf.

122 William Tobey, "The Effects of the War in Ukraine on NNSA Missions," in *The Inflection Point in the US Nuclear Security Enterprise*, Brad Roberts and William Tobey, eds., *Center for Global Security Research*, Lawrence Livermore National Laboratory and Office of National Security and International Studies, Los Alamos National Laboratory, (October 2023), 24, https://cgsr.llnl.gov/content/assets/docs/CGSR-Inflection-OP-FullBook-10-04-2023-v4-Web.pdf.

123 US Department of Defense, *2022 Missile Defense Review*, 6.

end FY 2028. Each NGI will feature multiple kill vehicles, able to intercept multiple objects—whether they be warheads or decoys.[124] However, in June 2024, the US Government Accountability Office (GAO) identified risks to the realism of the modeling and testing that the NGI will undergo.[125] The MDA also conducts a SLEP specific to a subset of the oldest existing GBIs to improve their reliability and service life, given their age.[126]

The United States is also upgrading its sensor network to complement these improved effectors. For instance, the Long-Range Discrimination Radar (LRDR), an S-band radar at Clear Space Force Station in Alaska, should achieve full operating capability in early 2025; the LRDR is slated to enhance discrimination between RVs and decoys.[127] In addition, the Space Development Agency's (SDA) planned Proliferated Warfighter Space Architecture (PWSA) is slated to include sensors in support HBMD. Through its so-called "tracking layer," the PWSA's tranche one (slated to launch in 2025) will provide missile warning and missile tracking capabilities; tranche two and further demonstrations are expected to provide fire-control-quality tracking and cueing for missile defense.[128] (See Section Nine for a more thorough description of the planned sensor upgrades.)

Given the uncertain timeframe and performance of the NGI; the uncertain success of US attack operations against North Korean road-mobile, solid-fueled ICBMs; and the uncertain pace of North Korean warhead, missile, and launcher building, it is not possible to assess with any confidence the sufficiency of the existing program of record to "stay ahead" of the North Korean threat.

Is there an alternative? Will deterrence by punishment work?

Though critics argue that the United States should accept a nuclear deterrence relationship with North Korea centered around deterrence by punishment, taking that approach would have grave repercussions for US grand strategy, principally through the risks of assurance to the ROK and Japan.

Assurance and US nuclear and missile defense strategy

Assuring US extended nuclear deterrence allies that the United States is willing to use nuclear weapons on their behalf is perhaps the most vexing challenge of US nuclear strategy. Indeed, the 2022 NPR recognizes that the network of US alliances globally is "a military center of gravity" and that "US extended nuclear deterrence is foundational to this network." Moreover, the NPR states, "Allies must be confident that the United States is willing and able to deter the range of strategic threats they face, and mitigate the risks they will assume in a crisis or conflict."[129] Furthermore, as the 2022 MDR states, "missile defense systems such as the GMD … reassure[s] Allies and partners that the United States will not be coerced by threats to the homeland from states like North Korea. …"[130]

State of US nuclear assurance to South Korea and Japan today and consequences of its failure

North Korea's growing nuclear arsenal is stressing extended deterrence in South Korea and Japan, though proximity and a different attitude toward nuclear weapons means that these concerns are more dire in Seoul than they are in Tokyo.

In the years since North Korea's test of an ICBM capable of striking the US homeland, South Korea's leaders and public are demonstrating an increased skepticism of US extended deterrence and interest in developing indigenous ROK nuclear weapons. In January 2023, ROK President Yoon Suk Yeol publicly mused that Seoul would consider developing its own nuclear weapons or asking for US nuclear forces to be deployed to the Peninsula, should the nuclear threat from Pyongyang continue to escalate.[131] In June 2024, following a Russian announcement that seemed tantamount to a mutual defense pledge with North Korea, leading South Korean politicians called for the ROK to develop nuclear capabilities, with one leader even going so far as to call for Seoul to withdraw from the Nuclear Nonproliferation Treaty (NPT) to do

124 "US Missile Defense Agency Selects Lockheed Martin To Provide Its Next Generation Interceptor," Lockheed Martin Corporation, press release, April 15, 2024, https://news.lockheedmartin.com/2024-04-15-U-S-Missile-Defense-Agency-selects-Lockheed-Martin-to-provide-its-Next-Generation-Interceptor.

125 "Missile Defense: Next Generation Interceptor Program Should Take Steps to Reduce Risk and Improve Efficiency," US Government Accountability Office, GAO-24-106315, June 26, 2024, https://www.gao.gov/products/gao-24-106315. The DOD had not responded to this assessment at the time of writing.

126 Vice Adm. Jon A. Hill and Michelle C. Atkinson, "Missile Defense Agency Officials Hold a Press Briefing on President Biden's Fiscal 2024 Missile Defense Budget (Transcript)," US Department of Defense, March 14, 2023, https://www.defense.gov/News/Transcripts/Transcript/Article/3328637/missile-defense-agency-officials-hold-a-press-briefing-on-president-bidens-fisc/.

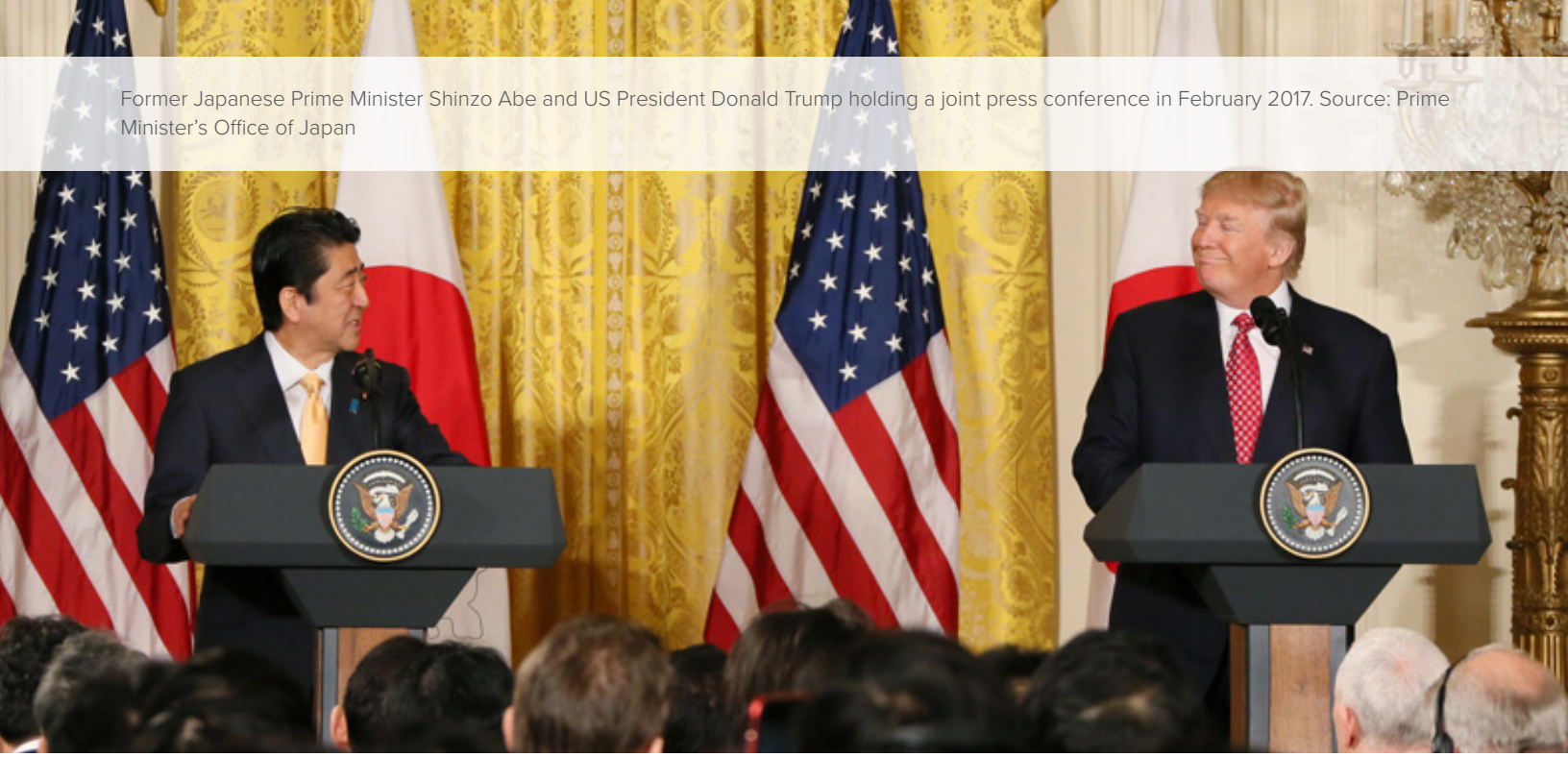
127 "Long Range Discrimination Radar (LRDR)," Lockheed Martin Corporation, n.d., https://www.lockheedmartin.com/en-us/products/long-range-discrimination-radar.html.

128 "Proliferated Warfighter Space Architecture (PWSA) Tracking Layer," US Space Development Agency, October 2023, https://www.sda.mil/wp-content/uploads/2023/11/Tracking-Layer-Fact-Sheet_FINAL_Oct-2023-1.pdf.

129 US Department of Defense, *2022 Nuclear Posture Review*, 8.

130 US Department of Defense, *2022 Missile Defense Review*, 6.

131 Choe Sang-Hun, "In a First, South Korea Declares Nuclear Weapons a Policy Option," *New York Times*, January 12, 2023, https://www.nytimes.com/2023/01/12/world/asia/south-korea-nuclear-weapons.html.



Former Japanese Prime Minister Shinzo Abe and US President Donald Trump holding a joint press conference in February 2017. Source: Prime Minister's Office of Japan

so.[132] Another senior politician from the ruling People Power Party vowed to include the pursuit of nuclear weapons in the party's political platform.[133] The same month, a South Korean state-run think tank released a report explicitly linking the North Korean ability to hold the US homeland at risk with South Korean doubts in US extended deterrence commitments.[134] (The more liberal Democratic Party, currently in opposition, is far less sanguine on ROK nuclear capabilities, and some of its representatives condemned statements in favor of South Korean nuclear weapons.)[135] Pro-nuclear sentiments are not limited to political leadership. According to a Chicago Council on Global Affairs opinion poll in February 2022, a remarkable 71 percent of South Koreans supported an indigenous nuclear weapons program, and a majority supported the deployment of US nuclear weapons.[136]

In response to the worsening security environment and risks to the assurance of Seoul, President Joe Biden and President Yoon held an April 2023 summit and issued the Washington Declaration, spelling out several steps to strengthen extended deterrence. These included the routine visit of US strategic assets to the ROK (including existing strategic bomber overflights and renewed ballistic missile submarine port visits), the stand-up of a US-ROK Nuclear Consultative Group (NCG), enhanced ROK conventional support to US nuclear operations, increased scenario-based exercises for nuclear contingencies, etc. The ROK, for its part, reaffirmed its commitments under the NPT to not acquire nuclear weapons.[137] The NCG held its third meeting in June 2024.[138] ROK Prime Minister Han Duck-soo reaffirmed that the additional measures implemented following the Washington Declaration were sufficient for Seoul's assurance "for now" without developing or hosting nuclear capabilities.[139]

Japan is also taking steps to enhance its deterrence capabilities and the extended deterrence relationship with the United States, even though Tokyo mutes its concerns about US vulnerability to North Korean missile attack more than Seoul. Japanese politicians have floated the need for an indigenous

132 Kim Seung-yeon, "Deepening Russia-N.K. Ties Reignite Debate over S. Korea's Nuclear Options," Yonhap News Agency, June 26, 2024, https://en.yna.co.kr/view/AEN20240626005000315?section=features/features.

133 Lee Haye-ah, "PM Says S. Korea Not at Stage to Consider Nuclear Armament 'for Now,'" Yonhap News Agency, June 26, 2024, https://en.yna.co.kr/view/AEN20240626006100315.

134 Jesse Johnson, "State-Run Think Tank Makes Rare Call for Seoul to Consider Own Nukes," *Japan Times*, June 25, 2024, https://www.japantimes.co.jp/news/2024/06/25/asia-pacific/politics/south-korea-nuclear-weapons-think-tank/.

135 Yi Wonju, "DP Says PPP's Calls for Nuclear Armament 'Extremely Dangerous,'" Yonhap News Agency, June 26, 2024, https://en.yna.co.kr/view/AEN20240626006000315.

136 Toby Dalton, Karl Friedhoff, and Lami Kim, *Thinking Nuclear: South Korean Attitudes on Nuclear Weapons*, Chicago Council on World Affairs, February 21, 2022, https://globalaffairs.org/research/public-opinion-survey/thinking-nuclear-south-korean-attitudes-nuclear-weapons.

137 "Washington Declaration," White House, April 26, 2023, https://www.whitehouse.gov/briefing-room/statements-releases/2023/04/26/washington-declaration-2/.

138 US Mission Korea, "Joint Press Statement on the 3rd Nuclear Consultative Group (NCG) Meeting," US Embassy and Consulate in the Republic of Korea, press release, June 10, 2024, https://kr.usembassy.gov/061124-joint-press-statement-on-the-3rd-nuclear-consultative-group-ncg-meeting/.

139 Lee, "PM Says S. Korea Not at Stage to Consider Nuclear Armament 'for Now.'"

Japanese nuclear program since the Cold War, and events like North Korea's nuclear weapons tests and missile tests often provoke similar reactions.[140] Then-Japanese Prime Minister Shinzo Abe pointed out in 2016 after a North Korean missile test the challenge that system poses to the United States.[141] In response to a December 2023 test of the Hwasong-18, Japan's Parliamentary Vice Minister of Defense Shingo Miyake made a point of noting that the missile could range the continental United States.[142] That senior Japanese officials call attention to the ability of North Korea to hold the US homeland at risk demonstrates the impact that US homeland vulnerability has on assurance to allies.

To address these concerns, Japan is enhancing its conventional forces and deepening its extended deterrence relationship with the United States; calls for nuclear sharing or nuclear modernization are also present but lack the public support evident across the Korea Strait. Japan has increased its conventional military capabilities, revising its constitution to allow for a greater range of military operations, raising its defense budget to 2 percent of gross domestic product, and developing so-called "counterstrike" capabilities for long-range conventional precision strikes.[143] Notably, a justification for these capabilities is to complement a missile defeat approach for North Korean nuclear weapons.[144] While not explicitly conducted in a nuclear context, the Japanese military has conducted joint exercises with US nuclear-capable bombers.[145] Since 2010, the United States and Japan have conducted the Extended Deterrence Dialogue. The latest edition, held in June 2024, covered measures to enhance extended deterrence, exchange views on strategic threats in the Indo-Pacific region, and improve coordination on missile defense. Japanese officials also participated in a tabletop exercise and viewed US ICBM facilities.[146] The United States, Japan, and the ROK are also deepening trilateral cooperation on several fronts, including a facility to exchange real-time missile tracking and missile warning information on North Korean missile launches.[147]

While Japanese political and national security leadership has raised consideration of nuclear sharing, public support has not materialized for this idea. Japan, of course, is the only nation to suffer atomic bombings in wartime and has made countering nuclear dangers a centerpiece of its foreign policy. US nuclear weapons were withdrawn from the Japanese island of Okinawa after it reverted to Japanese control in 1972.[148] For decades, Japan has benefitted from a robust civilian nuclear power program, including a domestic nuclear fuel cycle, giving Japan so-called "nuclear latency," or the ability to develop nuclear weapons quickly in exigent circumstances.[149] Following the Russian re-invasion of Ukraine in 2022, then-former Prime Minister Shinzo Abe called for a national debate in Japan on adopting a NATO-like nuclear-sharing arrangement, a position endorsed by some influential Japanese leaders.[150] Unlike in the ROK, however, Japanese public opinion is not firmly in favor of moving in this direction. While polling after Abe's statement indicated an openness to have such a debate, the government of current Prime Minister Fumio Kishida (incidentally a representative from Hiroshima) has disavowed the pursuit of nuclear sharing.[151]

Instead of nuclear sharing, the Japanese strategic community remains more focused on US theater nuclear forces that do not require basing on Japanese territory. Japanese officials registered objections to the Obama administration's retirement of the nuclear-armed Tomahawk land-attack missile (TLAM/N). Moreover, consultation with Japanese government officials helped inform the Trump administration's decision to call for the nuclear-armed sea-launched cruise missile (SLCM-N). While the development of this weapon would be a welcome contribution to US strategic posture in the region, its deploy-

140 Sayuri Romei, "Japan and the Nuclear Challenge in a New Era of Rising Tensions: Balancing Between Disarmament and Deterrence," *Journal of Indo-Pacific Studies* 2, No. 3 (Fall 2019): 66–84, https://www.airuniversity.af.edu/Portals/10/JIPA/journals/Volume-02_Issue-3/04-Romei.pdf.

141 Romei, "Japan and the Nuclear Challenge in a New Era of Rising Tensions."

142 "North Korea Fires ICBM-Class Missile After Condemning 'War' Moves," Reuters, December 18, 2023, https://www.reuters.com/world/asia-pacific/north-korea-says-it-conducted-hwasong-18-icbm-monday-yonhap-2023-12-18/.

143 Jingdong Yuan, "Japan's New Military Policies: Origins and Implications," Stockholm International Peace Research Institute, February 2, 2023, https://www.sipri.org/commentary/blog/2023/japans-new-military-policies-origins-and-implications.

144 Yuki Tatsumi, Pamela Kennedy, and Kenji Nagayoshi, *Japan's Strategic Future and Implications for the US-Japan Alliance*, Stimson Center, February 28, 2024, https://www.stimson.org/2024/japans-strategic-future-and-implications-for-the-us-japan-alliance/.

145 Tatsumi, Kennedy, and Nagayoshi, "Japan's Strategic Future."

146 US Department of State, "US-Japan Extended Deterrence Dialogue," Office of the Spokesperson, June 17, 2024, https://www.state.gov/u-s-japan-extended-deterrence-dialogue-3/.

147 "United States-Japan-Republic of Korea Trilateral Ministerial Joint Press Statement," US Department of Defense, press release, December 19, 2023, https://www.defense.gov/News/Releases/Release/Article/3621235/united-states-japan-republic-of-korea-trilateral-ministerial-joint-press-statem/.

148 "The History of US Decision-Making on Nuclear Weapons in Japan," Federation of American Scientists, August 21, 2019, https://fas.org/publication/the-history-of-u-s-decision-making-on-nuclear-weapons-in-japan/.

149 Tatsumi, Kennedy, and Nagayoshi, "Japan's Strategic Future."

150 Tatsumi, Kennedy, and Nagayoshi, "Japan's Strategic Future."

151 Tatsumi, Kennedy, and Nagayoshi, "Japan's Strategic Future."

ment will not take place until 2034, and it may not address all of Tokyo's assurance concerns.[152]

A possible future decision by either the ROK or (less likely) Japan to seek indigenous nuclear weapons would have deleterious effects on US grand strategic and foreign policy goals. In general, the United States has sought since the dawn of the atomic era to limit the spread of nuclear weapons, even to allies. Doing so reduces the dangers that nuclear weapons might fall into the wrong hands and helps maintain US international standing by demonstrating leadership in nuclear risk reduction. Denying nuclear weapons to (most of) its allies has also increased these states' reliance on Washington and discouraged them from turning to more independent foreign policies that would be less aligned with US national interests. Specifically, for the ROK or Japan, a decision to seek indigenous nuclear weapons would bring significant international opprobrium to Seoul, Tokyo, and Washington; could lead to economic sanctions against these allies; and could make continuing US support for the alliances politically toxic.

Cost and desirability of other measures that would be necessary to reassure South Korea and Japan without robust HBMD

While the United States has in the past successfully assured allies and prevented proliferation without the benefit of comprehensive missile defense, doing so for Seoul or Tokyo might require additional US forces in the region and a change to the tailored deterrence approach to the DPRK, which may be less politically desirable than maintaining a robust HBMD.

North Korea is the only state against which the United States has ever fielded a comprehensive HBMD system. Yet Washington has successfully prevented nuclear proliferation (with the notable exceptions of France and Israel) and assured allies in Europe and Asia against the nuclear threats from the Union of Soviet Socialist Republics/Russia and China for decades. Critics of missile defense might ask: Why could this approach not work for South Korea and Japan today?

The critics have a point; the United States could likely assure the ROK and Japan without HBMD. But it would come at a cost. The United States backs its extended deterrence pledge to NATO through nuclear sharing and forward-deployed US nuclear weapons in Europe. The United States has had no such forces in East Asia since 1991. To head off an ROK or (less likely) Japanese indigenous nuclear program, the United States may need to develop limited nuclear options tailored to the Indo-Pacific region, such as the SLCM-N, or deploy US nuclear weapons to South Korean or Japanese territory, possibly under a nuclear-sharing arrangement. In the absence of effective HBMD, the push for nuclear sharing could accelerate, which may be desirable, but would not be without costs.

152 Anya L. Fink, "Nuclear-Armed Sea-Launched Cruise Missile (SLCM-N)," Congressional Research Service, May 31, 2024, https://crsreports.congress.gov/product/pdf/IF/IF12084.

A Tomahawk guided missile flight test launch from the destroyer *USS Dewey* (DDG 105) in the Western Pacific Ocean, August 17, 2018. Source: Devin Langer/US Navy.

The other cost to relatively degraded HBMD might be the US pledge to end the Kim regime in the event of any nuclear use. The United States does not make such a pledge for any other nuclear-armed state. Promising to destroy the Kim regime in the event of any nuclear weapons use is credible only so long as the United States and its allies can execute a disarming strike combined with missile defenses to mop up remaining warheads. If HBMD does not keep pace (barring a great improvement in attack operations) and the United States moves to a deterrence-by-punishment approach, then Washington might need to abandon the regime-elimination plan. Instead, in the event of North Korean limited nuclear weapons use, US planners may need to develop a plan for controlled and graduated use of nuclear and nonnuclear strategic weapons to restore deterrence under the best possible political terms—which is today's strategy toward Russia and China. While many in Washington are already skeptical of this approach, Seoul has been a strong proponent of this remaining US policy. Changing the policy could have costs to assurance.

Another alternative to assure South Korea or Japan without sufficient missile defense could require further investment in the other half of comprehensive missile defeat—left-of-launch operations. While attack operations should receive investment, they face the "inevitable political constraints" that mobile missiles would likely disperse as a crisis unfolds, and an overreliance on attack operations compounds pressures for a disarming strike early in a crisis.[153]

What are the implications for "Staying Ahead" of North Korea for relations with Russia and China?

The United States can stay ahead of the North Korean nuclear missile threat without undermining a Russian or Chinese assured second-strike capability due to the size of those states' arsenals and the diversity of their nuclear delivery vehicles. An HBMD system scoped solely to the current (or even projected) threat from North Korea would provide only very modest protection from limited missile strikes from Russia and China (as the next section discusses) or a combined disarming strike from both powers (as Section Seven reviews). While Russia and China are both likely to use US HBMD as a propaganda tool to argue that the United States is harming strategic stability globally and spurring an arms race, there are good reasons to believe these claims are disingenuous.

US HBMD and deterrence with Russia and China

US HBMD scoped to "stay ahead" of North Korea will not undermine deterrence with Russia and China, despite critics' arguments to the contrary.

In the abstract, critics' arguments are compelling—a missile defense system capable of defeating all the missiles from a first strike from State A, a smaller nuclear power, might also be capable of defeating a ragged retaliation from State B, a larger nuclear power, after State B endured a first strike on its nuclear forces. For instance, Moulton, as the top Democrat on the Strategic Forces Subcommittee, stated: "If we continue to expand our current arsenal of interceptors, we must ask not just how North Korea will respond, but how Russia and the CCP will respond as they see a pathway for our missile shield to impact their deterrent as well … at what point will this arms race provoke a response from Russia and the CCP?"[154]

This straightforward, abstract interpretation falls apart when mapped onto Russia, China, and North Korea. Simply put, Russia and China would quantitatively and qualitatively overwhelm existing and planned HBMD scoped to the North Korean threat. Russian and Chinese forces could also directly attack US HBMD scoped to North Korea.

Russia and China both possess a robust second-strike capability that could quantitatively overwhelm US HBMD scoped to the current or anticipated North Korean threat. A single Russian Borei-class nuclear-powered ballistic missile submarine (SSBN) can carry ninety-six nuclear warheads, which would be sufficient to overwhelm US defenses scoped to the current North Korean threat.[155] The probability that the United States would conduct a nuclear first strike on Russia or that such an attack would reduce Russian nuclear holdings below a few hundred surviving warheads strains credulity. China's current nuclear arsenal is somewhat more vulnerable but is sufficiently survivable that a US first strike would be very unlikely to reduce the residual force to a level that US missile defenses could cope with. For instance, the PLA Rocket Force has MIRVed its DF-41 ICBMs, according to open-source reports, and China has an extensive network of tunnels in which these road-mobile missiles could hide. Combined, these attributes would make the DF-41 extremely challenging to target and disable.[156]

Even if "staying ahead" of the North Korean threat required a sophisticated missile defense force of several hundred interceptors, Russia and China could still qualitatively overwhelm this

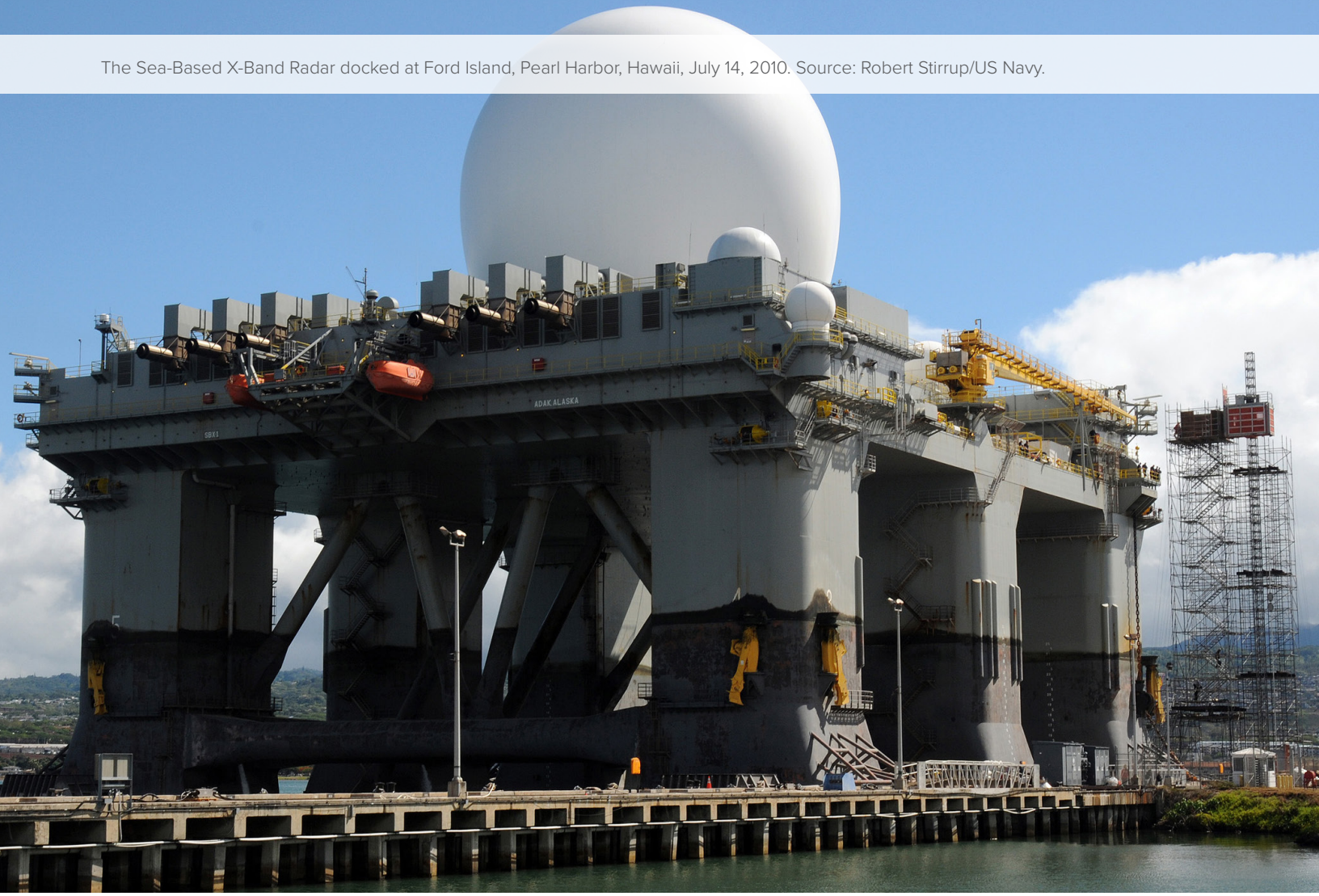
153 Joseph and DeBiaso, "Homeland Missile Defense."

154 *Hearing on National Defense Authorization Act for Fiscal Year 2024 and Oversight of Previously Authorized Programs before the House Armed Services Committee – Subcommittee on Strategic Forces Hearing on Fiscal Year 2024 Budget Request for Missile Defense and Missile Defeat Programs*, 118th Cong. (April 18, 2023), https://www.congress.gov/event/118th-congress/house-event/LC72450/text.

155 Jake Cordell, "Putin Submits Law on Suspending Nuclear Arms Treaty," Reuters, February 21, 2023, https://www.reuters.com/world/europe/russia-we-will-still-observe-nuclear-warhead-limits-under-new-start-2023-02-21/.

156 Missile Threat, "DF-41 (Dong Feng-41 / CSS-X-20)," Missile Defense Project, Center for Strategic and International Studies, last update April 23, 2024, https://missilethreat.csis.org/missile/df-41/.

The Sea-Based X-Band Radar docked at Ford Island, Pearl Harbor, Hawaii, July 14, 2010. Source: Robert Stirrup/US Navy.



defense even after absorbing a US first strike. The United States does not have a comprehensive air or cruise missile defense of the homeland, so Russia would be able to strike the contiguous United States with gravity bombs from strategic bombers or air- and submarine-launched nuclear-armed cruise missiles. If alerted, a significant fraction of Russia's strategic aviation is survivable, and many of its nuclear-cruise-missile-armed attack submarines would likely escape destruction as well. Moreover, HBMD against North Korea concentrates on a specific geographic architecture, whereas Russia is capable of launching SLBMs from essentially any angle it chooses, including depressed trajectory launches close to US shores. Russia's Avangard nuclear-armed HGV would circumvent defenses meant to target North Korean RVs in midcourse. And finally, Russia's so-called "exotic" nuclear weapons—its nuclear-powered, nuclear-armed cruise missile and nuclear-armed torpedo drone—are far beyond the scope of any plausible HBMD against North Korea. (To be clear, this study suggests that the United States ameliorates these vulnerabilities but only to a degree sufficient to address limited attacks.)

China is more of an edge case. China's nuclear triad is more nascent than Russia's, lacking an appreciable intercontinental air-delivered capability. The People's Liberation Army Navy (PLAN)'s SSBN capability is more limited than Russia's and is more vulnerable to US and allied anti-submarine warfare (ASW). China is, however, actively developing likely nuclear-capable HGV weapons that would defeat defenses for classic ballistic missiles. One could imagine Beijing's alarm if confronted by rapid expansions of the US ballistic missile defense arsenal scoped to North Korea but slated to arrive before Chinese nuclear modernization results in a more reliable triad. However, this requires heroic assumptions about the pace of possible US missile defense expansion and delays in China's nuclear modernization. Even then, China's most logical reaction would be to do what it is already doing without such a motivator—grow the quantity and quality of its nuclear arsenal.

Finally, Russia and China need not fear for their nuclear deterrents because each state could disable a US HBMD scoped to North Korea through direct attack. The current and planned US HBMD relies on a fragile network of sensors that would be almost trivial for Russia to degrade or destroy. Russia, for instance, could use nuclear or even conventional cruise missiles to destroy large, fixed radar sites like Cobra Dane in the Aleutian Islands of Alaska or the slow-moving Sea-Based X-band (SBX) radar that typically operates in the Pacific.

Again, China presents more of an edge case. It seems unlikely that China would project significant long-range aviation or naval power into the Eastern Pacific in the timeframe of this study. China's non-ballistic attack methods against the US HBMD

include HGVs, cyberattacks, counterspace attacks on missile warning / missile tracking, and possibly special forces.

In sum, the projected evolution in North Korea's strategic forces makes it possible to stay ahead of the DPRK threat without undermining Russian and Chinese second-strike capabilities, which would quantitatively or qualitatively overwhelm HBMD scoped to the North Korean threat or simply destroy it.

Applicability of HBMD scoped to North Korea to Russian and Chinese limited strikes on the US homeland

This paper argues at length that the United States should develop homeland missile defenses capable of defeating limited, coercive strikes from Russia and China across various attack modes (see the next section for the full argument). HBMD scoped to North Korea would provide a start for limited defenses.

Against Russia, this system would provide only minimal protection for limited ballistic strikes, though Russia may be less likely to reach for ballistic missiles for this purpose. The supporting sensors and command-and-control would have some utility for broader defenses.

Against China, HBMD scoped to North Korea would be more robust, especially in the short term. Apart from its HGV capabilities, China relies on ballistic missiles for intercontinental strikes. For nuclear strikes, the PRC would likely employ MIRVs and sophisticated decoys, capabilities which HBMD scoped to North Korea may or may not be capable of addressing. The PLA is also reportedly considering ICBMs for long-range conventional strikes.

Applicability of HBMD scoped to North Korea to Russian and/or Chinese disarming strikes on the US nuclear triad

This paper contends that the advent of the two-nuclear-peer problem means that the United States needs to enhance the survivability of its nuclear forces, and that homeland missile defenses are one way to do so. HBMD scoped to the North Korea threat would have some limited applicability to the nuclear triad protection problem set. Qualitatively, a disarming strike on the US triad consists of non-silo elements of the triad and the missile silo problem set.

The non-silo elements of the US nuclear force include submarine pens, strategic bomber bases and backup sites, and NC3 nodes. The dynamics of this target set are similar to those of the limited coercive strike target set. Russia could attack these sites using capabilities not susceptible to ballistic missile interceptors designed to a North Korea threat standard. China, by contrast, might need to depend on ballistic missiles to achieve those effects, especially in the short term.

The missile silo element of the US nuclear triad would be a more stressful attack for either state, and both would almost certainly need to rely on their ballistic missile forces to do so. China certainly lacks the non-ballistic missile capabilities for a counter-silo attack. Russia would likely need to employ ICBMs as well. According to one open-source estimate:

> The Russian Navy operates 12 nuclear-powered, nuclear-armed ballistic missile submarines (SSBNs) of two classes: five Delta IV SSBNs (Project 667BRDM Delfin) and seven Borei SSBNs (Project 955/A), four of which are improved Borei-A (Project 955A) submarines. The seventh Borei-A SSBN is the Imperator Alexandr III (also known as Emperor Alexander III), which was commissioned in December 2023. … Each submarine can carry 16 submarine-launched ballistic missiles (SLBMs), and each SLBM can carry several MIRVs, for a combined maximum loading of approximately 992 warheads on 12 submarines. … However, not all these submarines are fully operational, and the warhead loading on some of the missiles may have been reduced for Russia to stay below the New [Strategic Arms Reduction Treaty] START treaty limit on deployed warheads. One or two SSBNs are normally undergoing maintenance, repair, or reactor refueling at any given time and are not armed. As a result, the total number of warheads carried by Russia's SSBN forces is possibly around 640.[157]

The United States has 450 missile silos, and nongovernmental analysts typically assume that states target two high-accuracy warheads against hardened silos for an acceptable probability of kill.[158] So, while it is possible that Russia could attack US silos using only SLBMs from trajectories not covered by a counter-DPRK HBMD and other non-ballistic weapons, that would be an unlikely scenario. Moscow would likely prefer to preserve its most survivable nuclear forces to attempt to deter US retaliation and would want to cross-target US silos from a variety of platforms to reduce technical risk.

At least some Russian weapons attacking US silos would therefore likely be ICBMs traveling on a trajectory susceptible to US HBMD scoped to North Korea. Even in this case, however, these missiles are likely to have MIRVs and decoys that may be more sophisticated than a counter-DPRK system is equipped to handle. Meanwhile, Russia still possesses the capability to destroy US HBMD before conducting an attack with classic ballistic missiles.[159]

157 Hans M. Kristensen et al., "Russian Nuclear Weapons 2024," *Bulletin of the Atomic Scientists* 80, no. 2 (2024): 118–45, https://www.tandfonline.com/doi/full/10.1080/00963402.2024.2314437?src=recsys#d1e1879. Internal citations omitted.

158 See Matthew Kroenig, *The Logic of American Nuclear Strategy: Why Strategic Superiority Matters* (Oxford: Oxford University Press, 2018).

159 An attack on HBMD still serves some strategic utility by clarifying for policymakers the stakes of an incoming attack. The study discusses this benefit later.

In sum, an HBMD system scoped solely to the North Korean threat is likely to have little to no utility for Russian counterforce attacks on the US homeland, since Russia has a full range of non-ballistic missiles and could easily dismantle US defenses. In the short term, while China continues to develop a more robust nuclear triad and a conventional military capable of long-range strategic bombing and blue-water naval operations across the Pacific, HBMD scoped to North Korea may have limited utility against Chinese strikes, depending on its ability to counter more sophisticated Chinese MIRVs and decoys and its resilience to Chinese non-kinetic attacks.

A SM-3 Block IIA missile is launched from the Arleigh Burke-class guided missile destroyer *USS McCampbell* (DDG 85) off the coast of the Pacific Missile Range Facility, Hawaii, February 8, 2024. Source: Nancy Jones-Bonbrest/Missile Defense Agency.

Applicability of HBMD scoped to North Korea for accidental or unauthorized launches

HBMD scoped to North Korea would make a modest contribution to countering accidental or unauthorized ballistic missile launches from any source. The National Missile Defense Act of 1999 explicitly included accidental and unauthorized launches as part of US ballistic missile defense policy. The key characteristics of an accidental or unauthorized attack are the limited scope of the missile raid and the lack of supporting military action.

The most stressing unauthorized scenario is a rogue Russian SSBN commander firing his entire payload at the United States—perhaps sixteen SLBMs MIRVed to six warheads each, plus decoys and countermeasures.[160] As stated above, an SSBN attack from near US shores or a southerly trajectory would likely evade HBMD scoped to North Korea. Depending on the effectiveness of NGI at intercepting multiple RVs, of improved US sensors in discriminating warheads from decoys in midcourse, and of SM-3 bk IIA missiles in a layered defense, intercepting ninety-six Russian warheads with an HBMD system scoped to North Korea might be possible, but it would be a stretch.

Of course, one could imagine accidental or unauthorized launches of smaller scales. Depending on their trajectory and the sophistication of their decoys, they might also be susceptible to HBMD.

Accidental or unauthorized launches would be much less likely to be accompanied by attacks that Russia or China would otherwise be capable of conducting to degrade or disable US HBMD systems.

Information dimension of HBMD scoped to North Korea

Regardless of the actual utility of a US HBMD system scoped to the North Korean threat, Moscow and Beijing are likely to use it as a propaganda tool to argue that the United States is an irresponsible actor in international affairs. As explained later, these arguments are disingenuous and should not shape US policy.

Current and projected Islamic Republic of Iran missile and nuclear threats to the United States

Current US missile defense policy also extends to a possible future nuclear-armed Iran. Iran poses a very limited but growing long-range missile threat to the US homeland, and Tehran continues to inch closer to a nuclear breakout. The existing GMD system could cope with a possible future nuclear-armed ICBM threat from Iran but may require a changed footprint to address the different geographic origin of the threat.

160 To comply with New START limits, Russian SSBNs today do not likely carry this many warheads. If the United States and Russia do not reach a follow-on agreement to New START or voluntarily continue to comply with its limits, then Russian deployments could reach this number in 2026.

Current and projected Iranian missile threat

The United States assesses that Iran possesses the largest and most diverse missile arsenal in the Middle East.[161] Iran's arsenal includes a "substantial inventory of close-range ballistic missiles (CRBMs), short-range ballistic missiles (SRBMs), medium-range ballistic missiles (MRBMs)," as well as a growing land-attack cruise missile (LACMs) and anti-ship cruise missile (ASCMs) force, many of which are "inherently capable of carrying nuclear payloads."[162] While Iran retains a large missile arsenal, its self-imposed missile range limit of 2,000 kilometers falls well short of the range required to threaten the US homeland.[163] However, Iran could abandon this self-imposed restriction at any moment, and, in the meantime, Iran's missile capabilities continue to develop and pose an increasing risk to the United States.[164]

Iran's capability gap is also closing due to its increasingly successful space program, specifically its SLVs. Iran has emphasized developing solid-propellant rockets, which "have greater military utility and likely are being used to develop an alternative ICBM pathway by the Iranian security establishment."[165] Iran claims that its interest in space is "peaceful," but the growing interest of the Iranian Revolutionary Guard Corps (IRGC) in space capabilities and the inherent "dual civilian-military use of many space technologies" ring alarm bells.[166] The 2023 US Intelligence Community's Annual Threat Assessment (ATA) confirmed that Iran's pursuit of SLVs "shortens the timeline to an [ICBM] because SLVs and ICBMs use similar technologies."[167] The Strategic Posture Commission report of 2023 concluded that Iran "could field advanced longer-range missile systems in the 2027–2035 timeframe."[168]

India is a historical example, for which the missile program initially began as a space launch program, highlighting that "nations driven by status and security considerations have used solid-propellant SLVs and space programs more generally to develop ICBMs."[169] Following Supreme Leader Khomeini's range restriction, the former head of Iran's missile force, Hassan Tehrani-Moghadam, chose to work on SLVs and solid propellants to "keep this path [long-range missile capabilities] moving forward."[170] Iran's pursuit of these advanced systems is inseparable from its ideological objectives, "framing scientific accomplishment, particularly while under sanctions, as the fruits of its defiance against perceived Western attempts to impede Iranian power."[171]

In 2020, Iran successfully launched its first dual-purpose Noor satellite using the Qased SLV.[172] In January 2024, following numerous failures, Iran successfully launched three satellites into orbit using the Simorgh SLV.[173] The ATA specifically cites the Simorgh as a possible dual-use rocket, and experts claim that "the Simorgh SLV can provide Tehran with a pathway to at least an IRBM capability if reconfigured."[174] Days prior, the IRGC launched its own Soraya satellite using an all-solid propellant.[175] These successful launches, as well as evidence presented by imagery analysts showing Iran has "conducted plausible [long-range] LR/ICBM liquid-propellant missile motor tests," highlight Iran's burgeoning capabilities.[176] Furthermore,

161 Kenneth Saltzman, "Iran's Foreign and Defense Policies," Congressional Research Service, 2021, 9–10, accessed August 1, 2024, https://crsreports.congress.gov/product/pdf/R/R44017/80.

162 *Iran Military Power: Ensuring Regime Survival and Securing Regional Dominance*, Defense Intelligence Agency, August 2019, https://www.dia.mil/Portals/110/Images/News/Military_Powers_Publications/Iran_Military_Power_LR.pdf; Iran Watch, "Table of Iran's Missile Arsenal," Wisconsin Project on Nuclear Arms Control, February 22, 2024, https://www.iranwatch.org/our-publications/weapon-program-background-report/table-irans-missile-arsenal - fn3

163 Jon Gambrell, "Iran Says Supreme Leader Limiting Ballistic Missile Range," *Associated Press*, October 31, 2017, https://apnews.com/article/a9b9ff80f4424ce5be3a4a81e04dc8dc

164 Missile Threat, "Missiles of Iran," Missile Threat Project, Missile Defense Project, Center for Strategic and International Studies, June 14, 2018, last updated August 10, 2021, https://missilethreat.csis.org/country/iran/.

165 "Iran Bolsters Missile Capacity with Satellite Launches," Foundation for Defense of Democracies, January 29, 2024, https://www.fdd.org/analysis/2024/01/29/iran-bolsters-missile-capacity-with-satellite-launches/.

166 ehnam Ben Taleblu, "Arsenal: Assessing the Islamic Republic of Iran's Ballistic Missile Program," Foundation for Defense of Democracies, February 15, 2023, https://www.fdd.org/analysis/2023/02/15/arsenal-assessing-the-islamic-republic-of-irans-ballistic-missile-program/#easy-footnote-bottom-400-137662.

167 Saltzman, "Iran's Foreign and Defense Policies."

168 Creedon et al., *America's Strategic Posture*, 10.

169 Ben Taleblu, "Arsenal: Assessing the Islamic Republic."

170 Ben Taleblu, "Arsenal: Assessing the Islamic Republic."

171 Ben Taleblu, "Arsenal: Assessing the Islamic Republic."

172 "Iran's Space Program: Timeline and Technology," Rasanah, April 29, 2020, https://rasanah-iiis.org/english/monitoring-and-translation/reports/irans-space-program-timeline-and-technology/.

173 Jon Gambrell, "Iran Launches Three Satellites into Space," Associated Press, January 28, 2024, https://apnews.com/article/iran-satellite-launch-us-ballistic-missiles-israel-hamas-74bcd3eb7e48a31be4f52b8d86d24721?taid=65b5f8f14d231b00014df5e1.

174 Gambrell, "Iran Launches Three Satellites"; Ben Taleblu, "Arsenal: Assessing the Islamic Republic."

175 Ben Taleblu, "Arsenal: Assessing the Islamic Republic."

176 Intel Lab (@TheIntelLab), "VHR Satellite Image from June 3rd, 2022 bolsters …" X, June 4, 2022, 4:30 a.m., https://twitter.com/TheIntelLab/status/1533003243978215424.

An “Eman” intermediate-range ballistic missile. Iran’s first precision-guided IRBM. Source: Mohammad Agah

with persistent reports of Iranian-North Korean missile cooperation and increasing ties with Russia, Iranian capabilities may continue to advance.[177] This cooperation has garnered concerning results, with the upper stage of North Korea’s Hwasong-14 ICBM being derived from the Iranian Safir SLV.[178]

In sum, Iran currently lacks the missile capabilities that could credibly threaten the US homeland, but this could soon change, as the worsening security environment in the Middle East pushes Iran to pursue longer-range missile capabilities more actively. Iran seeks to overturn Middle Eastern power structures and solidify its role as a regional hegemon. However, to compensate for the relative weakness of its air force, Iran uses ballistic missiles to threaten and attack adversaries in the region.[179] Iran’s pursuit of a strategic counter against the United States could further drive Iran to develop an ICBM, and this would compel the United States to reassess the threat posed by Iran.[180]

Islamic Republic of Iran’s pursuit of a nuclear weapon

Iran’s continued pursuit of advanced missile capabilities ties intrinsically to its pursuit of a nuclear warhead.[181] The Strategic Posture Commission concluded that Iran “will maintain a nuclear program as part of its strategic goals …” which includes

177 Kenneth Saltzman, “Iran’s Foreign and Defense Policies,” Congressional Research Service, 2021, 9-10, accessed August 1, 2024, https://crsreports.congress.gov/product/pdf/R/R44017/80.

178 Ankit Panda, *Kim Jong Un and the Bomb: Survival and Deterrence in North Korea* (Oxford University Press, 2020), https://global.oup.com/academic/product/kim-jong-un-and-the-bomb9780190060367?cc=us&lang=en&.

179 *Iran Military Power*, Defense Intelligence Agency, August 2019, https://www.dia.mil/Portals/110/Images/News/Military_Powers_Publications/Iran_Military_Power_LR.pdf.

180 Defense Intelligence Agency, *Iran Military Power.*

181 Ben Taleblu, “Arsenal: Assessing the Islamic Republic.”

the "capability to build missile-deliverable nuclear weapons."[182] With two major wars diverging much of the global attention away from Iran's pursuit of a nuclear weapon, as well as increasing retaliatory strikes by the United States and Israel against Iranian proxies and even in Iranian territory, the regime "may have heightened motivations to pursue a nuclear weapon."[183]

The Iranian regime has taken steps to pursue all three requirements of a nuclear weapons program: fissile material, weaponization, and launch vehicles.[184] Since the withdrawal of the Joint Comprehensive Plan of Action (JCPOA) and Iran's removal of all International Atomic Energy Agency (IAEA) surveillance and monitoring equipment and personnel, the transparency of their program has been further reduced.[185] Iran has made significant progress on its ability to produce weapons-grade uranium, making it "difficult if not impossible, to restore the one-year breakout timeline" associated with the JCPOA.[186] Additionally, Iran has produced uranium metal, which can be used for the core of a nuclear device.[187] Collectively, "historical efforts to conceal nuclear activities under civilian guises, along with contributions from various international sources, have facilitated Iran's progress in nuclear technology."[188] Ali Akbar Salehi, the former head of Iran's Atomic Organization, has stated that "Iran possesses all the necessary components to construct a nuclear bomb."[189]

Applicability of defenses scoped to North Korea to the Iranian threat

Historically, US missile defense policy has focused on the threats posed by "unpredictable regional actors, i.e., 'rogue' powers."[190] While North Korea has been the focus of this, with the entirety of US GBI systems located on the West Coast, the Strategic Posture Commission confirms that homeland missile defense systems need to deter, and, if necessary, defeat possible future long-range missile attacks from Iran.[191] Due to the relatively rudimentary nature of Iranian missiles, similar to those of North Korea, the United States should model its defense scope from North Korea to Iran.

The proposed FY 2025 NDAA, which has passed through the House, calls for completing, by the end of 2030, "an additional continental United States interceptor site, located at … Fort Drum," to protect the homeland against "potential long-range ballistic missile originating from Iran or North Korea."[192] During a House Armed Services Committee hearing in 2023, Rep. Elise Stefanik (R-NY-21) questioned Chairman of the Joint Chiefs of Staff Gen. Mark Milley and Secretary of Defense Lloyd Austin on a so-called "third site." Milley confirmed that a third site would be strategically worthwhile and stated that developing a missile defense system on the East Coast "would further enhance the protection of the United States."[193]

The debate around a third site located at Fort Drum is not new, with a 2012 National Research Council study explaining that "an additional GBI site located in northeastern [continental United States] CONUS would be much more effective and reliable and would allow considerably more battle space and firing doctrine options."[194] Furthermore, Gen. Charles Jacoby (Ret.), in 2014 as then-commander of USNORTHCOM and NORAD, stated, "[a third site] would give us increased inventory and increased battlespace with regards to a threat coming from the direction of the Middle East."[195] As Iran continues to proliferate toward long-range ICBMs, the development of a third site located on the East Coast will be needed to address the full scope of the North Korean and Iranian missile threat to the homeland.

182 Creedon et al., *America's Strategic Posture*, 10.

183 Farhad Rezaei, "Iran Could Decide to Build a Nuclear Weapon," *National Interest*, February 26, 2024. https://nationalinterest.org/feature/iran-could-decide-build-nuclear-weapon-209616.

184 Ben Taleblu, "Arsenal: Assessing the Islamic Republic."

185 Rezaei, "Iran Could Decide to Build a Nuclear Weapon."

186 Eric Brewer, "Iran's Evolving Nuclear Program and Implications for US Policy," Center for Strategic and International Studies, October 15, 2021, https://www.csis.org/analysis/irans-evolving-nuclear-program-and-implications-us-policy.

187 Brewer, "Iran's Evolving Nuclear Program and Implications for US Policy."

188 Rezaei, "Iran Could Decide to Build a Nuclear Weapon."

189 Rezaei, "Iran Could Decide to Build a Nuclear Weapon."

190 Robert Soofer and Matthew Costlow, *US Homeland Missile Defense: Room for Expanded Roles,* Atlantic Council, November 15, 2023. https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/us-homeland-missile-defense-room-for-expanded-roles/

191 Missile Threat, "Ground-based Midcourse Defense (GMD) System," Missile Defense Project, Center for Strategic and International Studies, last updated July 26, 2021, https://missilethreat.csis.org/system/gmd/; Creedon et al., *America's Strategic Posture*, 63, 103.

192 Servicemember Quality of Life Improvement and National Defense Authorization Act for Fiscal Year 2025, H.R. 8070, 118th Cong. (2024), https://www.congress.gov/bill/118th-congress/house-bill/8070.

193 *FY24 Defense Budget Request*, House Armed Services Committee, 118th Cong. (2023) (statement of General Mark Milley, Chairman of the Joint Chiefs of Staff), https://armedservices.house.gov/committeeactivity/hearings/full-committee-hearig-fy24-defense-budget-request.

194 National Research Council, "Making Sense of Ballistic Missile Defense," Washington, DC, 2012, 85, https://nation.time.com/wp-content/uploads/sites/8/2012/09/nrc-bmd-report-2012-09.pdf.

195 *The Posture of US Northern Command and US Southern Command*, House Armed Services Committee, 113th Cong. (2014) (statement of USNORTHCOM Commander, General Charles Jacoby), https://www.govinfo.gov/content/pkg/CHRG-113hhrg86969/html/CHRG-113hhrg86969.htm.

Section five: Deterring Chinese and Russian limited coercive missile threats

Introduction

Russia and China may be considering limited, coercive strikes, both nuclear and conventional, on the US homeland in the event of war to degrade US national will, disrupt force flow, and terminate a conflict on terms acceptable to them. A combination of US government statements, Russian and Chinese military capabilities, and certain elements of both states' military doctrines strongly suggests that these strikes are well within the realm of possibility. Russia and China possess a range of means to carry out such strikes, including aircraft, cruise missiles, ballistic missiles, hypersonic missiles, and more. One way to understand these developments is to conceive of these states as expanding the anti-access, area-denial networks they already have in Europe and East Asia, respectively, to North America.

It is not necessary to develop a leak-proof, population-level defense of the entire US homeland to negate the advantages that Moscow and Beijing might seek from such attacks. Rather, limited and preferential defenses for some key sites could ameliorate this vulnerability.

Therefore, the United States should re-scope its homeland missile defense policy not only to include rogue, accidental, or unauthorized launches, but also to explicitly encompass limited strikes from Russia and China. The purpose of such defenses is to deny a "cheap shot" to either Russia or China and protect certain critical sites in the US homeland. Both states possess sufficient forces that, should they commit enough weapons, either state could destroy any particular target they choose. But limited, preferential defenses will increase the size of the force package that Russia or China would require to do so. At that point, Russian or Chinese defense planners might lose confidence that the United States would still perceive the attack as "limited" and refrain from massive retaliation. The United States should not count on Russia or China to exercise restraint in attacking the US homeland. While deterrence by punishment and deterrence by resilience have roles to play in addressing these threats, by themselves these approaches are not sufficient; missile defenses must play a role.

This section examines the role limited, coercive strikes may play in Russia's and China's defense strategies, the logic for those states to conduct such attacks on the US homeland, and the present and developmental capabilities that they have to do so. It then argues that deterrence by denial is an important part of addressing such attacks.

Limited and coercive threats in Russia's theory of victory

Limited and coercive strikes, both conventional and nuclear, play a significant role in Russia's overall military and defense strategies, and those strikes may well include attacks on the US homeland. Russia has an especially diverse range of capabilities to conduct these strikes, including ballistic missiles, cruise missiles, hypersonic missiles, and crewed aircraft, among other capabilities.

Limited and coercive strikes in Russian military strategy

Russia's military strategy likely includes limited and coercive strikes of both a conventional and nuclear nature. Russia's formal nuclear doctrine lays out a range of circumstances in which Russia would consider using nuclear weapons, including warning of ballistic missile attack on Russia or its allies, nuclear or WMD use against Russia or its allies, attacks on Russian leadership or nuclear command-and-control nodes, and conventional aggression against Russia in which "the very existence of the state is in jeopardy."[196] However, statements by Russian officials and Russian military capabilities suggests that the bar for Russian nuclear use may be lower than this formal doctrine implies. Around Russia's full invasion of Ukraine since February 2022, Russian President Vladimir Putin has routinely raised the role of Russian nuclear weapons in deterring further Western support of Ukraine, though usually couched within Russia's stated nuclear weapons policy.[197] Western analysts and US defense officials grew concerned, in the summer and fall of 2022, that Russia might use battlefield nuclear weapons in Ukraine, perhaps to stave off the collapse of the Russian front in Ukraine; Washington, Lon-

196 "Basic Principles of State Policy of the Russian Federation on Nuclear Deterrence," Ministry of Foreign Affairs of the Russian Federation, June 8, 2020, https://archive.mid.ru/en/web/guest/foreign_policy/international_safety/disarmament/-/asset_publisher/rp0fiUBmANaH/content/id/4152094.

197 Mark Trevelyan, "Putin's Nuclear Warnings since Russia Invaded Ukraine," Reuters, March 13, 2024, https://www.reuters.com/world/europe/putins-nuclear-warnings-since-russia-invaded-ukraine-2024-03-13/.

don, and Paris reportedly threatened conventional retaliation against Russian forces in that eventuality.[198]

US officials have also voiced concerns that Russia might have a so-called "escalate-to-deescalate" or "escalate-to-win" doctrine. This concern, spelled out in the 2018 NPR and elaborated on by Western analysts, posits that, in the event of a high-end war with NATO, Russia might engage in limited nuclear use, either early in a conflict to degrade NATO Allies' will to fight and split the alliance, or deep into a conflict to prevent a Russian conventional loss that could destabilize Putin's regime.[199] While the impact of the ongoing Russian invasion of Ukraine for Russia's future defense and national security strategy remains contested, some US policymakers worry that Russia's threshold for nuclear weapons use may fall further.[200] Other experts conclude that Russia's perception of the success of its nuclear deterrent in its invasion of Ukraine may spur it to develop additional types of nuclear weapons.[201]

While the potential for Russian limited use of nuclear weapons is uncertain and remains contested, Russian strategy for conventional air and missile strikes on key military and critical infrastructure nodes is well established. NATO staff officer Dave Johnson has convincingly argued that Russia will conduct "strategic operations for the destruction of critically important targets (SODCIT)" through a "newly diversified strategic toolkit, which includes multiple new non-nuclear tools."[202] Russian planners understand SODCIT to include "the massive use of precision weapons of various basing means" and "the destruction of facilities in the rear area, of the economy and communications in the entire territory of the warring parties."[203] The purpose of these massed aerospace strikes is to alter the political-military ability and willingness of the adversary to continue military operations.

To emphasize further, Russian experts see the future of warfare as characterized by "degradation of military-economic potential through quick destruction of critically important military and civilian infrastructure objectives" and "simultaneous action on enemy forces at all depths of the area of operations. …"[204] According to another analyst of Russian military affairs, "Russian strategic operations envision conventional strikes, single or grouped, against critical economic, military, or political objects. These may be followed by nuclear demonstration, limited nuclear strikes, and theatre nuclear warfare."[205] In the view of one analyst, Russian writings express a phasing of escalation against the adversary's homeland, starting with conventional strikes on military capabilities, expanding to conventional strikes on state-supporting civilian infrastructure, and finally reaching nonstrategic and then strategic nuclear weapons use.[206] Russian military leaders,

198 David E. Sanger, "Biden's Armageddon Moment: When Nuclear Detonation Seemed Possible in Ukraine," *New York Times*, March 9, 2024, https://www.nytimes.com/2024/03/09/us/politics/biden-nuclear-russia-ukraine.html; Max Seddon, "Why Vladimir Putin Toned down His Nuclear Rhetoric," *Financial Times*, November 1, 2023, https://www.ft.com/content/d98446ac-b56e-4f1d-bfa9-ebaed4e26884.

199 US Department of Defense, *2018 Nuclear Posture Review* (Washington, DC: Office of the Secretary of Defense, February 2018): 10, 35–36, https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF; Gen. John E. Hyten, "US Strategic Command Space and Missile Defense Symposium Remarks" (speech presented by General Hyten as commander of the US Strategic Command, August 7, 2018), https://www.stratcom.mil/Media/Speeches/Article/1600894/us-strategic-command-space-and-missile-defense-symposium-remarks/; Matthew Kroenig, *A Strategy for Deterring Russian De-Escalation Strikes*, Atlantic Council, April 24, 2018, https://www.atlanticcouncil.org/in-depth-research-reports/report/a-strategy-for-deterring-russian-de-escalation-strikes/. Some scholars dismiss the escalate to deescalate doctrine as alarmism or criticize the description as a dangerously incomplete way of understanding Russian strategy. The 2022 NPR did not describe Russian nuclear strategy in the same way. See Kristin Ven Bruusgaard, "Myth 9: 'Russian Nuclear Strategy Is Best Described as "Escalate to De-escalate,"' Chatham House, September 22, 2022, https://www.chathamhouse.org/2022/07/myths-and-misconceptions-around-russian-military-intent/myth-9-russian-nuclear-strategy and David Johnson, *Russia's Conventional Precision Strike Capabilities, Regional Crises, and Nuclear Thresholds*, Livermore Papers on Global Security, No. 3, Center for Global Security Research, Lawrence Livermore National Laboratory (February 2018), 13, https://cgsr.llnl.gov/sites/cgsr/files/2024-08/CGSR-Inflection-OP-FullBook-10-04-2023-v4-Web.pdf. "It is also a mis-leading label in that it does not fully encompass Russia's approach, which is better understood as a strategic deterrence, counter-escalation, and warfighting strategy."

200 See Colin Kahl, "Nuclear Deterrence and National Security in a Decisive Decade," in *The Inflection Point in the US Nuclear Security Enterprise*, Brad Roberts and William Tobey, eds., *Center for Global Security Research*, Lawrence Livermore National Laboratory and Office of National Security and International Studies, Los Alamos National Laboratory (October 2023), 7, https://cgsr.llnl.gov/content/assets/docs/CGSR-Inflection-OP-FullBook-10-04-2023-v4-Web.pdf.

201 Tobey, "The Effects of the War in Ukraine on NNSA Missions."

202 Johnson, *Russia's Conventional Precision Strike Capabilities*, 4.

203 Johnson, *Russia's Conventional Precision Strike Capabilities*, 16.

204 Johnson, *Russia's Conventional Precision Strike Capabilities*, 17; emphasis added.

205 Michael Kofman, "The Role of Nuclear Forces in Russian Maritime Strategy," *Russian Military Analysis*, March 12, 2020, https://russianmilitaryanalysis.wordpress.com/2020/03/12/the-role-of-nuclear-forces-in-russian-maritime-strategy/. Cited in Bruce Sugden, "Nuclear Operations and Counter-Homeland Conventional Warfare: Navigating Between Nuclear Restraint and Escalation Risk," *Texas National Security Review* 4, No. 4 (Fall 2021): 60–89, 75, https://tnsr.org/2021/10/nuclear-operations-and-counter-homeland-conventional-warfare-navigating-between-nuclear-restraint-and-escalation-risk/.

206 Jack Durkalec, *Russian Net Assessment and the European Security Balance*, Livermore Papers on Global Security, No. 13, Center for Global Security Research, Lawrence Livermore National Laboratory (March 2024), 43, https://russianmilitaryanalysis.wordpress.

A mockup of the Russian "Kalibr" cruise missile. Source: Allocer

observing the success of their long-range strike campaign in Syria, may have concluded that "deep operations" will take on increasing importance.[207] Russian military doctrine clearly calls for non-nuclear precision strikes on opponent's rear-area civilian and military targets.[208] In sum, these strikes serve the purpose of denying an adversary's military response but also directly attacking the civilian population's will to endure through the conflict.

Importantly, Russian strategic thinking prioritizes advantage gains in the initial phase of war through such asymmetric means as the "use of weapons from unanticipated locations" and "disorganizing state government control by … targeting power plants in vastly populated areas, for example."[209] Russia has implemented this strategy during its re-invasion of Ukraine, carrying out devastating attacks on power-generation infrastructure, among other target sets.[210] (Russian strikes in the initial phase of war had uneven success in Ukraine, as demonstrated by the cobbled-together nature of the invading forces, failure of basic combined-arms maneuver, and ultimately, these forces' retreat from Kyiv and the Kharkiv region in 2022.[211])

Russia could also choose to escalate against the US homeland using chemical, biological, or radiological weapons.[212] Notably, Russia has engaged in attacks and quasi-nuclear brinkmanship around Ukraine's nuclear power plants. Russian officials have

com/2020/03/12/the-role-of-nuclear-forces-in-russian-maritime-strategy/.

207 Durkalec, *Russian Net Assessment*, 74.

208 or further support to this assertion, see Michael Kofman et al., *Russian Military Strategy: Core Tenets and Operational Concepts*, Center for Naval Analyses, August 6, 2021, i, https://www.cna.org/reports/2021/08/Russian-Military-Strategy-Core-Tenets-and-Operational-Concepts.pdf, which assesses that Russian strategy calls for "a defensive offense that envisions persistent engagement of an opponent throughout the theater of military action, to include *critical infrastructure in their homeland*, executing strategic operations that *affect an adversary's ability or will* to sustain the struggle." Emphasis added.

209 Durkalec, *Russian Net Assessment,* 37.

210 Benjamin Jensen, "Crippling Civilian Infrastructure Has Long Been Part of Russian Generals' Playbook—Putin Is Merely Expanding That Approach," *The Conversation*, October 14, 2022, https://theconversation.com/crippling-civilian-infrastructure-has-long-been-part-of-russian-generals-playbook-putin-is-merely-expanding-that-approach-192226.

211 Durkalec, *Russian Net Assessment*, 100.

212 For more on Russian CBRN escalation, see Natasha Lander, Ryan Arick, and Christopher Skaluba, *Conceptualizing Integrated Deterrence to Address Russian Chemical, Biological, Radiological, and Nuclear (CBRN) Escalation*, Atlantic Council, October 2023, https://www.atlanticcouncil.org/in-depth-research-reports/report/continued-us-and-allied-integration-is-essential-to-deter-russian-cbrn-use/.

threatened European nuclear power stations as well.[213] Russian long-range conventional strikes on US nuclear power plants to generate radiological effects might be a form of intermediate escalation between conventional and nuclear weapons use against the US homeland.

US government concerns about Russian strikes on US homeland

In addition to Russian doctrines indicating an interest in coercive strikes on infrastructure in the US homeland, high-level US military and defense leaders and documents have stated time and again that the US homeland may well come under attack from Russia in the event of a war. The 2018 NDS noted that it "is now undeniable that the homeland is no longer a sanctuary," and that, in the event of war, "attacks against our critical defense, government, and economic infrastructure must be anticipated."[214] The 2022 NDS expands on that initial finding by observing that the United States faces "competitor doctrines that pose new threats to the US homeland. …"[215] More specifically, US adversaries are "posing all-domain threats to the US homeland in an effort to jeopardize the US military's ability to project power and counter regional aggression."[216] The 2022 NDS goes on to assert that the "PRC or Russia could use a wide array of tools in an attempt to hinder US military preparation and response in a conflict, including actions aimed at undermining the will of the US public, and to target our critical infrastructure and other systems."[217] At the highest level of US strategy, Russian threats to the US homeland are a driving concern.

For USNORTHCOM, tasked with the defense of the continental United States, Russian coercive, limited strikes are a clear threat. Guillot, in his responses to policy questions ahead of the SASC hearing on his nomination to command USNORTHCOM and NORAD, argued that "the next commander must also deter and stand ready to defend the United States against Russian … pursuit of advanced long-range conventional and nuclear missile technologies."[218] Guillot later testified before SASC that "[Russia and China] have sought to hold defense critical infrastructure in the United States at risk with kinetic and non-kinetic systems intended to impede our ability to flow forces overseas."[219] (Offering his best military advice, but not making an official statement of policy, Guillot recommended that the United States consider adjusting national missile defense policy to address Russian and Chinese limited strikes.)[220] Russia's kinetic threat to the US homeland is a major concern to the US military.

Finally, the latest Strategic Posture Commission, a bipartisan, congressionally chartered commission which released its final report in late 2023, perhaps summarized these concerns most clearly, warning "[limited coercive] attacks are potentially designed to dissuade and deter the United States from defending or supporting its Allies and partners in a regional conflict; keep the United States from participating in any confrontation; and divide US alliances. To defend against a coercive attack from China or Russia, while staying ahead of the North Korean threat, the United States will require additional [IAMD] capabilities beyond the current [program of record]."[221] In sum, US government sources consistently evince concern about Russian coercive strikes on the US homeland in wartime.

Russian capabilities for limited strikes on the US homeland

Russia's strategy to strike the US homeland and US defense leaders' concern about Russia doing so find validation in Russia's robust range of military capabilities to conduct limited coercive strikes on the US homeland. Russia's strategic nuclear triad is of course capable of conducting large-scale or limited nuclear attacks on the US homeland from silo-based and mobile ICBMs, SLBMs, and SLCMs launched from different directions or close to US shore, and strategic bombers capable of delivering gravity bombs or releasing ALCMs. Qualitative enhancements to Russia's strategic forces, as numerically limiting strategic arms treaties came into effect in the 1990s and 2000s, were a notable priority of Putin's.[222] Russia has modernized its ICBM arsenal in recent years, gradually phasing out the SS-18 Satan, SS-19 Stiletto, and SS-25 Satan in favor of more modern

213 Tobey, "The Effects of the War in Ukraine on NNSA Missions."

214 US Department of Defense, "Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge" (Washington, DC: Office of the Secretary of Defense, January 2018): 3, https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf.

215 US Department of Defense, *2022 National Defense Strategy*, 4.

216 US Department of Defense, *2022 National Defense Strategy*, 4.

217 US Department of Defense, *2022 National Defense Strategy*, 5.

218 "Advance Policy Questions for Lieutenant General Gregory M. Guillot, USAF Nominee for Commander, US Northern Command, and Commander, North American erospace Defense Command," US Senate Armed Services Committee, 118th Cong. (2023), https://www.armed-services.senate.gov/imo/media/doc/guillot_apq_responses.pdf.

219 US Senate Armed Services Committee, "Statement of General Gregory M. Guillot" (March 14, 2024).

220 Theresa Hitchens, "NORTHCOM Nominee Backs a 'Look at' Potential Changes to Homeland Missile Defense Rules," *Breaking Defense*, July 27, 2023, https://breakingdefense.com/2023/07/northcom-nominee-backs-look-at-potential-changes-to-homeland-missile-defense-rules/.

221 Creedon et al., *America's Strategic Posture*, 63, 103.

222 Durkalec, *Russian Net Assessment*, 119.

silo-based and road-mobile ICBMs.[223] Russia also fielded the Borei-class SSBNs with new SS-N-32 Bulava SLBMs, replacing older SSBN models.[224] In addition to enhanced delivery vehicles, Russia has also deployed improved warheads and RVs capable of maneuvering.[225]

In addition to its traditional nuclear triad, Russia can employ its Avangard HGV with intercontinental range. The Avangard is one of the six so-called "exotic" systems announced by Putin in a 2018 address.[226] Russian state media has reported that the Avangard is deployed to the SS-19 Stiletto and SS-X-29 Sarmat ICBMs.[227]

For more limited coercive strikes, Russia could also rely on its cruise missile arsenal and hypersonic missile capabilities. Indeed, the 2022 NDS identifies Russia's "long-range cruise missile threats" as one of the "serious, continuing risks" that allow Russia to remain an "acute threat."[228] The 2022 MDR expands on this assertion, stating that "Russia is developing and fielding a suite of advanced precision-strike missiles that can be launched from multiple air-, sea-, and ground-based platforms, and feature many capabilities designed to defeat missile defenses."[229] VanHerck, in March 2022 testimony as the then-commander of USNORTHCOM and NORAD, doubled down on that warning, stating that "Russia has fielded a new family of advanced air-, sea-, and ground-based cruise missiles to threaten critical civilian and military infrastructure."[230] Russia gained experience employing many of these capabilities in its ongoing military operations in Syria.[231]

Russian long-range aviation includes the Tu-160 "Blackjack" and Tu-95 "Bear" strategic bombers. Since 2007, Russia has resumed patrols with its bombers, which routinely enter the air defense identification zone of Alaska and operate near the airspaces of US allies as well.[232] Both bombers are primarily cruise-missile-launching platforms, capable of launching the Kh-55 and Kh-101/102 (AS-23a/23b) dual-capable supersonic cruise missiles.[233] The range of the AS-23a "enables Russian bombers flying well outside NORAD radar coverage—and in some cases from inside Russian airspace—to threaten targets throughout North America."[234] The Tu-22M medium-range bomber (as well as some Russian fighters) can also carry the Kh-47 Kinzhal air-launched ballistic missile (ALBM).[235] Russia is in the midst of developing the PAK DA, its next-generation flying-wing stealth bomber reported to be projected to enter service in the late 2020s.[236] Russia is also developing a next-generation long-range cruise missile, the Kh-BD.[237]

In addition to Russia's air-based cruise missiles, the Russian Navy can deliver nuclear or conventional cruise missiles from surface or subsurface assets. Russian surface frigates and corvettes, as well as its Kilo-, Akula-, Yasen-, and Borei-class submarines can fire the 3M-14 Kalibr (SS-N-30A) dual-capable cruise missile, with a reported range of 1,500 – 2,500 kilo-

223 Durkalec, *Russian Net Assessment*, 123.

224 Durkalec, *Russian Net Assessment*, 124.

225 Durkalec, *Russian Net Assessment*, 135–136.

226 Matthew Kroenig, Mark J. Massa, and Christian Trotti, "Russia's Exotic Nuclear Weapons and Implications for the United States and NATO," Atlantic Council, March 6, 2020, https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/russias-exotic-nuclear-weapons-and-implications-for-the-united-states-and-nato/.

227 "Russia to Use SS-19 ICBMs as Carriers for Avangard Hypersonic Glide Vehicles—Source," TASS, March 20, 2018, https://tass.com/defense/995167; "Missile Regiment near Orenburg Being Rearmed with Avangard System—Defense Ministry," TASS, November 18, 2022, https://tass.com/defense/1539059.

228 US Department of Defense, *2022 National Defense Strategy*, 5.

229 US Department of Defense, *2022 Missile Defense Review*, 3.

230 "Statement of General Glen D. VanHerck, United States Air Force, Commander, United States Northern Command and North American Aerospace Defense Command," US Senate Armed Services Committee, 117th Cong. (March 24, 2022), 6, https://www.armed-services.senate.gov/imo/media/doc/USNORTHCOM%20and%20NORAD%202022%20Posture%20Statement%20FINAL%20(SASC).pdf.

231 Durkalec, *Russian Net Assessment*, 74.

232 At the time of writing, most recently in July 2024. Oren Liebermann and Natasha Bertrand, "NORAD Intercepts Russian and Chinese Bombers Operating Together near Alaska in First Such Flight," CNN, July 25, 2024, https://www.cnn.com/2024/07/24/politics/norad-russian-chinese-bombers-alaska/index.html.

233 Missile Threat, "Kh-55 (AS-15)," Missile Defense Project, Center for Strategic and International Studies, last updated April 23, 2024, https://missilethreat.csis.org/missile/kh-55/; Missile Threat, "Kh-101 / Kh-102," Missile Defense Project, Center for Strategic and International Studies, last updated April 23, 2024, https://missilethreat.csis.org/missile/kh-101-kh-102/.

234 US Senate Armed Services Committee, "Statement of General Glen D. VanHerck" (March 24, 2022), 6.

235 Like most ballistic missiles, this ALBM has a maximum speed of more than Mach 5, and as such the Kinzhal is often referred to as a hypersonic missile. "Kh-47M2 Kinzhal (Dagger) Russian Air-Launched Ballistic Missile," US Army Training and Doctrine Command, n.d., https://odin.tradoc.army.mil/WEG/Asset/Kh-47M2_Kinzhal_(Dagger)_Russian_Air-Launched_Ballistic_Missile.

236 "Russia Builds Test Facilities for Next-Gen PAK-DA Bomber: What's Next?" Sputnik, December 12, 2023, https://sputnikglobe.com/20231215/russia-builds-test-facilities-for-next-gen-pak-da-bomber-whats-next-1115606302.html.

237 Durkalec, *Russian Net Assessment*, 126.

A Kh-47M2 Kinzhal being carried by a Mikoyan MiG-31K interceptor at the 2018 Moscow Victory Day Parade. Source: Kremlin.ru.

meters.[238] Russian Akula-class attack submarines are also capable of firing the RK-55 Granat (SS-N-21 "Sampson") intermediate-range cruise missile; while previously nuclear capable, these missiles were converted to conventional only for compliance with START II.[239] In the words of a former USNORTHCOM commander, Russian "Severodvinsk-class guided missile submarines … are designed to deploy undetected within cruise missile range of [US] coastlines to threaten critical infrastructure during an escalating crisis. This challenge will be compounded in the next few years as the Russian Navy adds the Tsirkon HCM to the Severodvinsk's arsenal."[240] Russia announced the successful completion of its Tsirkon testing program in June 2022 and has employed it in strikes on Ukraine in 2024.[241]

Russia's ground-launched cruise missile (GLCM) arsenal is primarily a threat to US deployed forces, allies, and partners in Europe but has some capability to hold Alaska at threat. The SSC-8/9M729 GLCM (the development of which prompted the collapse of the Intermediate-Range Nuclear Forces Treaty) has an estimated range of 2,500 kilometers, sufficient to range Alaskan targets from the Russian Far East.[242]

Some US analysts have also noted Russian interest in developing nuclear warheads with sub-kiloton yields.[243] Warheads of this yield, if developed and fielded, could perhaps make li-

238 Missile Threat, "3M-14 Kalibr (SS-N-30A)," Missile Defense Project, Center for Strategic and International Studies, last updated April 23, 2024, https://missilethreat.csis.org/missile/ss-n-30a/.

239 Missile Threat, "RK-55 Granat (SS-N-21)," Missile Defense Project, Center for Strategic and International Studies, last updated April 23, 2024, https://missilethreat.csis.org/missile/ss-n-21/.

240 US Senate Armed Services Committee, "Statement of General Glen D. VanHerck" (March 24, 2022), 6–7.

241 "Russia Says It's Completed Testing of Hypersonic Zircon Cruise Missile," Reuters, June 1, 2022, https://www.reuters.com/world/europe/russia-says-its-completed-testing-hypersonic-zircon-cruise-missile-2022-06-01/; "Russia Uses Zircon Hypersonic Missile in Ukraine for First Time, Researchers Say," Reuters, February 12, 2024, https://www.reuters.com/world/europe/russia-uses-zircon-hypersonic-missile-ukraine-first-time-researchers-say-2024-02-12/.

242 Missile Threat, "9M729 (SSC-8)," Missile Defense Project, Center for Strategic and International Studies, last updated April 23, 2024, https://missilethreat.csis.org/missile/ssc-8-novator-9m729/.

243 Roy Boone et al., *The Challenge of Russia's Non-Strategic Nuclear Weapons: Western Air Supremacy as One Russian Justification for NSNW*, National Strategic Research Institute, October 29, 2021, https://nsri.nebraska.edu/-/media/projects/nsri/docs/academic-publications/2021/october/The-Challenge-of-Russias-NSNW.pdf; Hans Kristensen and Robert Norris, "The B61 Family of Nuclear Bombs," *Bulletin of the Atomic Scientists* 70, no. 3 (November 2015): 79–84, doi:10.1177/0096340214531546.

mited nuclear use against the US homeland more thinkable in the minds of Russian planners by further reducing the collateral damage of such strikes.

In summary, conventional strikes against homeland infrastructure are a core part of Russian military doctrine, and limited nuclear strikes may also play a part in the Kremlin's military plans. US military and civilian defense leaders have raised the alarm about such attacks from Russia. And the Russian military has a diverse suite of capabilities capable of delivering such attacks.

Some of these capabilities proved to lack actual combat effectiveness in Russia's invasion of Ukraine. Observers have noted high failure rates of cruise missiles, poor battle-damage assessment, ineffectiveness against mobile targets, susceptibility to air defenses, and evidence of poor training of Russian aircrews.[244] A Ukrainian defense official stated publicly that Russia had expended more than 80 percent of its long-range land-attack missiles in the first year of the war.[245] Western economic sanctions and export restrictions may interfere with Russia's ability to reconstitute its long-range strike capabilities, although there is evidence that China is assisting Russia in replacing components that it can no longer acquire from Western suppliers.[246] This performance should measure, though not dismiss, US concerns about Russian strikes on the US homeland.

Limited and coercive threats in China's theory of victory

Chinese military strategy and plans also appear to call for limited and coercive strikes on the US homeland. China is certainly capable of conducting these strikes but is, in the short term, limited to ballistic missiles and an emerging hypersonic missile capability to do so.

Limited and coercive strikes in Chinese military strategy generally

Chinese military doctrine is opaquer than Russia's on the topic of limited and coercive strikes on the US homeland but still evinces a clear role for precision conventional strikes aimed to degrade key infrastructure and target an opponent's will to fight. Particularly, China's no-first-use (NFU) declaratory policy for nuclear weapons means that potential Chinese limited nuclear first use would derive from the nature of PRC capabilities, rather than official pronouncements.

In PRC strategy, precision conventional strikes are an important way to achieve a deterrent effect. The PLA's authoritative *Science of Military Strategy* (*Science*), last updated in 2020, notes the decreasing utility of nuclear deterrence under conditions of mutual vulnerability, a phenomenon that Western analysts recognize as the stability-instability paradox. Considering this condition, the *Science* notes that "the development of high-tech conventional weapons has not only narrowed the gap between combat effectiveness and nuclear weapons, but also has higher accuracy and greater controllability."[247] Through high-precision conventional weapons, the *Science* postulates, the PLA can achieve strategic effects. (Chinese strategy also recognizes "defensive deterrence" and "offensive deterrence," a concept closer to coercion or compellence in Western thinking.)[248] The *Science* also speaks of "warning military strikes," limited, high-precision strikes on military or political targets designed to demonstrate Chinese ability and determination as one of the key "methods of strategic deterrence."[249] The *Science* further stresses the importance of timing deterrent strikes to impact the resolve of the adversary and impact its will to fight. PLA writings emphasize the nature of modern warfare as a confrontation between systems and call for "kinetic and non-kinetic strikes against key points and nodes" to defeat opposing systems, including adversary willpower.[250] Absent from this discussion of precision strikes is the explicit reference to targets in the opponent's homeland or rear area, evident in Russian writing on the same issues, although there are oblique references to the "deeper level and … wider field" that the PLA can expect to face in People's War under today's conditions.[251] Limited, high-precision strikes to

244 Durkalec, *Russian Net Assessment*, 100.

245 Durkalec, *Russian Net Assessment*, 102.

246 Durkalec, *Russian Net Assessment*, 108; Kylie Atwood, "China Is Giving Russia Significant Support to Expand Weapons Manufacturing as Ukraine War Continues, US Officials Say," CNN, April 12, 2024, https://www.cnn.com/2024/04/12/politics/china-russia-support-weapons-manufacturing/index.html.

247 *In Their Own Words: Science of Military Strategy 2020*, (translation and publication of Xiao Tianliang et al., eds., *Science of Military Strategy* (Revised in 2020), PLA National Defense University), China Aerospace Studies Institute (January 2022), 129, https://www.airuniversity.af.edu/Portals/10/CASI/documents/Translations/2022-01-26%202020%20Science%20of%20Military%20Strategy.pdf.

248 China Aerospace Studies Institute, *In Their Own Words: Science of Military Strategy*, 128. For an explanation of the inclusion of compellence in Chinese concepts of deterrence, see Dean Cheng, "Chinese Views on Deterrence," *Joint Forces Quarterly* 60 (2011): 92-94, https://ndupress.ndu.edu/Portals/68/Documents/jfq/jfq-60/jfq-60_92-94_Cheng.pdf?ver=7wdLUCDzUSCAYlOp45x-FuQ%3D%3D and Michael Clarke, "Understanding China's Approach to Deterrence," *The Diplomat*, January 9, 2024, https://thediplomat.com/2024/01/understanding-chinas-approach-to-deterrence/. "China conceives of and practices deterrence in a distinct manner that combines dissuasive and compellent forms of coercion."

249 China Aerospace Studies Institute, *In Their Own Words: Science of Military Strategy*, 138.

250 Jeffrey Engstrom, *Systems Confrontation and System Destruction Warfare: How the Chinese People's Liberation Army Seeks to Wage Modern Warfare*, RAND, February 1, 2018, iii, https://www.rand.org/pubs/research_reports/RR1708.html.

251 China Aerospace Studies Institute, *In Their Own Words: Science of Military Strategy*, 187.

impact the adversary's will to fight can therefore be recognized as an essential part of Chinese military strategy.[252]

While nuclear weapons NFU remains official Chinese policy, US officials worry that limited, coercive nuclear first use may become part of Chinese nuclear strategy. The DOD, in the 2023 edition of its authoritative *Military and Security Developments Involving the People's Republic of China*, assesses that, despite the NFU policy:

> China's nuclear strategy probably includes consideration of a nuclear strike in response to a nonnuclear attack threatening the viability of China's nuclear forces or C2, or that approximates the strategic effects of a nuclear strike … Beijing probably would also consider nuclear use to restore deterrence if a conventional military defeat in Taiwan gravely threatened CCP regime survival.[253]

The 2022 NPR warns that "the range of nuclear options available to the PRC leadership will expand in the years ahead, allowing it potentially to adopt a broader range of strategies to achieve its objectives, to include nuclear coercion and limited nuclear first use."[254]

When it comes to so-called nuclear "counterstrike" operations following an adversary's first use, however, the DOD assesses that "military capability, population, and economy" targets are all in-scope.[255] The 2023 edition of the authoritative DOD report on China's military strategy and capabilities makes note of Chinese strategic thinking on the "controlled use" of lower yield nuclear warheads for "warning and deterrence," a continuation of China's steady departure from a nuclear posture congruent with minimum deterrence.[256] The *Military and Security Developments* goes on to warn that:

> PRC military writings in 2021 noted that the introduction of new precise small-yield nuclear weapons could possibly allow for the controlled use of nuclear weapons. … Such discussions provide the doctrinal basis for limited nuclear employment on the battlefield, suggesting PRC nuclear thinkers could be reconsidering their long-standing review that nuclear war is uncontrollable.[257]

The DOD goes on to assess that, after initial nuclear use, the PRC anticipates needing to conduct "multiple rounds of counterstrikes" against targets "to achieve conflict de-escalation" and "that the scale and intensity of retaliatory force needs to be carefully controlled."[258] It does not require much of a logical leap to combine an emerging belief that nuclear war is controllable, an appreciation for the less escalatory nature of low-yield nuclear use, and a proclivity for strikes on the US homeland to degrade force flow and national will to assess that China might conduct limited nuclear strikes on the US homeland in the event of a major war. Indeed, US defense scholars have posited a range of circumstances in which China could find it advantageous to use nuclear weapons first in a conflict with the United States.[259]

US government concerns about Chinese strikes on the US homeland

The quotations noted from the 2022 NDS, the 2023 Strategic Posture Commission, and testimony from military leaders demonstrate a concern for Chinese strikes on the US homeland in the same breath as the Russian threat. To recap, the 2018 NDS warns that "the homeland is no longer a sanctuary."[260] The 2022 NDS further asserts that the "PRC … could use a wide array of tools in an attempt to hinder US military preparation and response in a conflict, including actions aimed at undermining the will of the US public, and to target our critical infrastructure and other systems."[261] Guillot, in March 2024, the month after assuming command of USNORTHCOM and NORAD, argued before the Senate that "[China has] sought to hold defense critical infrastructure in the United States at risk with kinetic and non-kinetic systems intended to impede our ability to flow forces overseas."[262] The Strategic Posture Commission stated clearly that:

252 China Aerospace Studies Institute, *In Their Own Words: Science of Military Strategy*, 139.

253 US Department of Defense, *Military and Security Developments Involving the People's Republic of China, 2023 Annual Report to Congress* (Washington, DC: Office of the Secretary of Defense, October 19, 2023): 95, 106, https://media.defense.gov/2023/Oct/19/2003323409/-1/-1/1/2023-MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA.PDF.

254 US Department of Defense, *2022 Nuclear Posture Review*, 11.

255 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 94.

256 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 112.

257 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 99.

258 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 105.

259 See Matthew Kroenig, *Deliberate Nuclear Use in a War over Taiwan: Scenarios and Considerations for the United States*, Atlantic Council, November 30, 2023, https://www.atlanticcouncil.org/in-depth-research-reports/report/deliberate-nuclear-use-in-a-war-over-taiwan-scenarios-and-considerations-for-the-united-states/; Gregory Weaver, "The Role of Nuclear Weapons in a Taiwan Crisis," Atlantic Council, November 22, 2023, https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/the-role-of-nuclear-weapons-in-a-taiwan-crisis/.

260 US Department of Defense, "Summary of the 2018 National Defense Strategy," 3.

261 US Department of Defense, *2022 National Defense Strategy*, 5.

262 US Senate Armed Services Committee, "Statement of General Gregory M. Guillot" (March 14, 2024).

> [Limited coercive] attacks are potentially designed to dissuade and deter the United States from defending or supporting its Allies and partners in a regional conflict; keep the United States from participating in any confrontation; and divide US alliances. To defend against a coercive attack from China or Russia … the United States will require additional [IAMD] capabilities beyond the current [program of record].[263]

Beyond these statements, military and defense leaders have concerns about China's specific designs on striking the US homeland. In 2022, VanHerck, the then-commander of USNORTHCOM and NORAD, testified to Congress that "China has begun to develop new capabilities to hold our homeland at risk in multiple domains in an attempt to complicate our decision making and to disrupt, delay, and degrade force flow in crisis and destroy our will in conflict."[264] His successor, General Guillot, later elaborated that "the PRC will continue to develop increasingly advanced kinetic and non-kinetic systems capable of holding US territory and interests at risk."[265] Secretary of the Army Christine Wormuth was even more direct, warning that, in "a major war with China, the United States homeland would be at risk … with both kinetic and non-kinetic attacks. … They are going to go after the will of the United States public. They are going to try to erode support for a conflict."[266] Military and civilian defense leaders clearly anticipate that China would now, or plans to, in the near future, strike critical civilian and military infrastructure in the US homeland in wartime.

Chinese capabilities for limited strikes on the US homeland

While China's ability to project air- and sea-borne power against the contiguous United States pales in comparison to Russia's, the PRC has a robust and expanding arsenal of long-range missiles capable of delivering nuclear and conventional limited strikes against the US homeland.

China's traditional nuclear triad includes hundreds of silo-based and solid-fueled, road-mobile ICBMs, mostly MIRVed or MIRVable, capable of ranging the US homeland. China could employ some of these forces in a limited way. The PRC also fields an SSBN and SLBM force that is growing in sophistication. The DOD assesses that the "PRC likely began near-continuous at-sea deterrence patrols with its six operations JIN class SSBNs."[267] While China's SSBNs may struggle to exit the "bastions" of China's near seas into the open ocean without interception during wartime, the new JL-3 SLBM should allow China to strike the contiguous United States from nearer to Chinese

263 Creedon et al., *America's Strategic Posture*, 64, 104.
264 US Senate Armed Services Committee, "Statement of General Glen D. VanHerck" (March 24, 2022), 7.
265 US Senate Armed Services Committee, "Advance Policy Questions for Lieutenant General Gregory M. Guillot" (2023).
266 Harrison, "Secretary of the Army Christine Wormuth's American Enterprise Institute (AEI) Transcript."
267 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 96.

A Chinese Type 094 (JIN Class) Ballistic Missile Submarine, 2014. Source: US Navy Office of Legislative Affairs, December 2010.

submarine ports. China is also developing a next-generation Type 096, which currently appears to be under construction.[268]

China is increasing the flexibility of its nuclear force in terms of the yield of its nuclear weapons, allowing Beijing to consider lower-yield nuclear strikes more seriously than before. The DOD asserts that the:

> PRC probably seeks lower yield nuclear warhead capabilities to provide proportional response options that its high-yield warheads cannot deliver. … A 2017 defense industry publication indicated a lower-yield weapon had been developed for use against campaign and tactical targets that would reduce collateral damage.[269]

Even if such weapons are developed in response to concerns about possible US nuclear low-yield nuclear first use, there is nothing that would prevent the PRC from using such low-yield weapons itself in a first strike.

US analysts have long observed the progress in China's defense industry and acquisition system and speculated that China could be developing the capability to strike the US homeland with conventional weapons.[270] Indeed, as far back as 2004, the *Science of Second Artillery Campaigns* called for the development of conventionally armed ICBMs, and some Western analysts speculated that China's three hundred new ICBM silos revealed in 2021 could be partially for this purpose.[271] The DOD furthered this speculation by stating that "the PRC may be exploring development of conventionally armed intercontinental range missile systems."[272] China's existing dual-capable DF-26 missile can range the US territory of Guam and targets in Alaska.[273] The DF-26 can rapidly swap between conventional and nuclear warheads.[274] China is also developing the DF-27, an ICBM or IRBM supposedly capable of delivering a hypersonic warhead.[275]

In addition to its traditional nuclear and conventional ICBM force, China is developing a range of hypersonic capabilities capable of holding the US homeland at risk. According to US government reports, China has tested an HGV on its DF-41 ICBM and has developed a variety of other HGVs with shorter ranges.[276] China has a robust capacity to design and test hypersonic weapons. In the summer of 2021, China tested an HGV deployed from a FOBS, a development that would prove even further confounding to missile warning, tracking, and defense.[277] This test "demonstrated the weapon's ability to survive reentry and perform high-speed and maneuvering glide after orbiting around the globe."[278] A FOBS could deorbit in such a way as to approach the US homeland from trajectories not currently covered by missile warning radars—such as the south.[279] Moreover, the FOBS-delivered HGV presents a "low-altitude approach and ability to maneuver midcourse" that would frustrate existing defenses.[280] (China could go further than a FOBS weapon, developing a MOBS, essentially a nuclear-armed satellite that could launch into orbit and then deorbit a nuclear-armed RV at will). In summary, China can carry out limited, coercive strikes against the US homeland using nuclear or conventional ICBMs and a growing number of HGVs, potentially deliverable by a FOBS.

Unlike Russia, China is less capable of striking the contiguous United States through air- or sea-launched missiles, though it is working toward developing such a capability. Since 2019, the PLA Air Force (PLAAF) has operated the H-6N strategic bomber as a nuclear-capable aircraft; the H6-N can be air-to-air refueled and can carry ALBMs and ACLMs.[281] The 2023 *Military and Security Developments Involving the PRC* report states that "in 2021, the Y-20U tanker entered service, sup-

268 Luke Caggiano, "China Deploys New Submarine-Launched Ballistic Missiles," *Arms Control Today*, May 2023, https://www.armscontrol.org/act/2023-05/news/china-deploys-new-submarine-launched-ballistic-missiles.

269 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 98.

270 Bruce Sugden, "China's Conventional Strikes Against the US Homeland," Center for International Maritime Security, June 25, 2014, https://cimsec.org/china-conventional-strike-us/.

271 The Second Artillery Corps operated the PLA's long-range, ground-based missiles before the creation of the PLA Rocket Force (PLARF) in 2015. Roderick Lee, "A Case for China's Pursuit of Conventionally Armed ICBMs," *The Diplomat*, November 17, 2021, https://thediplomat.com/2021/11/a-case-for-chinas-pursuit-of-conventionally-armed-icbms/.

272 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), VI, 67.

273 Missile Threat, "DF-26," Missile Defense Project, Center for Strategic and International Studies, last updated April 23, 2024, https://missilethreat.csis.org/missile/dong-feng-26-df-26/.

274 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 67.

275 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 67.

276 Kelley M. Sayler, "Hypersonic Weapons: Background and Issues for Congress," Congressional Research Service, updated February 9, 2024, https://crsreports.congress.gov/product/pdf/R/R45811.

277 Theresa Hitchens, "It's a FOBS, Space Force's Saltzman Confirms Amid Chinese Weapons Test Confusion," *Breaking Defense*, November 29, 2021, https://breakingdefense.com/2021/11/its-a-fobs-space-forces-saltzman-confirms-amid-chinese-weapons-test-confusion/.

278 S Senate Armed Services Committee, "Statement of General Glen D. VanHerck" (March 24, 2022), 7.

279 Timothy Wright, "Is China Gliding Toward a FOBS Capability?" International Institute for Strategic Studies, October 22, 2021, https://www.iiss.org/en/online-analysis/online-analysis/2021/10/is-china-gliding-toward-a-fobs-capability/.

280 US Senate Armed Services Committee, "Statement of General Glen D. VanHerck" (March 24, 2022), 7.

281 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 63.

porting the continued PLAAF expansion of air refuellable fighters, bombers, and [special mission] aircraft. These new air refuellable aircraft will *significantly expand the PRC's ability to conduct long-range offensive air operations*."[282] This new capability set will complement the existing "H-6U, a modified tanker variant of the H-6 bomber, as well as a small number of larger IL-78 Midas."[283] Given the range of the bomber and the limits of Chinese air-to-air refueling, it seems unlikely that the H6-N could reliably strike the *contiguous* United States, though USNORTHCOM has warned that the H6-N and ALBM combination will hold Alaska at risk.[284] This ALBM, the DOD assesses, is armed with a maneuvering reentry vehicle (MaRV), which would complicate any US defenses.[285]

China is also developing a long-range stealth bomber. According to a DOD report, "the H-20 bomber's range could be extended to cover the globe with aerial refueling. It is also expected to employ both conventional and nuclear weaponry. …"[286] It is unclear when the bomber will enter service, but it may be by the late 2020s.

China clearly intends to develop a capability to strike the US homeland with sea-launched LACMs, but this capability may be some years off. The 2023 *Military and Security Developments Involving the PRC* presents this as a key finding regarding the capabilities of the PLAN. The document states that "in the near term, the PLAN will have the ability to conduct long-range precision strikes against land targets from its submarine and surface combatants using land-attack cruise missiles, notably enhancing the PRC's power projection capability."[287] The PLAN is equipping LACMs to its Type 093/*Shang*-class SSGNs, guided missile destroyers, and guided-missile cruisers, among other vessels.[288] The annual report goes on to project that "the addition of land-attack capabilities to the PLAN's surface combatants and submarines would provide the PLA with flexible long-range strike options. This would allow the PRC to hold land targets at risk beyond the Indo-Pacific region," an oblique reference, perhaps, to the US homeland.[289] In a sign of the PRC's intent to project power across the Pacific, a PLAN naval squadron conducted drills near the Aleutian Islands of Alaska with Russian counterparts in August 2023.[290] The PLAN also fields increasingly capable replenishment vessels, which would enable long-range deployments.[291] USNORTHCOM warns that "later this decade, China seeks to field its Type 095 guided missile submarine, which will feature improved quieting technologies and a probable land-attack cruise missile capability … these weapons will offer Beijing the option of deploying strike platforms within range of our critical infrastructure during a conflict…"[292] In the future, the United States may well need to contend with an offshore cruise missile threat to the West Coast from Chinese guided-missile submarines or surface vessels.

There is some danger in overinterpreting the intent of China's leadership from PLA military capabilities. For instance, conventional ballistic missiles could be a stopgap measure to fill empty missile silos otherwise bottlenecked by limitations in China's fissile material production.[293] Like those of all states, China's weapons programs must conform to internal bureaucratic-political dynamics as well as the need to defend against a range of threat actors. But, on balance, the combination of Chinese official writings on military strategy, US government warnings about Chinese capability and intent, and China's burgeoning military capabilities make a strong case for concern about Chinese limited, coercive strikes on the US homeland in wartime.

The possibility for limited coercive stikes from North Korea

It is possible that North Korea could present a limited nuclear threat to the US homeland. The logic of electing limited coercive escalation against the United States depends on the ability of the escalating state to hold out a "third strike" against what the adversary values most. That is to say, North Korea could only benefit from a limited attack on the United States if North Korean leadership could out the threat of a large-scale strategic attack if initial US retaliation crossed a certain unacceptable threshold. If the size of North Korea's nuclear force and its intercontinental delivery modes continue to expand, there might be a minimal level of credulity in North Korea considering limited nuclear employment at an intercontinental range.

282 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 92; emphasis added.

283 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 63.

284 US Senate Armed Services Committee, "Statement of General Glen D. VanHerck" (March 24, 2022), 8. It is also notable that Chinese bombers would likely need to transit Russian airspace to reach most targets in the contiguous United States.

285 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 108.

286 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 92.

287 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), V.

288 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 56.

289 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 57.

290 Michael R. Gordon and Nancy A. Youssef, "Russia and China Sent Large Naval Patrol Near Alaska," *Wall Street Journal*, updated August 6, 2023, https://www.wsj.com/articles/russia-and-china-sent-large-naval-patrol-near-alaska-127de28b.

291 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 92.

292 US Senate Armed Services Committee, "Statement of General Glen D. VanHerck" (March 24, 2022), 8.

293 Ken Moriyasu, "China Expanding Ways to Target Continental US, Pentagon Report Says," *Nikkei Asia*, October 19, 2023, https://asia.nikkei.com/Politics/International-relations/US-China-tensions/China-expanding-ways-to-target-continental-US-Pentagon-report-says.

US Northern Command Commander US Air Force Gen. Glen D. VanHerck speaks during a press briefing at the Pentagon, July 28, 2021. Source: Brittany Chase/Office of the Secretary of Defense Public Affairs.

Why defend against limited coercive threats?

Having established that Russia and China are considering limited conventional and nuclear attacks on the US homeland, this section makes the case for defending against them. Being able to defend certain key nodes within the US homeland from limited attacks is essential for deterring adversary aggression and, if deterrence fails, for projecting power in support of US grand strategy. The argument that the United States, Russia, and China can deter each other from striking another's homeland during a large-scale and direct military conflict does not stand up to scrutiny. The logic of defenses against limited strikes is that doing so drives up the requirements for a successful attack. Against a conventional strike, this increases costs for the adversary. And, for a possible nuclear strike, even limited defenses could drive up the total force package an adversary would need to consider to be sure of the success of its attack, causing the attackers to reconsider whether such a strike would ultimately be perceived as limited.

To deter conflict, project power, and achieve US grand strategy, the United States must defend its homeland

Unless the United States fields more suitable missile defenses, Russian and Chinese limited, coercive missile threats to the US homeland will undermine US efforts to deter conflict and, if deterrence fails, to project power to key theaters. Russia and China plan to conduct long-range strikes on the US homeland to impede force flow and degrade national will. US adversaries may believe that missile attacks on the US homeland (possibly combined with antishipping campaigns in the Atlantic and Pacific Oceans, attacks on disembarkation points in theater, and non-kinetic campaigns globally) can prevent force flow long enough so that these adversaries can achieve a *fait accompli* territorial seizure and then deter or defeat an allied counterattack. Missile defense of the homeland is a key component of degrading adversaries' confidence that they can prevent timely reinforcement and thereby help the United States deter such a conflict in the first place.

It is also essential to Russian and Chinese theories of victory to be able to control escalation once a conflict begins and convince the United States to sue for peace on terms acceptable to those regimes. They may be able to directly target the will of the US population to support such a conflict by targeting critical infrastructure, such as power plants, pipelines, water treatment facilities, etc. (Of course, while Russian and Chinese planners may *think* such measures will degrade US national will, examples from Pearl Harbor to September 11th suggest otherwise.) Still, US homeland missile defense might undermine Russian and Chinese confidence that they can deliver strikes tailored to control escalation, enhancing deterrence.

Both above measures—reducing vulnerability to attacks on force flow and civilian infrastructure—will be noted by allies. By better protecting itself, the United States can make clear to its

allies that it is better able to stand by them in conflict. This assurance will help allies remain aligned with US foreign policy goals, even when doing so puts them in danger from aggressors.

The United States cannot avoid attempts at limited strikes on the US homeland, either through deterrence or restraint

Even if Russia and China are capable of limited, coercive threats on the US homeland, critics might argue that these states would not dare conduct such attacks due to the consequences of US retaliation. The United States should not count on adversaries refraining from attacks on the US homeland for fear of reciprocal attack or constraints to US options to make such a tradeoff possible. Some might dismiss the likelihood of Russian or Chinese strikes on the US homeland, thinking that both parties to the conflict have strong incentives to avoid escalation that might come through strikes on each other's homelands. Indeed, some US analysts have proposed entire warfighting strategies around the idea that Washington should eschew attacks on the Chinese homeland, lest nuclear war result.[294] An important element of deterrence is matching the promise of punishment with assurance to withhold that punishment (in this case, strikes on Russia's or China's homelands) if the party one seeks to deter complies with one's demands (in this case, not strike the US homeland). But the United States would find it very hard to win a regional war against Russia or China, without destroying at least some targets inside those countries. And if the United States is striking their territory, there is no reason to think that either state would restrain itself from reciprocating.

Nor can the United States rely solely on the threat of deterrence by punishment through nuclear escalation to address coercive threats. There is certainly a subset of conventional attacks on the US homeland that would prompt a nuclear response. In the 2018 NPR, these were called "non-nuclear strategic attacks."[295] The 2022 NPR does not use those exact words but restates the same concept by asserting that "nuclear forces [are] the ultimate backstop to deter attacks on the homeland."[296] More explicitly, the 2022 NPR "affirms that [US] nuclear forces deter all forms of strategic attack. … nuclear weapons are required to deter not only nuclear attack but also a narrow range of high consequence, strategic-level attacks."[297] The 2018 and 2022 NPRs both make clear that certain Russian or Chinese non-nuclear strikes on the US homeland could rise to the level of a nuclear response but are deliberately ambiguous about how consequential such strikes would need to rise to become "strategic-level attacks."

But this nuclear threat cannot, and is not intended to, deter Moscow and Beijing from the full range of possible non-nuclear strikes on the US homeland. VanHerck, just before turning the helm of USNORTHCOM and NORAD over to Guillot, fretted that "projected developments in our strategic competitor's kinetic and non-kinetic capabilities exploit an increasing gap between our nuclear deterrence and conventional homeland defenses."[298] This is a classic instance of the stability-instability paradox—a cornerstone of nuclear deterrence theory which holds that robust deterrence at one level of escalation (e.g., a strategic nuclear exchange) may permit aggression at a different level (e.g., a conventional attack) because neither side can rely on escalation to deter the lower-level attack. In the words of one scholar writing on the emerging situation in which all three great powers are capable of conventional precision strikes on each other's homelands:

> [J]ust as the great powers' assured-nuclear-destruction capabilities provide their homelands a higher (but not absolute) level of sanctuary against nuclear escalation in the midst of conventional operations in peripheral areas, those same nuclear capabilities will still provide a higher level of sanctuary status against nuclear escalation in the era of a long-range conventional precision-strike regime, but the homelands will not necessarily serve as sanctuaries for critical assets against conventional strikes. … Under nuclear stalemate, as long as a competitor does not view enemy conventional strikes against its homeland as an existential threat, it might refrain from counter-homeland nuclear escalation out of fear of the enemy's nuclear counterstrikes.[299]

Regardless of what deterrent message the United States may wish to send, adversary military planners may believe, despite US messaging, that the United States will strike their homelands, and they can sufficiently control escalation so as to strike the US homeland without nuclear repercussions. Two respected scholars of China's strategic thinking have concluded that PRC strategists think this way.[300] Russian military thought evinces great concern that Western military

294 T.X. Hammes, "Offshore Control: A Proposed Strategy for an Unlikely Conflict," National Defense University Strategic Forum, June 2012, https://ndupress.ndu.edu/Portals/68/Documents/stratforum/SF-278.pdf.

295 US Department of Defense, *2018 Nuclear Posture Review*, XIII.

296 US Department of Defense, *2022 National Defense Strategy*, 9.

297 US Department of Defense, *2022 Nuclear Posture Review*, 8.

298 "An Interview with General Glen D. VanHerck, USAF, Commander, North American Aerospace Defense Command (NORAD) and United States Northern Command (USNORTHCOM)," Information Series, Conversations on National Security, no. 574, National Institute for Public Policy, February 1, 2024, https://nipp.org/wp-content/uploads/2024/01/IS-574.pdf.

299 Sugden, "Nuclear Operations and Counter-Homeland Conventional Warfare," 70, 71.

300 Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and US-China Strategic Stability," *International Security* 40, no. 2 (2015): 7–50, https://doi.org/10.1162/ISEC_a_00215; Fiona S. Cunningham and M. Taylor Fravel, "Dangerous Confidence? Chinese Views on Nuclear Escalation," *International Security* 44, no. 2 (Fall 2019): 61–109, https://doi.org/10.1162/ISEC_a_00359. Cited in Sugden, "Nuclear Operations," 77.

strategy relies on multi-domain precision strikes on Russia.[301] And, Russian planners, for their part, believe that escalation control is essential in military planning and that the strategic use of nonnuclear weapons can help deliver the right "dose" of deterrent pain short of nuclear weapons use.[302] In sum, it is not possible or desirable to deter the full range of Russian and Chinese limited, coercive strikes on the US homeland by the threat of conventional or nuclear punishment.

Limited defenses introduce uncertainty by driving up force packages

Limited homeland missile defenses make it possible to deter limited strikes, so long as defenses are in place for the range of limited attack options available to the attacker. Defenses introduce uncertainty into the calculations of an attacker. Without sufficient confidence that an attack would make it through, the attacker would need to increase the number of weapons allocated to the attack or suppress defensive systems. In this case, the attack faces a dilemma—additional weapons or the preparatory suppression of defenses would likely be evident to the adversary. The attacker, then, would also lose confidence that the adversary would perceive the attack as limited, which may invite stronger retaliation than the attacker could accept. Russian strategists already demonstrate some concern that they may not understand what level of response they would draw from specific degrees of attacks; defenses can contribute to increasing that amount to an intolerable level.[303]

This is the exact outcome of US missile defenses that worries some Russian analysts. One is quoted as saying that "the possibility that US BMD [ballistic missile defense] could achieve a limited interception of ballistic missiles in the near future could possibly violate the principle of 'dosing' and guaranteed fulfillment of assigned 'de-escalatory' activities."[304] Perhaps ironically, the deployment by China of certain Russian-origin capabilities (S-400 air and missile defenses, airframes for airborne early warning aircraft, air-and-missile-defense-capable surface vessels, and early-warning satellites) has raised concerns for US analysts that US limited nuclear operations against China could now require an undesirably large force package.[305]

Resilience must consist of active and passive defenses

To achieve resilience against adversary attacks, some might argue that the United States is better off relying on passive measures, like redundancy. These are misguided arguments. While deterrence by passive defense has its role in addressing threats to the homeland, deterrence by active denial alongside effective defenses, if deterrence fails, plays a separate, irreplaceable role.

Deterrence by passive defense is a necessary response but is not sufficient. The 2022 NDS asserts that the "Department will improve its ability to operate in the face of multi-domain attacks on a growing surface of vital networks and critical infrastructure, both in the homeland and in collaboration with Allies and partners at risk."[306] The NDS further explains that the "Department will take steps to … reduce [attackers'] expected benefits for aggressive actions against the homeland, particularly by increasing resilience."[307] Having backup facilities and the ability to reconstitute would be valuable. But duplicating facilities might, in some cases, be prohibitively expensive and reconstitution too time-consuming. Active defenses have a niche role to defend certain key targets and introduce uncertainty into attackers' decision-making.

Conclusion

There is strong evidence that Russian and Chinese military strategy may call for limited, coercive strikes on the US homeland in wartime. Russia has a robust, and China has a growing, arsenal of weapons capable of delivering such strikes with nuclear and conventional payloads from a variety of trajectories and delivery modes on the US homeland. US defense and military leaders are increasingly raising the alarm about the urgency of such challenges. Should these warnings go unaddressed, planners in Russia and China may come to believe that they can prevail in a conflict by disrupting US force flow and degrading US national will, allowing either state to create facts on the ground and deter a forceful US response.

How can the United States address this threat, maintain deterrence, and assure allies that the United States can protect them? Read on to Sections Seven through Ten, in which this report lays out a plan to do so.

301 Durkalec, *Russian Net Assessment*, 36.

302 Durkalec, *Russian Net Assessment*, 41.

303 Durkalec, *Russian Net Assessment*, 148.

304 Johnson, *Russia's Conventional Precision Strike Capabilities*, 74.

305 Ottawa Sanders, Mark J. Massa, and Alyxandra Marine, *The Impact of the Evolving Sino-Russian Relationship on Chinese Military Modernization and the Implications for Deterrence in the Indo-Pacific*, Atlantic Council, (unpublished manuscript, May 2022).

306 US Department of Defense, *2022 National Defense Strategy*, 8.

307 US Department of Defense, *2022 National Defense Strategy*, 9.

Section six: The two-nuclear-peer problem: Enhancing nuclear force survivability

Introduction

The PRC is rapidly expanding its nuclear arsenal. One DOD estimate slates China to reach 1,500 deployable nuclear warheads by the year 2035.[308] Russia, while currently capped at 1,550 accountable strategic warheads by New START, maintains the world's largest nuclear arsenal, which also includes thousands of tactical nuclear weapons and some so-called "exotic" intercontinental-range nuclear weapons not accounted for by New START.[309] With New START slated to expire in February of 2026 and prospects for its renewal quite dim, the United States will likely face two autocratic great-power rivals with revisionist foreign policies and nuclear arsenals similarly sized to the United States in the 2030s. This emerging two-nuclear-peer problem presents significant challenges to the United States.[310]

The two-nuclear-peer problem poses two intertwined sub-issues. The first is how to maintain the survivability of US nuclear forces to respond to novel scenarios possible with two nuclear peers. The second is the necessary size of the US nuclear force to cover the increased target set presented by larger opposing nuclear forces to the extent needed to achieve the desired deterrent effect against these states. Key to answering both questions is enhancing the total number of US deliverable nuclear warheads that would survive a nuclear first strike on the United States.

The United States engages in a range of efforts to enhance the survivability of US nuclear forces. The ongoing modernization of US nuclear forces is essentially a one-for-one replacement of the existing triad. Some analysts have suggested changes or additions to the US nuclear arsenals to address this issue—from making a portion of the ICBM force mobile and increasing the number of warheads on delivery vehicles to forward deploying a greater number of nuclear forces. The US government is also pursuing diplomatic efforts to reduce nuclear dangers. These efforts are essential, and fully analyzing them is beyond the scope of this study. But missile defenses must also be part of this equation.

The United States should expand its homeland missile defenses to address the increasing possibility of a combined Russia-China nuclear disarming threat to the ground-based elements of the US nuclear triad. The authors contend that the threat of simultaneous or sequential nuclear attack on US nuclear forces, while remote, is exactly the sort of high-consequence event against which US nuclear strategy must hedge. While such defenses will not completely defend the triad, their design should complicate adversaries' targeting problems as to introduce an unacceptably high degree of doubt to their planning. A full analysis of means to enhance US nuclear survivability under the two-nuclear-peer problem is beyond the scope of this study. In a limited budget environment, it is possible that the marginal defense dollar would be better spent enhancing nuclear force survivability through other means, such as uploading warheads or alerting bombers. However, the work of this study is to establish that missile defense is a key arrow in the quiver of defense planners as they design a portfolio of forces capable of achieving strategic deterrent effects. Indeed, enhancing homeland missile defense can complement other solutions to the two-nuclear-peer survivability problem, since defenses improve the effectiveness of many other approaches, such as an increase in strategic offensive forces, mobility, enhanced theater-range nuclear forces, etc.

This section reviews the role of retaliatory force survivability in nuclear planning. It then analyzes the nature of the two-nuclear-peer problem and its implications for survivability, including under the conditions of simultaneous and sequential attacks. The section examines the evidence and concerns the US government and, in particular, US Strategic Command (USSTRATCOM) have regarding the survivability and endurance of current and planned US nuclear forces. Finally, the study argues for a role for homeland missile defense in improving nuclear force survivability.

Survivability: The *sine qua non* of nuclear deterrence

The first and foremost requirement for stable nuclear deterrence is the ability to survive an enemy's disarming first strike

308 US Department of Defense, *Military and Security Developments Involving the People's Republic of China*, (2022). Notably, the 2023 edition of this annual report to Congress estimates one thousand warheads by 2030 without making a 2035 estimate, perhaps reflecting the uncertainty of projecting China's buildup so many years in the future.

309 *Report on the Nuclear Employment Strategy of the United States – 2020 Specified in Section 491(a) of Title 10 USC.*, US Department of Defense, November 30, 2020, https://www.esd.whs.mil/Portals/54/Documents/FOID/Reading%20Room/NCB/21-F-0591_2020_Report_of_the_Nuclear_Employement_Strategy_of_the_United_States.pdf.

310 Following the report of a study group convened by the Center for Global Security Research at the Lawrence Livermore National Laboratory, on which the principal investigator served as a member, this study uses the "two nuclear peer" shorthand for the situation likely to face the United States in the 2030s, should the PRC achieve its planned nuclear buildup. See Roberts et al., *China's Emergence as a Second Nuclear Peer*.

and retaliate in a manner that inflicts unacceptable damage on what the adversary most values. How the United States postures its nuclear forces will influence an aggressor's calculus about whether such a first strike is feasible and worth the risk. A nuclear force too small and unhardened against nuclear or precision conventional attack could prove to be a tempting target. If the United States convinces a potential adversary that a disarming or decapitation strike is not feasible (or that the success of such a strike is greatly uncertain), then this removes that threat as a means of coercion.

Ensuring the survivability of US nuclear forces against a Soviet attack was the driving concern of the 1983 Scowcroft Commission, which observed in its report that "the objective for the United States should be to have an overall program that will so confound, complicate, and frustrate the efforts of Soviet strategic war planners that, even in moments of stress, they could not believe that they could attack our ICBM forces effectively."[311] This remains good advice today and necessary to address the threat to US nuclear forces posed by China in addition to Russia. Enhanced survivability of a leg of the triad also hedges against the potential technological failure of the other legs or a technological breakthrough, such as the ability to track and target the US ballistic submarine fleet.[312]

The nature of the two-nuclear-peer problem

The expansion of China's nuclear capabilities and the persistence of the Russian nuclear threat means that the United States must now calculate the survivability of its nuclear forces against two major nuclear adversaries and across at least two different—but related—sets of circumstances. Put somewhat differently, a senior official at USSTRATCOM contends that the expansion of Chinese nuclear forces places a premium on survivable US warheads to hold at risk an expanded target set of Russian and Chinese nuclear weapons.[313] The **first** scenario of concern to US planners is a simultaneous, pre-planned, and combined Russian and Chinese nuclear (and conventional) attack against US nuclear forces and NC3. The **second** scenario envisions deterring a second adversary (through the threat of nuclear retaliation) while already engaged in a general nuclear war with the first.[314] In the formulation of the 2023 Strategic Posture Commission, "the United States must maintain a resilient nuclear force that can absorb a first strike and respond effectively with enough forces to cause unacceptable damage to the aggressor while still posing a credible threat to the other nuclear power."[315] This paper now examines both of these scenarios.

Scenario one: Surviving a simultaneous and combined disarming first strike

It is not necessary to assess the likelihood of a combined Russian and Chinese disarming first strike to appreciate the need to plan and structure forces against this possibility. Such an attack would pose the ultimate existential risk to the United States. Just the *threat* of such an attack, especially during a crisis or conflict with both Russia and China, could have a coercive effect on US intentions and war plans (and ultimately deterrence) if US leadership and allies thought it was a plausible option.

Soviet nuclear doctrine during the Cold War suggests Moscow made plans for a preemptive disarming strike against US nuclear forces and NC3 should deterrence fail.[316] Recent statements by Putin suggest this remains part of Russian nuclear thought today. Speaking about a disarming strike, Putin publicly said, "Maybe it's worth thinking about using this idea developed by our US

311 Brent Scowcroft (chair) et al., *Report of the President's Commission on Strategic Forces* (April 6, 1983): 15, HathiTrust digital release of the University of Minnesota archived December 10, 1990 copy [US - G.P.O. – D- 295], https://web.mit.edu/chemistry/deutch/policy/1983-ReportPresCommStrategic.pdf.

312 Risks to the submarine leg are speculated to include quantum sensing, large-scale use of uncrewed underwater vehicles, artificial intelligence, and other emerging technologies. See Sebastian Brixey-Williams, "Prospects for Game-Changers in Submarine-Detection Technology," *The Strategist*, Australian Strategic Policy Institute, August 22, 2022, https://www.aspistrategist.org.au/prospects-for-game-changers-in-submarine-detection-technology/; Rose Gottemoeller, "The Standstill Conundrum: The Advent of Second-Strike Vulnerability and Options to Address It," *Texas National Security Review* 4, no. 4 (Fall 2021): 115–124, http://dx.doi.org/10.26153/tsw/17496. The 2018 NPR made hedging against such technical risk a purpose of US nuclear strategy; the 2022 NPR removed this as an explicit goal.

313 Comment made in a non-for-attribution workshop in support of this paper. In response to the 2P problem, some have argued that the United States cannot afford to maintain nuclear counterforce as its exclusive nuclear-targeting doctrine. See Keir Lieber and Daryl G. Press, "US Strategy and Force Posture for an Era of Nuclear Tripolarity," Atlantic Council, May 1, 2023, https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/us-strategy-and-force-posture-for-an-era-of-nuclear-tripolarity/. The present author disagrees. See Keith B. Payne et al., "The Rejection of Intentional Population Targeting for 'Tripolar' Deterrence," *RealClearDefense*, September 26, 2023, https://www.realcleardefense.com/articles/2023/09/27/the_rejection_of_intentional_population_targeting_for_tripolar_deterrence_982200.html.

314 There are gradations and variations to each of these scenarios. For instance, the United States could need to deter Russia while in a nuclear conflict with both China and North Korea. Or the United States could face gradually escalating limited nuclear exchanges with both Russia and China. While spelling out each of the particular permutations of strategic simultaneity is beyond the scope of this paper, these two scenarios are the most stressing and a baseline for grappling with the two-nuclear-peer problem and its attendant implications for US homeland missile defense.

315 Creedon et al., *America's Strategic Posture*, 33, 97.

316 *Soviet Forces and Capabilities for Strategic Nuclear Conflict through the Late 1990s*, National Intelligence Estimate 11-3/8-87W, Central Intelligence Agency, July 1987, https://www.cia.gov/readingroom/docs/DOC_0000802749.pdf.

partners."[317] It is unclear how Putin concluded that the United States "has a theory of a preventive nuclear strike," perhaps he instead is mirroring Russian nuclear doctrine. As publicly released US employment guidance makes clear, the United States does not have a doctrine for nuclear preemption, disarming first strikes, or obtaining nuclear superiority.[318]

A disarming first strike against the US nuclear triad would be a daunting and risky proposition, even in the most extreme circumstances. Not only would an adversary have to destroy four hundred ICBMs deployed in hardened silos (that could launch while under attack), but it would also have to catch US nuclear ballistic missile submarines in port and bombers on bases before dispersal. However, on a day-to-day basis, the US military does not generate its bombers or submarines in port. These forces are therefore vulnerable to enemy attack, so one cannot dismiss this scenario out of hand. The calculations become even more complex when factoring into the mix an adversary's air and missile defense systems potentially capable of intercepting those US bombers and ballistic missiles that manage to escape a preemptive strike.

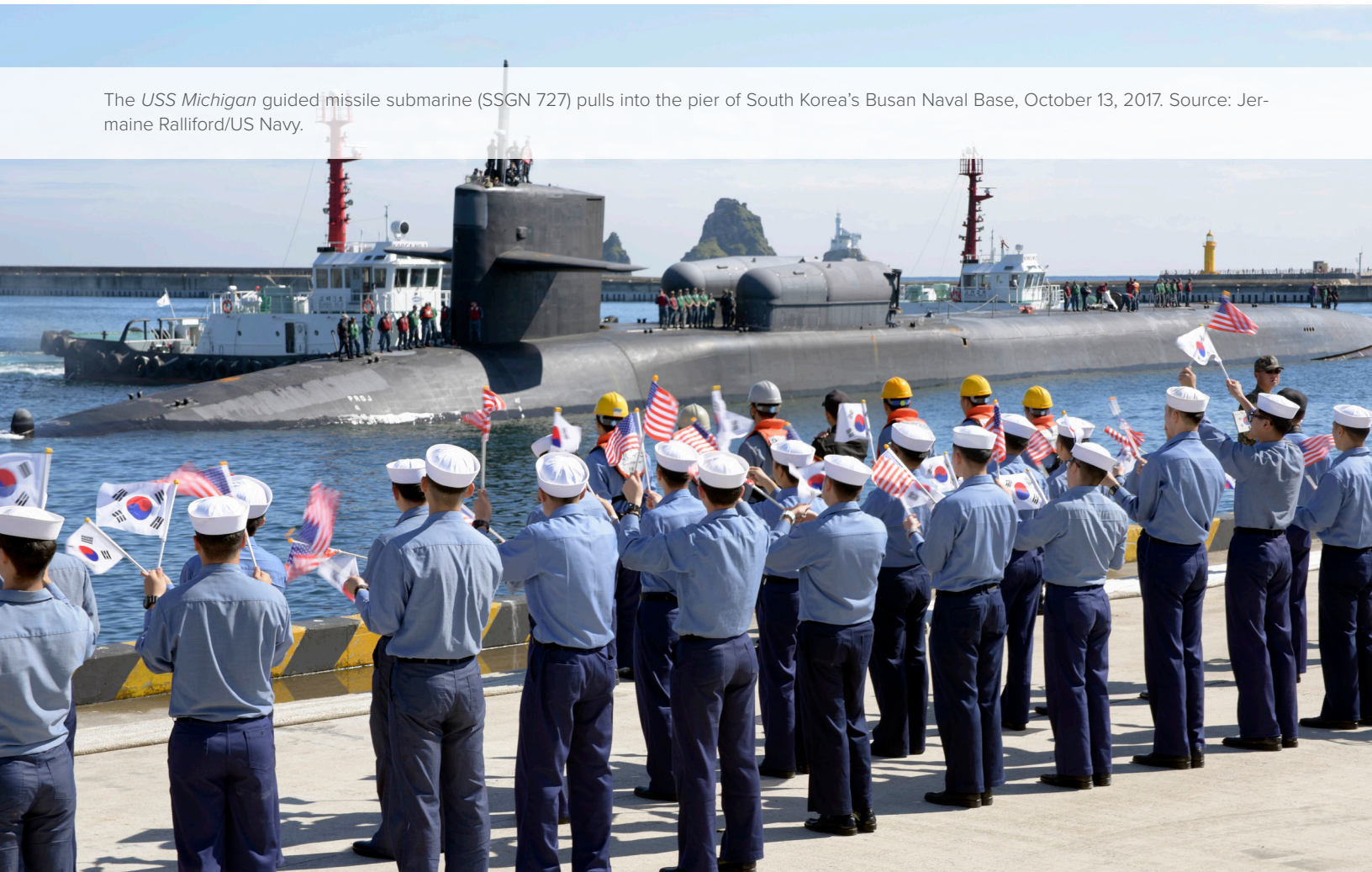
The number of US targets or "aim points" for the adversary could be as little as about five hundred: four hundred ICBM silos, about fifty launch control centers, a few strategic bomber bases, two ballistic missile submarine bases, and associated NC3 facilities. The ICBM leg of the triad illustrates the difficulty of such an attack. To be sure of destroying most, if not all, of the US ICBM force, the attacker would have to expend about one thousand nuclear warheads—roughly one-third of the 1,550 accountable warheads allowed to the United States and Russia under New START.[319] Even then, Russian attack planners cannot be sure that each missile will reach its target or be close enough to damage the silo. So, at the end of this attack, the United States will still have hundreds of nuclear warheads deployed on submarines already at sea and perhaps some dispersed nuclear bombers, and an attacker with an arsenal the size of Russia's today or China's in 2035 would have about a third of its nuclear force remaining. Clearly, this is not an appealing prospect for the adversary which has failed to successfully disarm the United States and now invites a devastating response.

317 "Putin Says Russia Could Adopt US Preemptive Strike Concept," Associated Press, December 9, 2022, https://apnews.com/article/putin-moscow-strikes-united-states-government-russia-95f1436d23b94fcbc05f1c2242472d5c.

318 *Report on Nuclear Employment Strategy of the United States Specified in Section 491 of 10 USC.*, US Department of Defense, June 12, 2013, https://apps.dtic.mil/sti/pdfs/ADA590745.pdf; US Department of Defense, *Report on the Nuclear Employment Strategy of the United States* (November 2020).

319 Assuming an average of roughly two-on-one targeting.

The *USS Michigan* guided missile submarine (SSGN 727) pulls into the pier of South Korea's Busan Naval Base, October 13, 2017. Source: Jermaine Ralliford/US Navy.



But imagine this thought experiment with two nuclear powers with arsenals of roughly 1,500 nuclear warheads each. There are now three thousand available warheads against four hundred ICBM silos and about one hundred additional nuclear-related targets. While the United States may have some hundreds of warheads remaining on survivable submarines, Russia and China each would have at least one thousand warheads after their initial combined attack. It is this disparity that poses a potential problem for deterrence. Would Russian and Chinese leaders now think that the post-exchange ratio favors them and act accordingly—coercing the United States into surrender by threatening a "third strike" on US cities, should the United States retaliate?

This somewhat simplistic assessment illustrates how a combined Russian and Chinese nuclear force could pose a danger for US nuclear forces as currently postured. The United States must never allow Russian and Chinese military planners and leadership to conclude that a preemptive nuclear attack against US nuclear forces (or NC3) could eliminate the capability or weaken the will of the United States to respond and inflict unacceptable damage on both adversaries.

Scenario two: Preserving sufficient nuclear forces to deter two nuclear adversaries sequentially

A combined disarming preemptive first strike is not the only danger posed by the expansion of Chinese nuclear weapons capable of counterforce attacks on US nuclear forces. The United States must also guard against the case of opportunistic aggression: the fear that a second major nuclear power may exploit a US nuclear force weakened by an adversary attack. As the 2023 Strategic Posture Commission observes: "the United States must maintain a resilient nuclear force that can absorb a first strike and respond effectively with enough forces to cause unacceptable damage to the aggressor while still posing a credible threat to the other nuclear power."[320]

In other words, US nuclear forces must be ready to fight two major nuclear adversaries sequentially, which means that the survivability and endurance of the nuclear force must be such that the United States not only maintains a strategic reserve after a major nuclear exchange, but also that the president can still communicate with those remaining forces—and, most importantly, this must be apparent to the third state. As described by the bipartisan expert study group formed by the Center for Global Strategic Research:

> The prospect of fighting two nuclear adversaries sequentially places a premium on the ability of US nuclear forces and command-and-control systems to survive attacks by the first nuclear adversary and maintain the force generation, situational awareness, and connectivity to surviving nuclear forces necessary to deter the second challenger. Both China and Russia continue to improve their capabilities for attacking US forces and associated command, control, and communications capabilities."[321]

Evidence of US government concern about nuclear force survivability

While some might question the importance of addressing nuclear survivability under the two-nuclear-peer problem, statements from former senior DOD officials, current DOD actions, and concerns from Congress clearly indicate that the US government is taking this problem seriously.

For instance, Robert Gates, secretary of defense under both Bush and Obama, noted his concern when observing that "the Chinese and Russian navies are increasingly exercising together and, it would be surprising if they were not also more closely coordinating their deployed strategic nuclear forces."[322] In July 2024, Russia and China conducted a joint nuclear-capable strategic bomber patrol, entering the Alaskan Air Defense Identification Zone.[323]

The DOD and USSTRATCOM continually evaluate the threat to the pre-launch survivability of US nuclear forces, though open discussion is limited for obvious reasons. Still, one can discern fresh thinking on the matter in recent years resulting from Russia's development of novel nuclear weapon systems as well as the impending expansion of Chinese long-range nuclear capabilities. For example, Gen. Anthony Cotton, the head of USSTRATCOM, stated during his nomination hearing in 2022 that he was examining the need to "disperse bomber forces in the future, especially with two near peers."[324] In another example, the USSTRATCOM deputy director for capability and resource integration (J-8), who is responsible for force management priorities and future concepts, noted recently in an interview that USSTRATCOM "has a requirement for resilient and robust missile warning and tracking capabilities to defend against the growing threat posed by hypersonic weapons, cruise and ballistic missiles." Hypersonic threats, in particular, present significant operational challenges and

320 Creedon et al., *America's Strategic Posture*, 33.

321 Roberts et al., *China's Emergence as a Second Nuclear Peer*, 52.

322 Robert M. Gates, "The Dysfunctional Superpower: Can a Divided America Deter China and Russia?" *Foreign Affairs*, September 29, 2023, https://www.foreignaffairs.com/united-states/robert-gates-america-china-russia-dysfunctional-superpower.

323 Liebermann and Bertrand, "NORAD Intercepts Russian and Chinese Bombers Operating Together."

324 US Senate Armed Services Committee, *Hearing on the Nomination of General Anthony Cotton to be Commander, US Strategic Command*, September 15, 2022, https://www.defense.gov/Multimedia/Videos/videoid/857452/?dvpsearch=army%252b. See exchange with Sen. Dan Sullivan (R-AK).

Navy Adm. Charles A. Richard, former STRATCOM commander, provides testimony at a Senate Armed Services Committee hearing, March 8, 2022. Source: Jackie Sanders/Office of the Secretary of Defense Public Affairs.

"risk to our strategic forces, creating vulnerability and eroding deterrence."[325]

Another senior USSTRATCOM official offered that the increase in the target set created by the need to deter China as a major nuclear adversary places a premium on the number of survivable and available US nuclear weapons. This is especially the case until (and if) the United States expands its deployable nuclear weapons in the future. Notably, then-STRATCOM Commander Admiral Charles Richard told Congress recently that he has "already repostured" aspects of the current nuclear force to address the growing Russian and Chinese nuclear threats, though he reserved further discussion to a classified session.[326] One possible explanation of a change in US nuclear posture in response to increasing Russian and Chinese capabilities to strike the US homeland is the application of agile combat employment to the US strategic bomber force. In this program, bombers practice dispersing to fallback airfields in the United States and Canada, in part to increase the number of targets that an adversary considering a disarming strike on the bomber force would need to contemplate targeting.[327]

Congress has expressed similar concerns. Rep. Don Bacon (R-NE-02), a former US Air Force general who flew missions on the US airborne nuclear command center and is now a member of the House Armed Services Committee, noted during a hearing that:

> I am concerned about the survivability of our Nuclear Command, Control and Communications (NC3) … with

325 "An Interview with Robert Taylor, US Strategic Command/J8," *Journal of Policy and Strategy* 3, no. 1 (2023): 79–84, https://nipp.org/wp-content/uploads/2023/09/Interview.pdf.

326 "Open/Closed: To Receive Testimony on United States Strategic Command and United States Space Command in Review of the Defense Authorization Request for Fiscal Year 2023 and the Future Years Defense Program," US Senate Armed Services Committee, March 8, 2022, https://www.armed-services.senate.gov/hearings/-to-receive-testimony-on-united-states-strategic-command-and-united-states-space-command-in-review-of-the-defense-authorization-request-for-fiscal-year-2023-and-the-future-years-defense-program.

327 Hans M. Kristensen et al., "United States Nuclear Weapons, 2024," *Bulletin of the Atomic Scientists* 80, no. 3 (2024): 182–208, https://doi.org/10.1080/00963402.2024.2339170; *Agile Combat Employment*, Air Force Doctrine Note 1-21, December 1, 2021, https://www.af.mil/Portals/1/documents/Force%20Management/AFDN_1-21_ACE.pdf.

A US Air Force B-52 Stratofortress aircraft receives fuel from a KC-135 Stratotanker above the Mediterranean Sea, September 27, 2017. Source: US Department of Defense.

> hypersonics and cruise missiles, perhaps submarines off our coasts, at some point again, it's harder to ensure that command authorities can survive a first strike and conduct a second counter strike. I want to have 100 percent confidence that the Russians and Chinese have 100 percent confidence that we can do a second strike, because that ensures deterrence.[328]

In a separate X post, Bacon emphasized that the combination of Russia-China politico-military alignment and the shorter arrival time of missiles based closer to US shores than traditional ICBMs poses a particular risk to US NC3.[329]

In sum, there is significant evidence that those tasked with ensuring US nuclear deterrence are concerned about the possibility of simultaneous or sequential nuclear attacks under the two-nuclear-peer problem.

Can missile defense improve triad survivability in light of the two-nuclear-peer problem?

As the previous sections suggest, senior US military and political officials have concerns about the growing vulnerability of US nuclear forces. Therefore, this study argues that it would be prudent to enhance the survivability of US nuclear forces and increase the uncertainty of attacker success to decrease the likelihood of a single or combined disarming first strike by adversaries. Missile defense is one way to do this, and its pursuit should be in conjunction with other measures.

In addition to missile defense, there are several ways to improve the survivability and endurance of US nuclear forces, including hardening, mobility, concealment, readiness posture, and dispersal. Critics of missile defense might argue that these measures are sufficient or preferable to active missile defense for enhancing triad survivability. However, these measures

328 US House Armed Services Committee, *House Armed Services Subcommittee on Strategic Forces Holds Hearing on Strategic Forces Posture* (Congressional Transcript: March 8, 2023, Revised Final), *Congressional Quarterly*, March 10, 2023, https://www.spacecom.mil/Portals/57/House%20Armed%20Services%20Subcommittee%20on%20Strategic%20Forces%20Holds%20Hearing%20on%20Strategic%20Forces%20Posture%208%20Mar%2023.pdf.

329 Rep. Don Bacon (@RepDonBacon), "With the growing alliance between Russia and China, along with the development of nuclear weapons that can hit the US within 15 minutes, it is my steadfast …" X, October 22, 2024, 8:52 a.m., https://x.com/RepDonBacon/status/1848709024205971619.

each have their respective costs and negative side effects, making active missile defense a valuable complement.

The means to ensure the survivability of US nuclear forces were known during the Cold War; as then-President Richard Nixon explained to Congress in 1970:

> Survivability of our retaliatory forces can be assured in a number of different ways: by increasing the number of offensive forces to ensure that a sufficient number will survive a surprise attack; by defending ICBMs, bombers with air and missile defenses; by hardening our existing silos, by increasing the mobile portion of our strategic forces. ...[330]

The means outlined by Nixon are applicable today. As the United States determines the additional nuclear forces needed to address the emerging two-nuclear-peer environment, there could be a tradeoff between improving the survivability of current forces and adding to the size of the force to increase survivability—or a combination of the two approaches. Enhancing the survivability of the US nuclear triad through a combination of additional hardening, mobility, and missile defense could reduce future nuclear force requirements by ensuring more survivable warheads for a counterstrike. Indeed, the very nature of the nuclear triad provides a level of survivability and unpredictability of success for the adversary. In the sequential peer attack scenario, it would be likely that US ICBMs were targets of the adversary or otherwise expended during the first stages of a major nuclear exchange. The United States, therefore, would have to rely on its submarine and bomber forces that survived the initial adversary attack. In addition, the United States could call upon its regional nuclear capabilities that also escaped initial attacks.

In this case, situational awareness and communication between the president and these remaining, dispersed, forces become critical. Submarines would be at sea but must eventually return to port for replenishment. Bombers dispersed to alternative runways and those returning from bombing missions would have to land and prepare for future sorties. The enemy would know the essential ports and large military bases, but not all the alternative runways. There would be many, perhaps too many, for the adversary to target with nuclear weapons or advanced conventional strikes across the US homeland and in friendly countries. In this case, enhancing the survivability of these alternative bases and alternative command-and-control channels would be imperative.

Today, these important nodes rely on mobility and deception for survivability; adding an under-layer missile defense would further enhance the ability of these forces to withstand enemy attacks. By doing so, the United States would complicate further the second adversary's assessment concerning the ability of US nuclear forces to respond to future nuclear attacks. Put simply, missile defenses would enhance the survivability of the US strategic nuclear reserve and thereby reinforce deterrence of the first, but more so the second adversary. Comprehensive missile defense is an important approach to reducing pressure on the need for strategic nuclear force build-up to manage the increasing two-nuclear-peer threat of disarming attacks.

Improving the pre-launch survivability of US nuclear forces may also contribute to stability during a crisis, even absent a threat from a second peer. During peacetime and likely during the early days of a crisis, the bomber force and part of the submarine force will not be on alert or generated, and therefore vulnerable to nuclear or conventional attack. The president would have to weigh changes in the alert posture for enhancing survivability against the possibility that an adversary may interpret such changes in posture as preparation for disarming first strike. Likewise, during a nuclear attack against US ICBMs, the president has the *option* to launch a retaliatory strike while under attack before the offending missiles even land. Missile defense protection for US nuclear forces provides a margin of security for the president, allowing him to possibly delay not just nuclear retaliation but even nuclear force generation during a crisis without undue risk to US retaliatory forces.

Similarly, US leaders may have to consider the impact of nuclear force generation decisions on the second potential adversary: Would the generation or dispersal of US nuclear forces to deter the first adversary inadvertently cause the third party to generate its forces, or worse? The protection afforded US nuclear forces during a crisis, by even limited missile defenses, would reduce pressures for the early use of nuclear weapons by creating uncertainty about the success of preemptive strikes and by providing additional confidence that such a decision can be deferred because one's nuclear forces are more survivable against a preemptive attack.

330 President Richard Nixon, "United States Foreign Policy for the 1970s," February 25, 1971, https://www.let.rug.nl/usa/presidents/richard-milhous-nixon/united-states-foreign-policy-for-the-1970s/ch14_p3.php.

Section seven: Missile defense basics and architectural challenges

Introduction

The next three sections of this report explain basic missile threat and missile defense concepts, lay out the benefits of a layered missile defense architecture, and then convert the policy and strategy objectives discussed in the previous sections into a homeland missile defense strategy and architecture effective for the current and emerging threat environment.

To begin, this section addresses some key general principles for missile defense and examines the challenges to developing an effective missile defense architecture under the current security environment. What are the threat scenarios against which the United States should plan? How can the missile defense system optimally complement other conventional and nuclear military capabilities? How should one think about the types of sensors and interceptors necessary to address the growing threat from North Korean ICBMs, as well as the coercive and counterforce missile threats posed by Russia and China?

This section offers a categorical look at missile threats and then provides an overview of the challenges and opportunities for engaging various missile threats during each phase of flight. The following sections explain how "layering" the defense takes advantage of these opportunities while mitigating certain challenges unique to each layer. In this sense, the whole of the defensive architecture is much greater than the sum of its parts, in that its constituent parts make up for the potential weakness of each other.

Characteristics of airborne threats to the homeland

As detailed earlier, US strategic competitors are "fielding more advanced offensive missiles—ballistic, cruise, and hypersonic—in greater numbers to not only deter involvement in a regional conflict but also directly target the US homeland.

Cruise missiles

All major powers have invested heavily in cruise missile technology, making this weapon class a large-scale problem. To date, the large-scale threat is only with sub-sonic missiles. Nevertheless, some supersonic or low-observable variants do provide potential adversaries with some exquisite options for deep strikes on high-value targets. The cruise missile threat class is often dual-capable, creating payload ambiguity in flight. Adversary cruise missile-launching platforms face a tradeoff between attacking from near the United States and risking a counterattack on the platform or launching from a distance and giving missile defenders more time to complete an intercept. The exceptionally long ranges of Chinese and Russian air- and sea-launched cruise missiles make it possible that the bomber, submarine, or surface ship launching an attack on the homeland would be too far from US shore defenses to be threatened by an immediate counterattack. However, in theory, a cruise missile launched far from the homeland provides more detection time, and therefore more intercept time. Alternatively, launching an attack closer to shore provides less reaction time for homeland defenses and adds the effect of deeper penetration. But this puts the launch platform at higher risk of direct counterattack or being traced back to its home port or airfield, where reprisal would be even more costly for the adversary. These physical limits for a cruise missile-based raid provide key opportunities that should be included in an efficient counterstrategy in which early detection supports both defensive actions and counterattack options.

The logistical challenges to posing a persistent cruise missile threat are insurmountable for a rogue state outside of a terror-oriented scheme of employment. Peer actors would also be hard-pressed to sustain a cruise missile strike campaign if their launch platforms depend on attrited support airfields and ports under attack. This reality puts pressure on them to consider nuclear employment. But even a small number of conventional strikes on the homeland might achieve either a rogue or peer adversary's coercive goals at the acceptable cost of a few lost aircraft or submarines. As recently demonstrated by Israel's defense against an Iranian missile raid, even large-scale cruise missile attacks can be denied with sufficient early warning alongside effective positioning of defensive assets.[331] In the near term, the United States' lack of persistent cruise missile defense will continue to appear highly provocative.

Ballistic missiles

The basics of ICBMs are important to understand as part of this conversation. These weapons travel distances greater than 5,500 km (3,400 mi.) by convention and fly a generally predictable arc from launch to target.[332] Because their flight is powered for only the first few minutes and they do not glide,

331 Vera Bergengruen, "How the US Rallied to Defend Israel From Iran's Massive Attack," *Time Magazine*, April 15, 2024, https://time.com/6966758/how-the-u-s-rallied-to-defend-israel-from-irans-massive-attack/.

332 "Intercontinental Ballistic Missiles," Federation of American Scientists, October 25, 1998, https://nuke.fas.org/intro/missile/icbm.htm.

Figure 2: Ten Steps of a Successful Ballistic Missile Intercept. Source: Courtesy US Missile Defense Agency, overview briefing, October 2023.

they spend most of the 30-minute flight in space while moving more than 15,000 mph.[333] Modern Russian and US ICBMs are credited with better than 100-meter accuracy for both ICBMs and SLBMs.[334] China has yet to prove this level of accuracy but may be close.[335] This level of accuracy opens a range of critical infrastructure targets for conventionally armed ICBMs and SLBMs.[336] The exceptional expense of intercontinental reach restricts this class of weapon from serving as a tool for consistent and protracted employment.

Technology for countermeasures to missile defense

Missile defense countermeasures became integral to Soviet and US ICBMs and SLBMs. Technology-based countermeasure systems intend to confuse sensors or decision makers within the missile defense systems. Countermeasures can range from simple chaff dispensers to mock warheads whose shape, mass, and surface are indistinguishable from a real warhead. However, fielding countermeasures incurs a cost on the attacker by reducing the throw weight dedicated to actual warheads. A credible homeland defense must account for a spectrum of sophistication in ICBM countermeasures. Yet not all threat actors or scenarios would result in the same quantity or quality employed.

Tactics for countermeasures to missile defense

Another form of countering defenses employs advanced technologies to carry out special tactics to thwart defenses. The primary tactic is simply one of approaching from an unseen

333 Christopher McFadden, "What Is an Intercontinental Ballistic Missile and How Does It Work?" *Interesting Engineering*, January 4, 2024, https://interestingengineering.com/innovation/what-is-an-intercontinental-ballistic-missile-and-how-does-it-work.

334 Missile Threat, "LGM-118 Peacekeeper (MX)," Missile Defense Project, Center for Strategic and International Studies, last updated April 23, 2024, https://missilethreat.csis.org/missile/lgm-118-peacekeeper-mx/; Missile Threat, "Trident D5," Missile Defense Project, Center for Strategic and International Studies, last updated April 23, 2024, https://missilethreat.csis.org/missile/trident/.

335 Missile Threat, "DF-31 (Dong Feng-31 / CSS-10)," Missile Defense Project, Center for Strategic and International Studies, last updated April 23, 2024, https://missilethreat.csis.org/missile/df-31/; Missile Threat, "DF-41 (Dong Feng-41 / CSS-X-20)," Missile Defense Project, Center for Strategic and International Studies, last updated April 23, 2024, https://missilethreat.csis.org/missile/df-41/.

336 The United States contemplated a conventionally armed Trident D-5 missile to hold at risk terrorist and other fleeting targets. The program proved too controversial for the US Congress, which canceled the effort. "US Hypersonic Weapons and Alternatives," Congressional Budget Office, last updated January 2023. https://www.cbo.gov/system/files/2023-01/58255-hypersonic.pdf.

or unseeable direction. Russia's Poseidon nuclear-armed, nuclear-powered submarine drone is one such weapon whose high-speed underwater "flight" puts it outside the scope of this study. But SLBMs launched from a submarine very close to the coast can attack with either a high or low angle that complicates intercept or reduces warning time. The ultimate example of combining technology and tactics is the MaRV that can turn once it re-enters the atmosphere. However, since most of the warhead's time is spent outside the atmosphere, maneuverability is limited, and mid-course intercept is generally unaffected. At the height of the Cold War and well before hypersonic missiles became popular, the Soviets and the United States explored MaRV technology. Because of the 1972 ABM Treaty alongside decades of incremental improvements to accuracy, there has been insufficient motivation to trade the throw weight of simple, purely ballistic RVs for their more expensive, heavy, complex, and yet more capable MaRV cousin—that is, until Russia fielded its Avangard weapon system that revives the long-range high-speed maneuvering nuclear weapon threat.[337]

Hypersonic weapons and missile defense

Hypersonic weapons have entered the defense lexicon as a term of art that describes maneuvering weapons which travel at speeds greater than Mach 5 for a large portion of their flight profile. HGVs appear similar to a traditional ballistic missile right after launch but then "tip over" and immediately reenter the atmosphere where they skip like a rock on pond water. These weapons have no engines and must rely on momentum and controlling aerodynamic surfaces to skip along on top of the thicker atmosphere near the Earth's surface and maneuver to their target. Alternatively, HCMs might launch from an aircraft like a traditional sub-sonic cruise missile common to major military powers. But HCM engines enable continuous powered flight up to ten times faster. In either case, HGVs and HCMs fly below the radar horizon for typical ICBM detection and require an entirely different interceptor for defense. Today, Russia has a handful of maneuvering RVs in the field. The Avangard HGV sits atop what was previously an SS-19 ICBM with six non-maneuvering warheads. This repurposed Soviet ICBM illustrates the operational trade-off for maneuvering ICBMs. In this case, Moscow traded six simple warheads for one HGV. This trade-off demonstrates just one way that defense adds value to one's strategic position.

Summary

Together, the cruise missile, ICBM or SLBM, and hypersonic threats to the homeland could be formidable. Each has uniquely useful attributes for making limited threats. But that also means that each has specific weaknesses to exploit for credible defense. The next section describes how the entire missile defense infrastructure works and the key challenges to its effectiveness.

Phases of ballistic missile defense

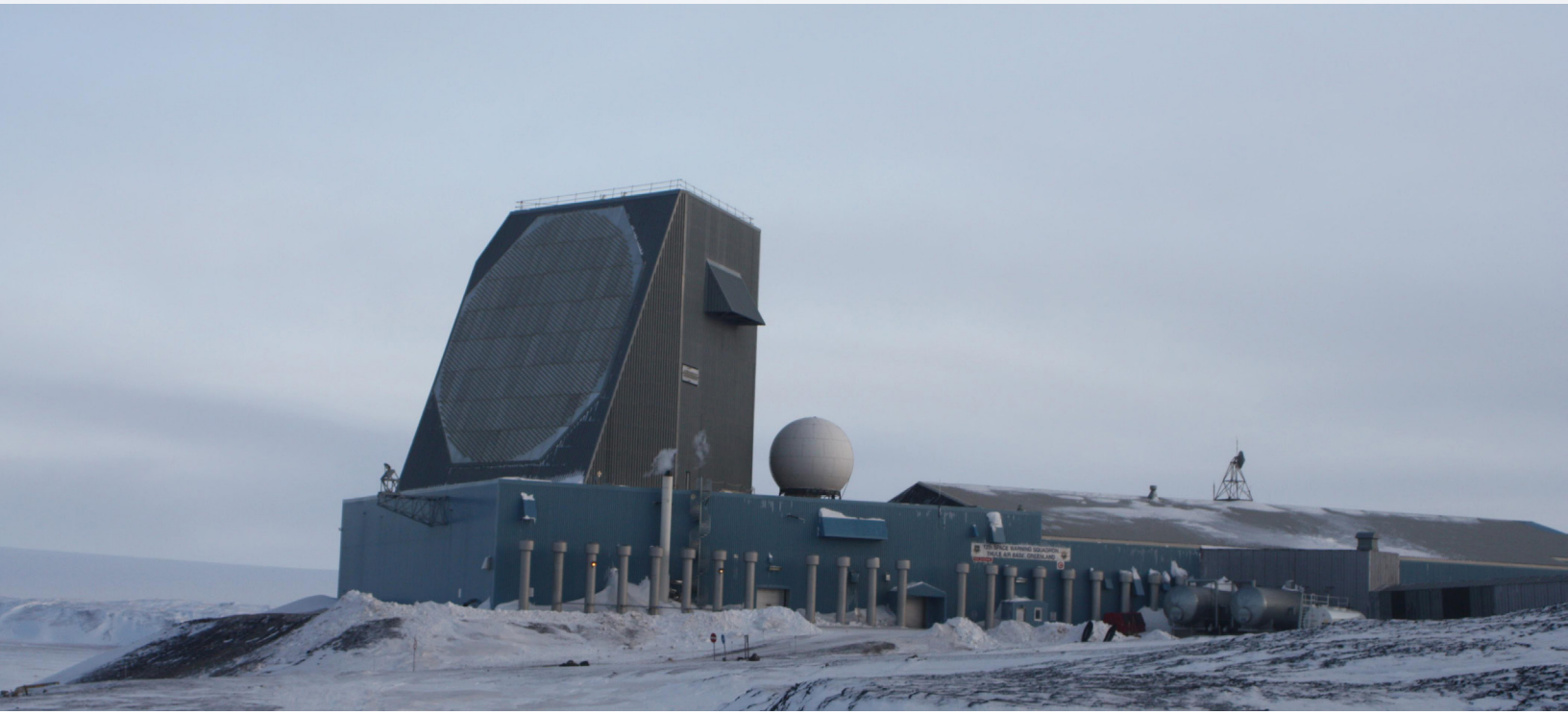
Figure 2 above shows a notional ballistic missile defense architecture and explains the ten steps to successful ballistic missile intercept.

1. **Detect/warn**: A missile defense intercept begins with initial launch detection by space-based infrared (IR) sensors, currently either the Space Based-Infrared System (SBIRS) or the legacy Defense Support Program (DSP). The infrared satellites detect the heat from the initial launch and provide information on the trajectory and potential range of the threat missile. The SBIRS sensors cue downstream sensors on the threat missile's initial position and velocity through the Command-and-control, Battle Management and Communication (C2BMC) network.
2. **Cue**: The C2BMC provides initial launch detection information from SBIRS to early warning radars, including the Cobra Dane or Upgraded Early Warning Radars (UEWRs), which operate at low-frequency bands and provide a cue and classification (missile type) information to more precise tracking radars.
3. **Track**: Radars such as the SBX, the LRDR, deployed in Alaska, the Army Navy/Transportable Radar Surveillance (AN/TPY-2), the ship-based Aegis Search Protect (SPY) radars, and in the future, the AN/TPY-6 radar provide a refined track (sufficient for engagement) to the weapon.[338]

337 The 1984 Massachusetts Institute of Technology review of US military research and development, specifically for intercontinental-range RVs, says there are two primary reasons to replace pure ballistic RVs with maneuverable ones: (1) to improve accuracy or (2) to evade defenses. It further notes, "Because of the ABM treaty of 1972, the Soviet Union has not yet made any significant deployment of anti-ballistic missiles, so MaRVs have not been required to evade ABMs. Similarly, the accuracy achievable with ballistic RVs is more than sufficient to destroy essentially any target in the Soviet Union, provided that warheads in the range of hundreds of kilotons are used." While both US and Russian RVs have reportedly improved accuracy since 1984, there has been no significant change to defense against a disarming first strike on either side. See Kosta Tsipis and Penny Janeway, "Review of US Military Research and Development," Program in Science and Technology for International Security Massachusetts Institute of Technology, 1984, https://scholar.harvard.edu/files/bunn_tech_of_ballastic_missle_reentry_vehicles.pdf; Akshai Vikram, "Russia's New Nuclear Weapons: Understanding Avangard, Kinzhal, and Tsirkon," Center for Strategic and International Studies, August 2, 2021, https://nuclearnetwork.csis.org/russias-new-nuclear-weapons-understanding-avangard-kinzhal-and-tsirkon/.

338 Of note, the TPY-6 is expected to be "vastly more" powerful than the TPY-2 while taking advantage of the technology put into the Long-Range Discriminating Radar in Alaska. This will significantly improve the ability of the system to discriminate actual warheads from decoys and at an even greater range. See "The Navy's Newest, Most Advanced Warships Will All Soon Have One Thing

The Ballistic Missile Early Warning Radar at Pituffik Space Base (formerly Thule Air Base), Greenland. Source: US Space Force.



4. **Classify and select the most lethal object (discriminate)**: An ability to discriminate the threat RV from other objects in the scene, such as the spent booster and decoys (also referred to as countermeasures), is needed so that the interceptor knows which object in the scene is most likely the RV. Some basic discrimination begins with the early warning radars, with more refined discrimination provided by the higher-quality tracking sensors listed above.
5. **Develop fire control solution**: Once the RV is identified, the tracking radars provide the range and location information to the interceptor with sufficient precision to engage the threat missile.
6. **Launch interceptor**: The interceptor then would launch based on the fire control solution provided.
7. **Update interceptor**: A ground system provides the interceptor with updated data in flight to refine the trajectory.
8. **Kill vehicle tracking and maneuver**: As the missile gets closer to the target, the interceptor's kill vehicle "opens its eyes." The kill vehicle's onboard sensors enable it to track the target on its own. The kill vehicle uses its divert and attitude control system to maneuver to engage the target. The kill vehicle's sensor can also refine the discrimination solution based on what its sensor detects at a much closer range than offboard sensors.
9. **Intercept**: The threat missile is destroyed using the direct force of a collision, called "hit-to-kill" technology. Some terminal phase ABM systems instead use an explosive blast-fragmentation warhead. A complete missile defense system can intercept threats in any phase of flight, including boost, midcourse, and terminal phases. Below are short descriptions with specific details for each:

    a. *Boost/ascent phase*: Boost-phase intercept occurs after the rocket launches but before fuel exhaustion. An intercept while the missile is "boosting" into space offers the option to engage the threat either prior to releasing countermeasures or force the missile to deploy its countermeasures early in flight likely making the discrimination problem easier.

    b. *Midcourse phase*: The midcourse phase begins when the ballistic missile booster burns out and it begins coasting in space towards its target in a ballistic trajectory. Most of the ballistic missile's flight occurs during the midcourse phase.

    c. *Terminal phase*: The terminal phase begins when the payload begins to reenter the atmosphere. Several options exist for terminal-phase intercept, including

in Common — The SPY-6 Radar," Breaking Defense, September 28, 2022, https://breakingdefense.com/2022/09/the-navys-newest-most-advanced-warships-will-all-soon-have-one-thing-in-common-the-spy-6-radar/.

The AN/SPY-1 radar (the light grey hexagonal panel) on the starboard side of the superstructure of the *USS Lake Erie*, Naval Station Pearl Harbor, Hawaii, 2006. Source: US Navy.

Aegis BMD with the Sea Based Terminal (SM-6) Interceptor, Terminal High Altitude Area Defense (THAAD), and Patriot Advanced Capability (PAC-3). The Aegis BMD equipped with the SM-6 missile can engage both cruise and ballistic threat missiles with a fragmentation warhead as a close-in defensive system. The THAAD system provides the capability to engage short-, medium-, and intermediate-range ballistic missile threats both in space and within the atmosphere with a hit-to-kill capability. The PAC-3 missile can intercept both cruise and ballistic missile threats. Its range is shorter than that of the THAAD or SM-6 but has a proven capability to protect sites of interest from both ballistic and cruise missile threats.

10. **Verify hit/kill:** After intercept, it is important to verify whether the threat has been destroyed. This can occur via terrestrial radars with a line of sight to the engagement, or airborne or space-based sensors.

Missile defense system challenges

The current US Ballistic Missile Defense System (BMDS), as described above, faces challenges from proliferating and advancing air and missile threats. Below, the report describes the challenges to each of the functions of missile defense.

The current HBMD architecture dates from the early part of the century; its original design was to completely deny limited attacks of simple ballistic missiles from rogue nations, not to counter large quantities of sophisticated ballistic or any quantity of hypersonic glide or cruise missiles. Forty-four GBIs (forty in Alaska and four in California) and ground-based radars deployed in the United States and abroad, as well as space-based early warning satellites, comprise the HBMD system (there is also a limited cruise missile defense in place in the National Capital Region). Starting in 2028, a future interceptor, the NGI, will upgrade the current emplaced GBI fleet. The NGI will provide improved reliability over the GBI and will have multiple kill vehicles on each interceptor to destroy the most credible threat objects in the scene and potentially reduce the number of interceptors needed to defeat a threat with countermeasures.[339] The United States plans to emplace twenty NGIs in Alaska, bringing the total number of long-range interceptors to sixty-four. It is not clear whether the plan is to replace the original forty-four GBIs with NGIs or if the number of total interceptors will simply increase.

Sensing challenges

Challenges to this surveillance system include discerning the threat trajectory and missile type to determine whether to en-

339 "Statement of Vice Admiral Jon A. Hill, USN, Director, Missile Defense Agency before the House Armed Services Committee Strategic Forces Subcommittee," US House Armed Services Committee, 118th Congress (May 9, 2023), https://www.armed-services.senate.gov/imo/media/doc/Hill%20Written%20Testimony%20-%2005.09.23%20SASC-SF%20Missile%20Defense%20Hearing.pdf.

gage the missile and with what system. Fixed systems far out at the edge of US-defended territory are also vulnerable to direct attack. Challenges to fire control sensors include:

Sensor coverage: The fire control sensor must have the target in direct line of sight. Sometimes, the best viewing locations for land-based radars require deployment on allied territory, necessitating host-nation approval. Many land-based radars only face one direction, making it possible for a threat to approach its target outside of the radar's view. Low-flying threats, such as cruise missiles and HGVs, provide additional challenges to land-based or ship-based radars because the curvature of the Earth limits their view. This significantly reduces the engagement timeline because terrestrial radar cannot detect the threat until much later in the weapon's flight.

The Medium Extended Air Defense System (MEADS) intercepted and destroyed two simultaneous targets fired from different directions using PAC-3 MSE missiles during a demonstration at White Sands Missile Range, New Mexico, November 6, 2013. Source: White Sands Missile Range Public Affairs.

Countermeasures: Countermeasures could include jamming the radar to significantly reduce the range at which the radar could pick out the target. Countermeasures could also use decoys to confuse the radars as to which object is the real warhead. Most forms of decoys are lighter than an actual warhead, and so late engagement, when the warhead is re-entering the atmosphere, mitigates for when mid-course sensors cannot filter countermeasures out.

Transition of threat information from fire control radars to the infrared (IR) weapon sensor: Different sensors "see" in different portions of the electromagnetic spectrum and from multiple angles. This adds more data on the threat scene, and, with good software, this would help with discernment. However, poor system communications or sensor capabilities can confuse correlating these different views, challenging discernment of which objects are the threat versus which are countermeasures.

Missile intercept challenges

Challenges to missile intercept, by phase, include the following:

Boost phase

- Boost-phase intercept requires a fast enough missile, launched from a close enough distance, to engage the target in the boost phase, while it is still moving upward into space. Faster missiles at longer ranges require larger boosters, making the missile too heavy for air launch.
- The launcher must also be in the right place at the right time and requires a very early decision to engage, perhaps before the missile is clearly on a threat trajectory.
- An alternative approach is to put the interceptor into orbit ahead of time as an SBI. But this approach faces a similar placement challenge because many dozens if not hundreds of interceptors must remain in orbit to ensure a reasonable number are in position to intercept a raid.

The United States currently has no purpose-built systems for defense against ballistic missiles in the boost phase of flight, though it has examined ground-, sea-, and air-based variants in the past.[340]

Midcourse phase

- Discrimination: During the midcourse phase, the threat has had the best opportunity to deploy countermeasures. Unintentional countermeasures, such as spent boosters or debris, can also confuse the scene. Discrimination is a vital component of HBMD. It reduces the number of

340 Ian Williams et al., "Boost-Phase Missile Defense: Interrogating the Assumptions (Appendix 5: Historical Overview of Boost-Phase Missile Defense Efforts)," Missile Defense Project, Center for Strategic and International Studies (June 24, 2022), 62–68, https://www.csis.org/analysis/boost-phase-missile-defense.

credible objects and, therefore, the number of interceptors needed to confidently destroy the threat missile.

- Reliability: Some older GBIs have lower reliability, resulting in a potential need to shoot more interceptors to provide confidence that the threat will be destroyed.[341] The MDA continues its GBI-specific SLEP to improve the reliability, availability, and service life of the existing GBI fleet.[342]

Terminal phase

- Terminal defense systems have a much smaller protection area than midcourse defense systems. The THAAD, SM-6, and PAC-3 terminal systems are too small and too slow to effectively engage ICBMs. All three systems would require modifications and a robust testing plan to show their efficacy in defense of ICBM-class threats.
- Certain systems, such as SM-6 and Patriot, offer an existing and proven multi-mission capability to defend against short-to-medium-range ballistic, cruise, and some hypersonic weapons. For example, the most advanced Patriot system, PAC-3 Missile Segment Enhancement (MSE), can engage HGVs as they slow down while approaching their target,[343] a capability proven by the successful intercept of a Russian Kh-55 missile over Ukraine under combat conditions.[344] The Kh-55 is arguably an HGV, though it was moving at less than Mach 4 near the target when destroyed. Regardless, Patriot MSE has had several successes in Ukraine against relevant homeland-threatening weapon systems.

System-level challenges

Current HBMD has a limited ability to counter large quantities of sophisticated ballistic missile and HGV threats. Some of the system-level challenges include the following:

Overwhelming raid

There are two ways an adversary can overwhelm a defensive system. Raid saturation with real and apparent warheads (countermeasures) can challenge the command-and-control system in determining the number of interceptors required, assessing which interceptor is best to engage which threat missiles, and planning for re-engagement for misses. A basic strategy for overwhelming the defense is to exhaust the interceptor inventory, an easy planning challenge for situations in which interceptor quantities are well known. One form of this tactic is firing attacking missiles faster than interceptor launchers can reload.

Cost

Missile defense interceptors are very expensive. A single GBI costs approximately $70 million, and the NGI has a slated price tag of $110 million each. An Aegis SM-3 IIA interceptor costs approximately $24 million, while a THAAD interceptor costs $10 million. The shortest-range interceptors are the least expensive, with an SM-6 interceptor costing $3.9 million and a Patriot interceptor costs $3.7 million.[345] The current conflict in Israel as well as the war in Ukraine show the need for rapid re-supply and lower cost interceptors. It is easy to see from these numbers that it is quite costly to design a defense based on mid-course intercept alone.

Threat maneuvers

Maneuvering threats challenge radar tracking and the interceptor's ability to rapidly change its flight path to respond to changes in threat missile trajectories.

Unexpected or challenging trajectories

Lofted or depressed trajectories challenge the ability to track the incoming threat and reduce engagement timelines for intercept. Expectations are that most threats would come via the North Pole, but sea-based threats may present eastern and western vectors as well. Meanwhile, China is developing FOBS that could even approach from a southerly direction. Additionally, high-speed hypersonic glide missiles demonstrated over the last few years by China and Russia can either fly under or maneuver around land- or sea-based tracking sensors.

Engagement timelines

Missile threats must be detected, tracked, identified (e.g., differentiating a satellite launch from a ballistic missile launch), and engaged in a very short time. For long-range (ICBM) threats, the window for engagement is from approximately five to twenty-five minutes after launch for mid-course engagement.

Command-and-control, battle management and communications integrated architecture (C2BMC)

The C2BMC provides situational awareness, battle management, training, and space sensor capabilities to combatant commands

341 *Director of Operational Test and Evaluation Report FY 2014 Annual Report*, (Washington, DC: Office of the Director of Operational Test and Evaluation, January 2015): 311–12, https://apps.dtic.mil/sti/tr/pdf/ADA623438.pdf.

342 "Lieutenant General Heath A. Collins, USAF Director, Missile Defense Agency Before the Senate Armed Services Committee Strategic Forces Subcommittee," US Senate Armed Services Committee, 118th Cong. (May 8, 2024), https://www.armed-services.senate.gov/imo/media/doc/collins_statement.pdf.

343 "PAC-3 MSE Overview," Lockheed Martin, https://f35.com/content/dam/lockheed-martin/mfc/documents/pac-3/24-09790-iamd-pac-3-mse-partner-ppt--updates_r2.pdf.

344 Jen Judson, "How Patriot Proved Itself in Ukraine and Secured a Fresh Future," *Defense News*, April 9, 2024, https://www.defensenews.com/land/2024/04/09/how-patriot-proved-itself-in-ukraine-and-secured-a-fresh-future/.

345 "Missile Interceptors by Cost," Missile Defense Advocacy Alliance, updated February 2024, https://missiledefenseadvocacy.org/missile-defense-systems-2/missile-defense-systems/missile-interceptors-by-cost/.

across fourteen time zones. Robust networking across the Missile Defense System is necessary to provide the coverage and effectiveness needed for robust missile defense. The network must provide resilient connectivity and low latency while retaining the highest levels of encryption-based security.

Conclusion

In summary, the ever-evolving threats present several challenges to US HBMD. Solutions exist to overcome these challenges, and foundational work has been underway to address these challenges. If sufficient funding were provided, new capabilities could be developed and integrated into the missile defense architecture. The next two sections describe concepts and strategies for layering HBMD defenses to make the whole system more robust against future threats.

Section eight: Advantages of layered defense

Introduction

The sensing and interceptor network required to defend against a complex ballistic missile attack on the US homeland is extensive. This is, in part, because it must cover multiple environments encompassing a large area and do so with a robust and resilient architecture. The interceptors must defend a huge swath of land and may come up against sophisticated penetration aids. The GMD system provides some of these necessary defensive features, but it cannot do the entire job efficiently and cost effectively even against just simple ICBMs employed in large numbers.

This section explains why layered defenses would improve on the current US HBMD system through **higher effectiveness and efficiency, preferential defense, and innate survivability**. Next, it applies these theoretical advantages of layering defenses to thwarting the objectives of the three different threats this report contemplates—denying a rogue state population strike, complicating major power coercive raid calibration, and degrading an attempted nuclear-disarming attack.

Theoretical advantages of layered defense

A layered missile defense system offers increased effectiveness and is more efficient. Defense-in-depth is another military term with essentially the same effectual meaning as layering, because both seek to degrade, rather than completely defeat, an attack with any single element of the defense. Rather, it is the collective result of a series of engagements that beats the attack. Layering has the additional advantage of allowing for the tactic of preferential defense. Finally, layering creates a more survivable defense architecture, complicating direct attacks on defenses from a sophisticated adversary.

Layering increases effectiveness and is more efficient

The traditional value of layered missile defense is a simple mathematical benefit similar to that of compounding interest. For example, a shoot-look-shoot intercept doctrine would be twice as effective as a shoot-shoot-look defense if the first shot is successful. Missile defense architectures that allow for en-

Two US Army THAAD launchers from the 2nd Air Defense Artillery Regiment arrive in South Korea, March 6, 2017. Source: Jaremy Larlee/US Forces Korea

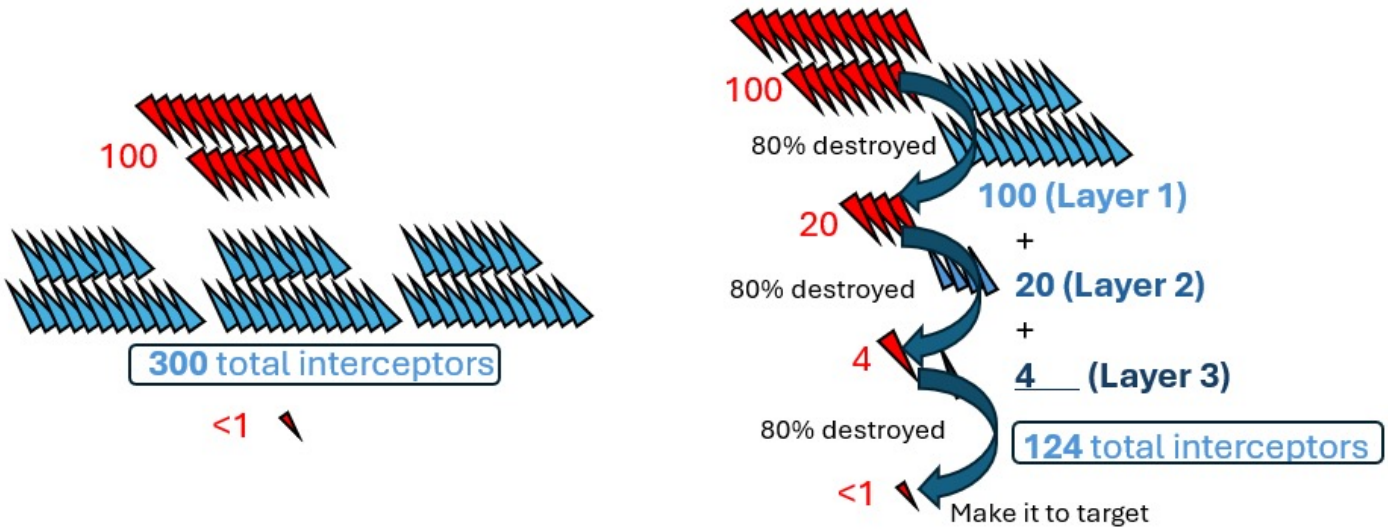


Figure 3: Comparison of a Single Layer of Defense to One with Three Nominal Layers. Source: Author's own design.

gagement at different phases of a ballistic missile's flight allow tracking and engagement with different types of interceptors and seekers. This multi-phenomenology and multi-phase engagement capability is the core characteristic of this report's concept for layering defenses. Approaching layered missile defense in this way incorporates the core tenet of combined arms with the expectation that countering one mechanism for defense makes the attacker more vulnerable to another. The expectation is that effectiveness—the likelihood of intercept—goes up because of the complementary nature of different track and intercept mechanisms spread across each phase of flight. Efficiency and effectiveness improvements then have the knock-on effect of increasing capacity.

A raid might defeat a single layer of a ballistic missile defense in diverse ways. A typical example comes in the form of low-cost, in terms of weight, countermeasures released in space. Dispensing many tinfoil inflatable copies of a warhead is advantageous for an attacker, since this requires little tradeoff in warhead weight or missile range. Even simple countermeasures like this greatly complicate mid-course intercept. However, these countermeasures are stripped away when the warheads re-enter the atmosphere and are not typically released until well into the ascent phase of flight. This general lack of countermeasures is one reason why defeating a missile during launch or ascent is highly desirable for the defense planner, whether accomplished with land-, air-, or space-based interceptors. However, if the threat missile deploys only simple, lightweight countermeasures, then the terminal defense layer remains relatively unaffected.

Layering different defensive systems improves the overall defense in this linear sequential manner but the full advantages of layering disparate systems are also non-linear. For instance, intercepting an SLBM on a depressed trajectory meant to fly under or around the mid-course intercept layer systems might prove achievable for a terminal-phase interceptor. While the SLBM could be moving at faster speeds than the current US terminal defense system design can handle, the SLBM warheads' lack of maneuverability makes such an intercept plausible and worthy of testing. At the conceptual level, layering in this manner allows taking advantage of both the mathematical benefits of making sequential intercept attempts to maximize system efficiency as well as challenging the multiple options an attack has available to complicate the defense at a more affordable price than a single-layer defense design.

Terminal defenses are typically forward deployable and, therefore, relocatable to be with US troops where the area that needs defending is relatively small. In this way, a small area can be well-defended in a cost-efficient manner. The target location of the strike is a known factor, simplifying this terminal defense challenge. Add to this an expectation of precision engagement, and the defense becomes even easier. Moreover, terminal ballistic missile interceptors are relatively inexpensive because they travel the least distance and engage threats in the least taxing discernment environment. The shorter the intercept range, the smaller and cheaper the rocket. Shorter-range ballistic missile interceptors like the THAAD cost about a tenth of what a regional interceptor, such as the SM-3 IIA, does and a thirtieth the price of GBI interceptors meant to defend the entire country. Of course, it is unlikely that mid-course interceptors have the same effectiveness as either regional or terminal defenses, whether or not one factors in countermeasures (notably, such effectiveness information is classified and therefore out of reach of this report). It is now tempting to assume that it is better to have thirty THAADs rather than one more GBI, but such a comparison is a vast oversimplification of the various threats the HBMD is meant to deter. However, terminal defense is sensible when the conditions, and especially when the targets, of a massive attack can be reasonably predicted. Terminal defense, as an element of a layered HMBD architecture, is most applicable for defending select high-value

targets needing a thicker defense. The inherent “mobility” of the THAAD provides different deterrent effects that the report discusses later.

The perfect mix and number of interceptors needed to defend against ballistic missile threats to the homeland would take both exquisite intelligence and a supercomputer to work out. However, the concept of gaining efficiency through layering is foundational to this discussion and worth presenting with an example. Figure 3 below compares a single layer of defense to one with three nominal layers, the key being that each achieves the same defensive effect, but with the layered design requiring less than half the interceptors.

This is a generic three-layered defense and so is basic and conceptually oriented. It does not directly represent the functionality or effectiveness of this study’s recommended HBMD system because the degree to which each layer would or could engage in a missile raid differs across the imaginable types of attack. There are two main reasons for this. First, a single layer might be capable of a shoot-look-shoot engagement if the interceptor is fast and fire control smart. In this way, one might imagine the first and second shots; therefore, the first two layers of some engagement scenarios might consist only of GBIs. Alternatively, if the sheer quantity of threats overwhelms the GMD system, the second mid-course intercept might come from sea- or land-based SM-3 IIA missiles.[346]

For the simplified purposes of thinking through the math of missile defenses, one can view “single-layer” effectiveness as a single opportunity to engage a threat, or a single shot, that missile defense parlance refers to as a single shot probability of kill (SSPK). The other key point with this elementary description of missile defense comes with the realization that a single engagement could include multiple interceptors. Within the current US HBMD design, this shot doctrine might occur with a salvo of three GBIs to improve the overall engagement’s

346 There are many reasons that the GMD might be incapable or undesirable for a second shot such as non-conducive threat missile trajectory or technical failure during GBI engagement, such as low launch reliability where the shortcoming would not likely translate to the SM-3 likelihood of a successful intercept.

A US Marine Corps radar technician initializes an AN/TPS-80 Ground/Air Task Oriented Radar (G/ATOR) in preparation for Exercise Arctic Edge at Fort Greely, Alaska, February 10, 2024. Source: Madisyn Paschal/US Marine Corps.

likelihood of intercepting a single threatening warhead.[347] Alternatively, the planned replacement for GBI has multiple "kill vehicles" that allow a single interceptor missile to take several "shots" at the warheads. For simplification purposes, this example treats all three of these engagement types: a single missile and warhead, multiple missiles and warheads, or a single interceptor missile with a multiple kill vehicle as simply a single layer. The single-layer defense illustration below depicts the most basic version of an intercept, launching three interceptors with single warheads all at once. While crude, this depiction is agnostic to the type of attacking missile and so works for this discussion of basic concepts of defense against any threat type, be it cruise missiles, hypersonic weapons, or a mixed, complex attack.

The graphic below visualizes the simplified math in the paragraph above. For this exemplary engagement, the assumption is each interceptor has an 80 percent chance of success. This illustration ignores any degradation from things like the interference among multiple interceptors launching all at once or the potential for common failure modes, such as all three kill vehicles suffering from the same deficient part. In this case of a non-layered defense, a defender could launch three hundred interceptors to achieve one hundred engagements as a three-on-one attempted intercept. In this instance, the defender could be confident of shooting down all but one of the attacking missiles for a 99 percent effective defense. Alternatively, a three-layered defense would expend only 124 interceptors for the same result, costing far less than half the single-layered interceptors, given that layers two and three are likely cheaper interceptors. These vast cost savings would likely be true even if those lower layers employ a shot doctrine with several interceptors launched per engagement.

Several details make this an overly simplified treatment of the problem, and actual efficiency gains would surely not be this

347 If the SSPK for the GBI is 55 percent, as some scholars presume, and there is neither interference between kill vehicles nor common failure modes then there is better than an 80 percent chance of successful intercept for a three GBI salvo defensive engagement.

A Patriot missile battery sits on an overlook at a Turkish army base in Gaziantep, Turkey, Feb. 4, 2013. Source: Department of Defense

great. But that simplicity helps make the value plain. Perhaps the reality is a cost efficiency gain of a *mere* ten or twenty percent. But in this example, with defenses numerically overwhelmed, that efficiency gain would translate to an operational benefit of perhaps a dozen more targets defended. Alternatively, in a smaller raid, say of just twenty missiles, the excess capacity could instead bring higher confidence of complete denial or, if sufficiently effective already, might instead mean billions of dollars saved because more interceptors remain immediately available for future contingencies.

In short, layering ballistic missile defense makes the system more likely to intercept both because of improved engagement options across phases of ballistic missile flight and various counter-countermeasure options. These two characteristics of layered defense that improve effectiveness directly translate to increased system efficiency. Higher efficiency can then increase defense capacity, make it more affordable, or be traded for greater confidence in denying any missile penetration at all. Furthermore, the layering concept for national missile defense does not just do the same job of a single layer better, it also adds entirely new ways to operate. Finally, just imagine the layered defense from the perspective of a would-be attacker; not only would this architecture drive up the number of attacking warheads necessary, but also the uncertainty of which or how many warheads ultimately reach their targets make any scale or scope of attack a very risky bet.

Layering allows for the tactic of preferential defense

A layered defense, underpinned by a robust and detailed sensor system, allows defenders to incorporate the tactic of preferential defense in their overall strategy. Preferential defense is perhaps more readily understood as preferential leaking. The defender decides which incoming warheads to engage and, at the extreme, which to let proceed to a supposedly inconsequential location. Preferential defense works best as an integrated effort hinging on both mobile terminal and mid-range type defenses with the goal of maximizing uncertainty for the attack planner. Preferential defense executes in several ways. In a strong sensing network, intentional leaking saves interceptors when the missile is clearly off target. Israel has employed this tactic for many years when it allows rockets to explode harmlessly in empty farmers' fields. More germane to this conversation is positing a large raid in which some of the attacking missiles target terminal defenses (such as ICBM silos or Washington, DC, as proposed in this study). Whether or not the existence of the terminal defenses is a surprise to the attacker, the upper layers, if overtaxed, can intelligently hand off threatening objects to lower layers. This approach frees up the longest-range interceptors to focus on threats headed to less thickly defended, or otherwise undefended, targets.

Stand-alone capable but fully integrated multi-role regional defense, such as the Aegis ashore system armed with the Navy's Standard Missiles, are the true heart of a layered architecture. Just three Aegis radar sites armed with SM-3 IIA missiles can detect and defeat ballistic missiles threatening a large portion of the contiguous United States with additional systems needed to defend both Alaska and Hawaii. Adopting the heart of the US surface Navy's missile defense means that each shore-based site could simultaneously defend itself from cruise missiles.[348] Aegis-commanded radars recessed into the homeland interior would also enable affordable and truly mobile terminal defense options by offboarding the radar from a potential mobile missile launcher. Moreover, the Navy's Aegis-based defensive capability against cruise and ballistic missiles will soon include hypersonic defense. Multi-mission, long-range intercept with organic robust radar that supports true mobility enables dynamic defense decisions that severely complicate adversary attack planning.

Regional defense radars would be the third, and perhaps, final sensor layer in a homeland defense architecture. Their survivability and overlapping radar pictures improve discernment clarity, adding confidence that a perceived missile attack is no glitch or error. Furthermore, integrated battle management is a staple of any regionally oriented defense and so naturally shores up remotely launching interceptors that supports mobility and improves range. This sort of regional architecture could support a truly mobile terminal defense that sheds organic radar and so becomes more affordable. A mobile's reduced cost, rather than a silo-based interceptor, might also allow the production of a reserve force of terminal interceptors. Reserves allow for fast expansion during a crisis, while mobility improves decoy efforts, offering an exceptionally cheap means for complicating attack planning. But the regional system would not simply be a support structure; it also has teeth.

As a wide-area defense system, the regionally oriented Aegis-based middle layer can augment the capacity of the nationwide defense or serve as a hedge against technical failure in the top layer. The regional defense layer significantly increases the robustness of the entire homeland defense system. But more importantly to the overall strategy, the mid-layer massively increases the uncertainty that attack planners will see, because of what they cannot see. Attack planners must account for where mobile defenses might be, as well as what the long-range systems will choose to defend.

The regional defense layer would provide a robust, reliable second or even a third ballistic missile intercept opportunity. Terminal defense adds affordable mass and through mobility adds a degree of uncertainty. But the larger defended area of a regional system introduces the option for dynamic decision-making by the defense commander. If an adversary were to find all of the US terminal defenses, the attack planner still could not know what, or how well, the USNORTHCOM commander would choose to defend. In fact, as the attack unfolds,

348 As the report explains later, three SM-3 IIA sites can cover the entire continental United States.

that plan could change with maturing information that better characterizes the attack and possibly changes defense—and counterattack—priorities. Robust, layered sensing supporting a mobile defense posture sets the uncertainty baseline for the attacker. So long as the commander's defense decisions remain unknowable, the dynamic intercept options that the regional defense system enables will force irresolvable uncertainty upon the attack planner.

Layering creates a more survivable defense

Layering improves defense effectiveness and affords new tactical options, but it also naturally makes defenses more robust and survivable. The effort to peel back the layers, or blind them, eliminates the surprise and confidence necessary for an adversary to attack. Successful decapitation or direct counterforce strikes require surprise to preclude dispersal or launching counterstrikes before the attack completes. But directly attacking strategic early warning systems has traditionally been considered the most escalatory non-nuclear strike because, once blinded, defenders would presume massive, immediate attacks on their nuclear forces. Layering sensors with credible shooters forces a sequential attack and denies this degree of surprise. Layered sensors also add independent multi-phenomenology looks at the raid, which reduces the fear that these indications might be faulty. Road-mobile terminal defense launchers employed without co-located radar would be vastly more survivable, since they would not emit energy that is readily detectable from space. This layered posture improves the survivability of dispersed bombers or, should the Strategic Posture Commission's recommendation for "pursuing the feasibility of fielding" road-mobile ICBMs ever move forward, these ICBMs' survivability would also improve when dispatched within this study's proposed layered HBMD and specifically with an accompanying mobile defense. Complimentary overlap and redundancy are the foundation of layering, and this architecture would improve the survivability of national missile defenses in the same way that the mutually reinforcing legs of the triad secure US strategic nuclear forces.

Summary

US homeland missile defense could very well become every bit as much a part of the homeland deterrence posture as the nuclear triad. Continuing with a single-layered approach to US national missile defense goes contrary to the foundational theory of America's strategic nuclear posture cemented in the triad's intentional redundancy and complementariness. The three layers of this report's recommended national missile defense architecture improve effectiveness, allow for preferential defending, and enhance system survivability. The strength of the classic nuclear triad comes from each leg providing unique contributions for assured second-strike capacity. Moreover, each leg mitigates against potential technical failure elsewhere in the system and reduces the risk of strategic surprise by an adversary. Even if the current homeland missile defense structure (i.e., GMD) expanded in quantity or quality, it would still be too susceptible to the failure of just one kind of rocket motor, one kind of intercept seeker, or a couple of terrestrial radars. Layering missile defenses frugally gains efficiency, preferential flexibility, and survivability that vastly enhances deterrence of any form of homeland strike well into the future.

Applying layered defense theory to three categorical threats

As described earlier, this report calls for the United States to expand homeland missile defense to encompass threats posed by rogue states like North Korea; accidental or unauthorized missile launches; coercive, limited strikes from Russia or China; and a disarming strike on the US nuclear triad by any combination of hostile nuclear powers, simultaneously or in sequences. Ideally, adversaries must perceive the national missile defense system as fully capable of degrading their contemplated attacks, thus deterring any attempts. Moreover, it should completely deny an all-out attack by a small nuclear power or accidental launch while drastically reducing the consequences of an unauthorized launch. A layered missile defense efficiently mitigates or defeats each of these very different attacks, illustrating the versatility and value of a layered defense architecture.

Denying the undeterrable: Rogue states and unauthorized/accidental launch

This paper groups three different threat situations: a rogue nuclear state population, a purely accidental launch, and an unauthorized attack. This study groups these together because the United States cannot or chooses not to rely on deterrence by punishment as its primary method for protection. Technical details of each attack scenario differ significantly. But the most important aspect of each is that the defender cannot confidently rely on punishment to deter or has made a policy decision not to do so.

By definition, an accidental or unauthorized launch is undeterrable. Moreover, there is insufficient proof that any potential nuclear-armed adversary has installed the requisite security features to preclude unauthorized launches. Therefore, denial, through effective missile defense, is the only sensible way to address this problem. The scale and sophistication of such an attack have remained relatively static over time and so provide a useful baseline for a minimum standard for homeland missile defense. A single missile launched accidentally sets the worst-case for a state's largest MIRVed system. This would be Russia's Sarmat ICBM, which can hold up to ten RVs/warheads, while China's DF-5 is reportedly able to carry up to five. North Korea also may be acquiring MIRVed capability—further contributing to the possibility of an accidental launch involving multiple warheads. The unauthorized launch scenario should encompass the largest number of missiles and warheads controlled by a single commander—in this case, a Russian ballistic missile submarine with sixteen SLBMs each armed with up to six warheads, resulting in a raid of approximately one hundred warheads. This should be a fruitful area for arms control discussions, to reduce both the likelihood of such an incident and the consequences should it still occur. But until such agreements are signed and exe-

cuted, this number could be a stable rubric for baselining national missile defense.

Clearly, the "rogue" moniker applies to North Korea, and possibly Iran, if it realized a nuclear ICBM capability. The rogue attack category considers a state with a small and vulnerable nuclear posture, perhaps with a leader on the verge of losing power and possibly his life. Based on slim public reporting, this study assumes that Kim Jong Un could launch as many as twenty warheads against the US homeland in the near future.[349] Regardless of the precise motivational details, the three attack types may be undeterrable and other means to reduce these threats are insufficient. Therefore, the United States must provide a nationwide active defense with a high likelihood for successful intercept.

Further analysis of a rogue, accidental, or unauthorized attack beyond just raid quantity draws out another key planning factor—the likely targets. A spiteful dictator on the verge of losing power and a rogue submarine captain might well target US cities to inflict maximum pain. Since there is no reason to hold back, the expectations are these actors would employ the best countermeasures under their control. But a nationwide missile defense capable of completely denying every warhead coming off a Russian SSBN is probably not achievable in the near future. However, incorporating this study's recommendations for more numerous GMD interceptors, primarily by way of the more capable NGI, would significantly reduce these undeterrable nationwide threats. The complete layered HBMD, here recommended, would provide high confidence of a nearly perfect denial for the rogue state threat or accidental launch while drastically reducing risk across the spectrum of potential unauthorized launch scenarios.

Nuclear disarming attack by major powers

The next key missile defense scenario derives from the past wisdom in missile defense literature. That wisdom still applies today but requires ongoing adaptations as the secure second-strike capability of US nuclear forces and command-and-control come under increasing threat in the emerging two-nuclear-peer environment. Therefore, the secondary—and historically well-established—deterrent effect of layered national missile defense is to significantly degrade confidence in Russia's and China's ability to decapitate or destroy US nuclear forces whether unilaterally or in collaboration. Defeating such an attack does not require perfect denial. Instead, doing so rests on two key elements inherent to the layered defense: thick defense of key nuclear sites along with denying surprise and lengthening the time over which the attack unfolds.

Within the category of disarming attack, the goal is simply ensuring the continuous availability of sufficient US nuclear response options to impose unacceptable consequences on the attacker. The layered missile defense concept, in the context of a two-nuclear-peer world, deters such attempts without necessarily raising strategic stability concerns. A layered system can do its rogue, accident, unauthorized launch denial job without being so large or effective as to overly concern US adversaries that the United States would consider a disarming attack on a nuclear peer backed by homeland missile defenses to mop up a ragged retaliation (this is especially true in a two-nuclear-peer environment).

This is possible, in part, because of the steady progress towards more accuracy and higher reliability ICBMs (along with arms control measures) that have culminated in a standard of two-on-one counterforce targeting. These advancements save money for nuclear states in the same way they affect conventional strike capabilities: by reducing targeting redundancies. But an indirect effect is that as overkill comes down, the potential value of missile defense goes up. A layered homeland defense scaled to denying the undeterrable does not need or attempt to outpace and completely deny a disarming attack. Rather, it incorporates an underlayer at key nodes to preclude confidence such an attempt could achieve the desired outcomes at an acceptable cost.

Someday, North Korea may incorporate rather complex countermeasures, but a disarming strike attempt from Russia and/or China would certainly employ the most sophisticated penetration aids. This is why endo-atmospheric intercept is an important capability to include within a layered defense for degrading a disarming attack. The HBMD system, in a pure counter-force situation, can shift the upper layer's focus to defending key nuclear targets. Yet, the relatively small and predictable areas that require thicker defense lean toward terminal defense as ideal because of its cost-effectiveness with mass and natural mitigation against space-oriented countermeasures. The role that regional defenses could play in this scenario would likely be to back up the earlier layer(s) in defending critical strategic nuclear sites that, while important, did not warrant a dedicated terminal defense. At even a modest scale, selective but effective intercept produces outsized deterrence effects by presenting the risk of partial denial. For the attacker, partial success would be the worst sort of failure, as it would steel resolve for retaliation while leaving the tools to do so. In the multi-nuclear-power threat environment of the future, modest missile defenses could serve as an alternative to nuclear buildup. In this new environment, it is also possible to see them as a part of a stabilizing strategic deterrent posture because they ensure the availability of sufficient weapons to cause unacceptable damage even after an all-out attack. In the next couple of decades, the same US nuclear force sizing of past decades will have to, after surviving a disarming attempt, retain at least a minimal deterrent posture relative to the remaining nuclear peer and rogue actor(s). Terminal point defenses at select locations provide relatively cheap capacity while mitigating mid-course

349 David Choi, "North Korean Parade Showed off Record Number of ICBMs, Analysts Say," *Stars and Stripes*, February 9, 2023, https://www.stripes.com/theaters/asia_pacific/2023-02-09/north-korea-icbm-military-parade-9085022.html.

defense vulnerability to sophisticated countermeasures for countering disarming attacks with ballistic missiles.

A successful disarming attack must reduce the victim's response options below the attacker's cost threshold before the victim can decide to respond. Early warning sensors and missile defenses, therefore, are necessary early targets. Denying this surprise aspect of disarming attacks is fundamental to the US counterstrategy predicated on seeking to ensure a surviving second-strike option while retaining a credible threat of launch before a successful disarming attack can be completed. Today's nationwide missile defenses are single-layered and defend against only ballistic missiles, presenting a thin and informationally inadequate defense. Layering systems across the phases of ballistic missile flight from space sensors and mid-course intercept through to high-quantity end game (terminal) defense takes away all doubt as to the nature of the attack if struck directly, widely, and simultaneously. Integrating all the recommended capabilities in this report into a layered defense challenges an attacker to simultaneously defeat all these systems *without convincing the president to launch retaliation as the attack unfolds*. Layered defense, as an integral part of the broader strategic deterrent force, makes the whole posture anti-fragile.[350] Layering, with integrated systems that can also function in stand-alone modes, adds the resilience and clarity that make the system stronger throughout the attack. Layered missile defense significantly improves deterrence and stability in a multi-nuclear-power environment by stretching out the attack timeline while adding presidential options and improving awareness that reduces pressure to either build up nuclear forces in peacetime or to act quickly with them during crisis.

Limited, coercive attacks from major powers

A coercive strike is the most difficult of the three scenarios to describe or defeat. An attacker must calibrate a limited attack so that the coerced state does not perceive the attack as a disarming attempt. The United States should expect potential adversaries to employ a complex strike with ballistic, hypersonic, and cruise missiles. This attack could be purely conventional, but the fact that each delivery platform could be nuclear armed accentuates the threat. A coercive strike might be very small and launch from a single air or sea platform. The raid might also employ dozens of weapons launched from multiple directions and by widely dispersed platforms. This study considers an exemplary coercive strike of perhaps more than a hundred weapons, the majority cruise missiles, but adds a handful of hypersonic and around a dozen ballistic missiles. This report's recommended homeland defense posture would make denial of each attack method possible, yet not perfect. The layered homeland defense counterstrategy to coercion instead relies on increasing costs for the attack while reducing their benefits and doing so in a way that maximizes uncertainty for the attacker while retaining flexibility for the defense. This section shows why the middle layer with its multi-mission regional radars and interceptors augmented with mobile terminal systems is ideally suited for addressing the ballistic missile element of a complex coercive strike.

Defending against a complex attack is easier if the targets are few or clustered into a defensible area. That is one attribute that makes a disarming attack more predictable *and* more defensible. However, coercive strikes may target widely dispersed critical infrastructure sites, such as power plants, transportation nodes, and military-supporting industries or military bases themselves. The dispersal of these targets up and down the US coastline rules out terminal defenses as the primary tool. Instead, regional systems (such as Aegis ashore with SM-3 and SM-6 and, soon, GPI) with their powerful radar and multi-mission long-range interceptors are more desirable to address this threat with the help of truly mobile terminal defense options. Of course, this element of the layered defense should, as well, support and complement a robust regionally oriented cruise missile defense. However, the cruise missile threat requires more extensive treatment, to which the study dedicates the entirety of Section 10.

A strategy for countering limited coercive attack: Risking two catastrophes

Perfect denial of a limited coercive strike is possible but not likely a credible claim as seen by a potential attacker. The highly dispersed nature of the targets maintains an attacker's option to overwhelm locally. But overwhelming defense generally depends on employing many cheaper and, so shorter-range, weapons. Therefore, only major powers able to send attack platforms *repeatedly* against the adversary's homeland pose a major coercive threat in this manner. But, unlike with a rogue actor, perfect defense is not a requirement to deter a limited coercive strike. Instead, the design goal is to make calibration of this attack category impossibly difficult. This paper proposes a counter-coercion strategy based on posing two intractable dilemmas for the attack planner. Too light of an attack might fail to gain the desired benefits but risk high costs. Too heavy, and the attack might lose the cloak of limited, inducing an unacceptably painful retaliation rather than compliance.

A coercive attack that mostly or completely fails risks costs beyond just military retaliation. Even incomplete denial severely risks the credibility of future threats with these weapons and perhaps calls into question even more sophisticated systems in the attacker's arsenals as the overall credibility of its military drops. That would generate the opposite effect a limited coercive attacker sought. The two-on-one strike assumption holds for purely conventional strikes when multiple re-attacks on a target are impractical. But this thinking typically applies where there are no defenses, so a "too small" attack could be as high as three or even four weapons.

Regionally oriented defenses (i.e., those able to cover a specific US region) able to shift where and what they defend could

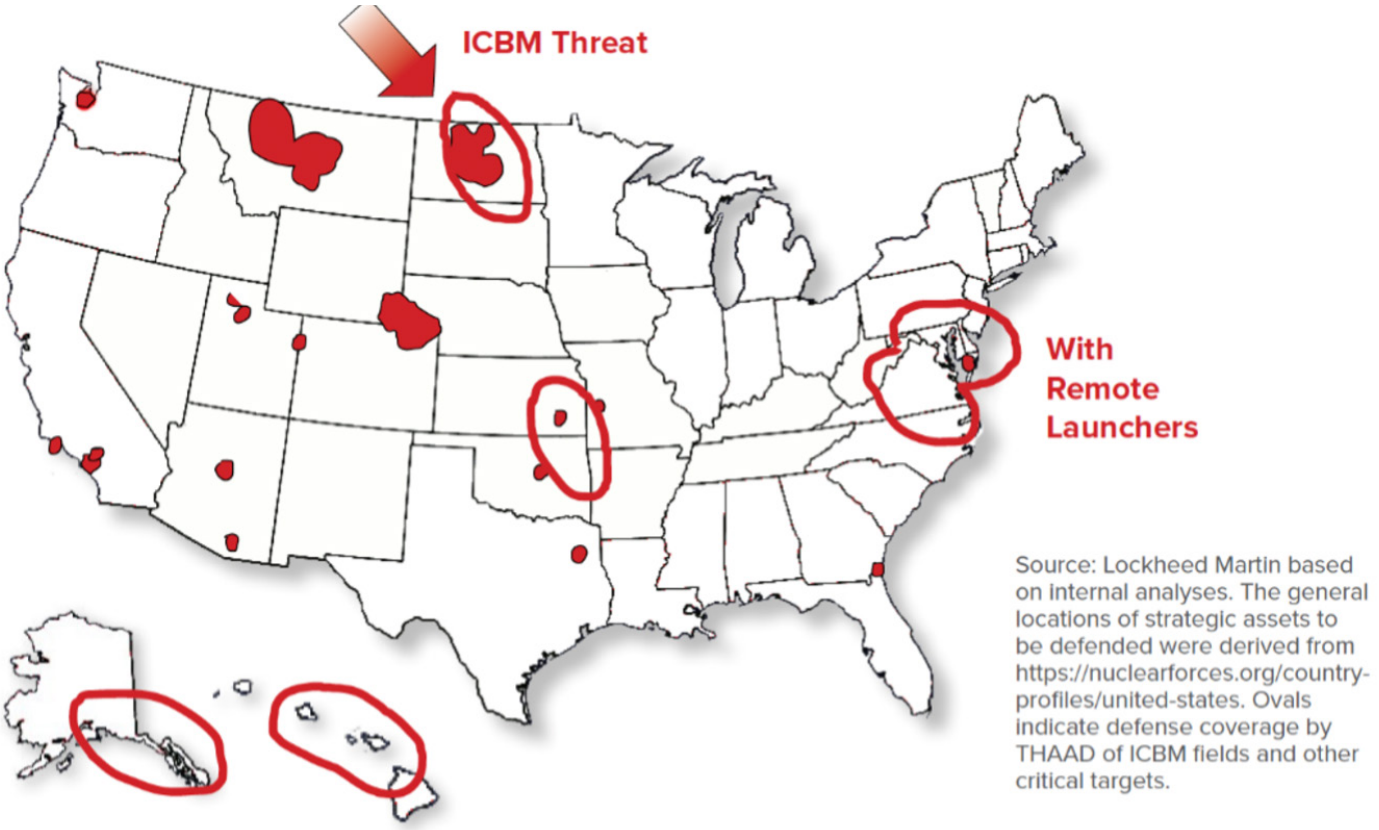
350 Nassim N. Taleb, *Antifragile: Things That Gain from Disorder* (New York: Random House, 2014).

invite catastrophic failure for the attacker by concentrating the defenses, causing the coercive attack to vastly underperform. The weapons employed in such a failed attack would suddenly and surprisingly be proven less potent than the attacker, target state, or third parties previously estimated. Iran recently experienced this degree of virtually complete failure when it launched several hundred missiles of various types in a raid against Israel. But the solution of simply sending more weapons of higher quality introduces its own kind of risks.

The other kind of catastrophe missile defense risks for a limited coercive strike is the cost of inducing too much pain; put differently, the enemy planner can no longer be confident that the attack will be perceived as limited, especially likely if the attacker's plan accounts for the defenses being significantly more effective than reality. In the latter case, the strike size might be, in the attacker's mind, just big enough to succeed. But the defender, knowing far more missiles will reach its targets, would see the attack as excessive. A widespread attack across many different targets would exacerbate the appearance of excessive damage. Moreover, avoiding sensitive targets is insufficient to preclude undesirable costs. The sheer volume of targets destroyed can induce an unexpected over response. These realities force the attack planner to consider the possibility of catastrophic success should the defenses prove less effective or more fragile than expected. The objective of a coercive strike is to impose the right amount of pain to gain one's political goals but not so much that it provokes undesirable behavior, such as over response, rather than compliance. Together, the risks of over and under success imply that a limited coercive strike, in the face of a credible defense, would concentrate multiple weapons aimed at just a few targets. This narrows the likely band of strike scenarios for coercive strikes, targets, and quantity and quality of attacking missiles. Credible defense against all types of missiles raises the cost of entry while the concentration effect reduces the benefits of such an attack, all the while increasing costly risks to limited launch platforms and potentially their supporting infrastructure.

An adversary might employ exquisite weapons during a limited coercive attack to thwart defenses, yet there are several reasons this might not be the case. If the defensive system is, in fact, anti-fragile, it will get stronger from being attacked as it will gain real-world data it can use to improve future intercepts. Moreover, especially if occurring in the early stages of conflict, a limited coercive strike that lands even just a few punches will likely prompt US leaders to loosen rules of engagement for interdiction, missile defeat, or even preemption; if US capabilities have not already dispersed for fear of escalation, they more likely would do so. An attacker may be willing to risk a few navy assets or outlying airfields and somewhat willing to reveal strategic secrets by employing otherwise unseen stealthy weapon systems. However, effective US defenses backed by credible response options should give

Figure 4: Lockheed Martin Example of THAAD Defense of Key Strategic Assets. ICBM = intercontinental ballistic missile.



adversary leadership pause before deciding. There are too many scenarios to imagine all possible forms of coercive attack. But the extensive sensor network of a layered defense discourages coercive strike planners from exposing strategic technical capabilities or risking limited numbers of expensive power-projection platforms, such as submarines or long-range bombers. Giving defensive systems a good look at these top-of-the-line weapons or countermeasures likely reduces their effectiveness in the future.

Summary

The coercive strike planners' task is to design a raid with enough weapons to provide high confidence that the attack will destroy most of the targets. They must do this without overly exposing technical secrets or inducing too much pain and achieving catastrophic success. Countering coercion does not require a perfect defense, but it does demand a credible capability to significantly reduce the likelihood of success for any form of attack while gathering the data needed to put the attacking platforms and their support elements at risk. Whether or not the defensive system becomes the primary target, a layered defensive system greatly reduces the provocative vulnerability of the homeland to peer coercion.

The role of the underlayer in homeland missile defense

The concept of employing regional missile defense systems as an underlayer for US homeland defense is not new. The 2010 BMDR initiated advanced technology development for a new SM-3 variant called the Block IIB, which "will ensure that the United States will stay ahead of the emerging long-range ballistic missile threat."[351] The Block IIB would contribute to the defense of US allies in Europe and would also augment US homeland defense by providing "an early-intercept capability against potential Iranian ICBMs."[352] In other words, the advanced version of the SM-3 would be part of a layered homeland missile defense. Ultimately, the Pentagon canceled plans for the Block IIB missile in 2013 due to dwindling support in Congress over cost and technology concerns.[353]

The Trump administration also directed the MDA to investigate the feasibility of incorporating regional missile defense capabilities into the homeland missile defense architecture.[354] Two US regional missile defense systems were under examination for their potential to supplement the GMD system: the Navy's sea-based SM-3 missile and the Army's ground-mobile THAAD system.

As part of its 2017–18 missile defense policy review, the Trump administration examined the technical feasibility of employing the recently deployed sea-based SM-3 block IIA missile as an underlayer. According to the 2019 MDR:

> The SM-3 Blk IIA interceptor is intended as part of the regional missile defense architecture, but also has the potential to provide an important "underlay" to existing GBIs [ground-based interceptors] for added protection against ICBM threats to the homeland. This interceptor has the potential to offer an additional defensive capability to ease the burden on the GBI system and provide continuing protection for the US homeland against evolving rogue states' long-range missile capabilities.[355]

In its FY 2021 request to Congress, the MDA included $40 million "to assess the Aegis Weapon System to determine if it can be upgraded to augment homeland defenses by supplementing the GMD system to defeat ICBM threats."[356] Congress, apparently thinking along the same lines, directed the DOD to conduct a test of the SM-3 against a simple ICBM target by the end of 2020. On November 16, 2020, a US Navy Aegis destroyer launched a SM-3 IIA, which intercepted a target that simulated a North Korean ICBM over the ocean northeast of Hawaii.[357]

351 US Department of Defense, *2010 Ballistic Missile Defense Review*, 17.

352 US Department of Defense, *2010 Ballistic Missile Defense Review*, 30.

353 Missile Threat, "Standard Missile-3 (SM-3): SM-3 Block IIB," Missile Defense Project, Center for Strategic and International Studies, last updated March 9, 2023, https://missilethreat.csis.org/defsys/sm-3/#:~:text=The%20Pentagon%20cancelled%20plans%20for%20an%20additional%20Block%20IIB%20version%20in%202013.&text=The%20Block%20IIB%20interceptor%20would,intercept%20intercontinental%2Drange%20ballistic%20missiles.

354 US Department of Defense, *2019 Missile Defense Review*, 61.

355 US Department of Defense, *2019 Missile Defense Review*, 21.

356 Budget Estimates Overview: Fiscal Year (FY) 2021, Missile Defense Agency, 2020, 9, https://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2021/budget_justification/pdfs/01_Operation_and_Maintenance/O_M_VOL_1_PART_1/MDA_OP-5.pdf.

357 "US Successfully Conducts SM-3 Block IIA Intercept Test Against an Intercontinental Ballistic Missile Target," US Department of Defense, press release, November 17, 2020, https://www.defense.gov/News/Releases/Release/Article/2417334/.

The SM-3, designed to deploy at sea, intercepts medium- and intermediate-range ballistic missile threats outside the atmosphere in the midcourse phase. The missile has currently been adapted for use as part of Aegis Ashore, a land-based version of the Navy's Aegis BMD system, with twenty-four SM-3s deployed in Romania and an additional twenty-four in Poland. Upgrading the SM-3 missile to intercept even a simplified version of a North Korean ICBM lacking countermeasures is not trivial. An April 2021 report from the US GAO pointed out that efforts by the MDA "to include the SM-3 Block IIA interceptor in a new 'layered' homeland defense against ICBM threats targeting the US could introduce considerable cost, schedule, and performance uncertainty to a program that has just entered initial production."[358] According to Raytheon, the manufacturer of the SM-3 family of missiles, the block IIA already has the speed, range, and altitude capabilities to intercept ICBMs (though it needs software changes).[359]

While the SM-3 IIA missile deployed on Aegis ships will continue to play an important regional defense role, the interceptor may be able to provide a modest, additional layer of protection for the homeland against North Korean ICBMs in an emergency or during a crisis. The ship would have to be in the right place near US coasts at the right time, and, given its smaller size compared to the GBI, the interceptor would not provide coverage for the entire United States. It would also deprive the ship of supporting other missions, including conventional warfighting. Moreover, the SM-3 would not be capable against the more complex Russian and Chinese ballistic missiles armed with penetration aids and decoys—nor would it defend against air- and sea-launched cruise missiles.

MDA also explored the technical feasibility of including the Army's THAAD system in the layered defense architecture, even deploying it to Hawaii for a short time in the early 2000s. The FY 2021 MDA budget request included $139 million to "initiate the development and demonstration of a THAAD interceptor prototype to support contiguous United States defense" and had anticipated a flight test in FY 2023. Meant to defend forward-deployed forces and military bases against MRBMs and IRBMs, THAAD may have some residual capability against long-range ballistic missiles and perhaps hypersonic weapons in their terminal glide phase. The defensive coverage of THAAD would be considerably smaller than the SM-3, and both would pale in comparison to the reach of the GBI, which can protect the entire nation from its two locations in Alaska and California. As a start, the MDA had proposed to examine what it would take to integrate the SM-3 and the THAAD into the GMD fire control structure to provide commanders with added defensive measures allowing a single command-and-control system to direct engagement in mid-course, late mid-course, and the terminal phase as well, should the earlier interceptors miss. The Biden administration did not pursue the underlayer concepts of SM-3 IIA and THAAD.

Figure 4 shows a notional example of the THAAD defense of key strategic assets with internal analysis by Lockheed Martin depicting the protection of a nuclear missile field in North Dakota, USSTRATCOM headquarters in Nebraska, and two batteries around the national capital region in addition to systems protecting Alaska and Hawaii.

358 "Missile Defense: Fiscal Year 2020 Delivery and Testing Progressed, but Annual Goals Unmet," US Government Accountability Office, April 2021, 24, https://www.gao.gov/assets/gao-21-314.pdf

359 "A New Layer of Homeland Defense: In a Test, Standard Missile-3 Destroys Its First Intercontinental Ballistic Missile Target," Raytheon, November 19, 2020, https://www.rtx.com/raytheon/news/2020/11/19/new-layer-homeland-defense.

Use-case: Synergy for HMBD and mobile ICBMS

The Strategic Posture Commission's 2023 report and the more recently released National Defense Strategy Commission both recommend reconsideration of the US nuclear posture with emphasis on the notion of increasing warhead count. One way to achieve this would be to field a road-mobile version of the normally silo-based ICBM. Several variations of this idea have been considered and rejected in the past. One reason past efforts failed was the exceptional financial and political expense of both the postulated two-hundred-thousand-pound specially hardened offroad vehicles and setting aside restricted lands for patrol. A recent variation on the Cold War-era mobile ICBM concept proposes housing simpler missile transporter-launchers in shelters within the existing ICBM missile field infrastructure to keep costs down. Following the recommendations of this report, the survivability of such a mobile ICBM would greatly multiply, whether in garrison or out on patrol near the missile field, where the mobile ICBM would receive the protection of all three layers of the proposed HBMD architecture.

In addition to the two over-layers, terminal defenses with a THAAD battery and its 6 launcher vehicles each carrying 8 interceptors would greatly improve the deterrence effects of the mobile ICBM force by demanding much more than just the standard two attacking warheads per silo. The complications for an attack planner start by inducing location uncertainty through mobility when deploying during a crisis and then compound when sprinting to an active defense "safe haven" when alerted to an incoming attack. The road-mobile ICBM could easily move fifteen miles in the time it takes an ICBM to complete its flight. Such a mobile missile could require half a dozen or more attacking missiles to ensure destruction based on a five-mile lethal range assuming a 200 kiloton (kt) airburst optimized for five pounds per square inch (psi). But under an active defense, the mobile ICBM would move to pre-designated defended areas unlocatable by the adversary because there is no physical marker to trace. Therefore, mobile ICBMs deployed alongside active defenses could force the attacker to double or triple the strike force to ensure destruction. This could make a dozen mobile missiles as survivable as a squadron of fifty silo-based ICBMs. This would be true even if the defensive system's likelihood of successful intercept is quite low or the GMD and regional defenses are prioritizing other locations. With the mobile missiles able to cluster, this would require, perhaps, as few as five safe havens, meaning that as many as ten missiles could defend each mobile ICBM. If THAAD or some other terminal defensive system proves credible in this role then road-mobile ICBMs would offer huge investment returns by enabling this relatively inexpensive means of increasing the cost of entry for an attempted disarming strike.

Conclusion

The current single-layer national missile defense system is too fragile to meet national defense objectives in the emerging strategic environment, much less the increased roles proposed by this study. Layered missile defense harnesses its inherent advantages over a single-layered system by efficiently increasing capacity while improving overall effectiveness. The proposed layered architecture allows posturing to thicken defenses where and when needed, but without allowing the adversary to observe all aspects. The regional layer multi-mission capability integrated with short-range systems together massively complicate adversary attack planning. The redundancy, overlap, and uncertainty built into the layered architecture make the system inherently robust and survivable. Furthermore, thinking about layered national missile defense as a tool of national power integrated with the rest of the strategic deterrent posture illustrates how layering would make the entire enterprise anti-fragile. The United States needs to deter three very different types of potential attacks, each requiring very different deterrent effects. Layered defense efficiently provides confident denial of a rogue strike while massively complicating a coercive strike plan and augmenting strategic nuclear deterrence effects.

Section nine: A better strategy for homeland missile defense

Introduction

The current HBMD system, designed for a specific and limited threat scenario focused on North Korea, comprises only a single layer, the GBI. The United States requires not simply a new architecture for accomplishing the same old mission better but rather a new architecture and strategy that layers in new capabilities designed to meet the challenges posed by Russian and Chinese limited strikes as well as the expansion of North Korea’s missile capabilities.

Given the limitations imposed by technology, funding, and industrial capacity, a phased approach is necessary. It should focus on near-term opportunities to bolster homeland defenses against the North Korean threat. This approach should simultaneously lay the research and development groundwork for follow-on measures to deal with limited numbers of more sophisticated Russian and Chinese missile threats (ballistic, cruise, and hypersonic) and stay ahead of potential further expansion of North Korean missile capabilities and, perhaps, a nascent Iranian ICBM capability.

There is an important distinction between the technological sophistication of a North Korean missile as compared to that of Russia or China. Great-power competitors employ sophisticated countermeasures that can challenge the US ability to distinguish between real warheads and false objects—placing great stress on US sensor capabilities to find the right targets for interceptors. This challenge is different in various phases of flight such that countermeasures in one phase may be ineffective in another; this is an advantage that layered missile defense exploits well. Simply and solely building more interceptors is a poor plan to defend against the increasing numbers of North Korea. It also will not solve the Russian and Chinese problem set or, perhaps, even the not-so-distant future North Korean countermeasure capabilities—additional defensive technology is necessary.

Since layered defense is this study’s essential recommendation, this section organizes the proposed architecture by phases of flight or interception. It begins with a summary of the existing architecture for the defense of the homeland against ballistic missile threats. Then, it describes the eyes and brain of the system—the sensors and fire control system. Next, this section addresses the terminal-phase defenses, which provide limited point defenses of key assets, traditionally the strategic assets, such as ICBM silos or nuclear command-and-control nodes. It then works to describe the larger area-defense systems, such as the SM-3 missile that engages threats in the late-midcourse phase. The section follows with the continent-wide defense provided by the long-range ground-based midcourse defense system and finally to the important yet challenging boost and ascent phase, where threats could be eliminated shortly after launch, perhaps even while they are still rising above the enemy’s territory. For each phase of flight or intercept, the report

A Ground-Based Midcourse Defense interceptor in a launch silo at Vandenburg Space Force Base (previously Air Force Base), California, 2006. Source: US Missile Defense Agency.

summarizes recommendations for near- and longer-term research and development and potential deployment.

Current homeland ballistic missile defense system

The cornerstone of the current US HBMD system architecture is the GMD, which defends the fifty United States against long-range ballistic missile attacks. GMD destroys intermediate- and long-range ballistic missiles during the midcourse phase of their flight. The GBI is a silo-launched interceptor consisting of a solid-fueled multi-stage boost vehicle and an exo-atmospheric kill vehicle that uses hit-to-kill technology. The GMD system has been operational since 2004 and consists of forty-four GBI interceptors. The interceptors stand watch at two sites in the United States: a few missiles at Vandenberg, California, while the vast majority are at Fort Greely, Alaska. The GMD system leverages Overhead Persistent Infrared (OPIR) satellites for initial launch detection and UEWRs for early detection and tracking, followed by more precise radars such as the LRDR and SBX radar for more precise tracking and discrimination. The C2BMC system provides planning, command-and-control, battle management, and communications.

Recommended defense designs in the near and far term

Missile threats to the US homeland are rapidly outpacing the existing and planned capabilities of the US missile defense architecture. Ballistic missile defense architectures do not fully address the urgent need of today's threats and must plan and make continual improvements to stay ahead of the threats. The United States needs to consider new and alternative concepts and capabilities to harness current and emerging technologies necessary to defend against future missile attacks, in a layered fashion.

Desired future architecture attributes

The future architecture requires global "birth to death" tracking and discriminating sensors that can provide engagement quality tracking for HGVs and can discriminate the ballistic RVs from countermeasures and decoys to minimize interceptor wastage. Multi-phenomenology sensors would provide less susceptibility to jamming and add robustness to discrimination solutions. The architecture requires a layered defense as described in the previous section. Adding boost/ascent-phase kill capability to the layered defense offers an option to engage the threat before countermeasure deployment. The whole system architecture should be designed to track and engage hypersonic and maneuvering targets and must be survivable, resilient, and able to defend against substantial raid sizes. One way to enhance survivability is to make GBIs mobile. By making these defensive systems and, *more importantly*, their defended assets less easily targeted because the GMD launch site is unpredictable, they become harder to target directly. The United States also needs more survivable sensors to engage in any direction and take the battle forward and far from defended assets. Above all, the architecture needs to raise the perceived cost of an attack and increase uncertainty.

Suggested defense architecture improvements

Sensors and BMC3

Sensors and BMC3 are the backbone of any defense architecture and generally support all phases of intercept: terminal, midcourse, and ascent/boost. This report does not recommend any changes beyond those currently planned for early warning radars or space sensors but describes suggested improvements to terrestrial tracking and discriminating sensors, followed by a discussion on space-based sensors.

Terrestrial sensors

Long-range discrimination radar (LRDR)

The LRDR provides enhanced warhead discrimination, precision tracking, and warhead kill assessment to GBIs, making them more effective. The MDA should continue funding the incremental software improvements to the LRDR while considering a modest expansion to add another array to cover more attack approach directions.

Discrimination and electronic protection improvements to existing radars (SBX, AN/TPY-2, SPY)

Successful missile defense requires the ability to distinguish the warhead from decoys and spent objects. This must begin as early as possible in the sensing phase of the kill chain. Equally important is the ability of the missile defense architecture to protect itself against electronic attacks, such as jamming. Electronic attacks against US missile defense systems can significantly degrade a radar's ability and timeline to support a missile defense engagement. While current radars have some discrimination and electronic protection (EP) capability, emphasis needs to be placed on making this capability more robust as threat countermeasures and electronic attack capabilities are becoming more sophisticated. The MDA's investment in discrimination technology has ebbed and flowed over the years; more recently, there has been less focus on discrimination. The MDA needs to reinvigorate its developments in discrimination and continue or expand its investments in EP technology across the missile defense architecture.

The DOD should continue to develop techniques and algorithms for improving discrimination by land- and sea-based sensors, making the GBI, NGI, and SM-3 interceptors more efficient and effective. In the longer term, the MDA should also assess and develop bi-static/multi-static sensing capabilities that make land- and sea-based sensors more effective when working together. If additional funds are available, the DOD could consider the deployment of more land-based sensors to provide more robust sensing in regions of increasing need, such as southern-facing radars in the contiguous United States or additional radars in Hawaii. Airborne UAV sensors should also be considered for surge operations when indications and warnings are available or during heightened alert.

Over-the-horizon radar (OTHR)

The MDA should assess the contribution of the OTHR capabilities being developed for homeland cruise missile defense and their potential application for ballistic missile defense. At a minimum, the expectation should be that this system would help identify the shooter/interceptor for cruise missiles, such as a bomber or surface ship, enabling missile defeat by targeting the launch platform.

Space-based sensors

Robust, multi-phenomenology layered sensors are essential to ensuring that the interceptor guides to the appropriate target even while the system itself is under attack. Space-based sensors can provide persistent global detection, warning, and precision tracking of threats launched from any location as well as kill assessment after interceptor engagements.

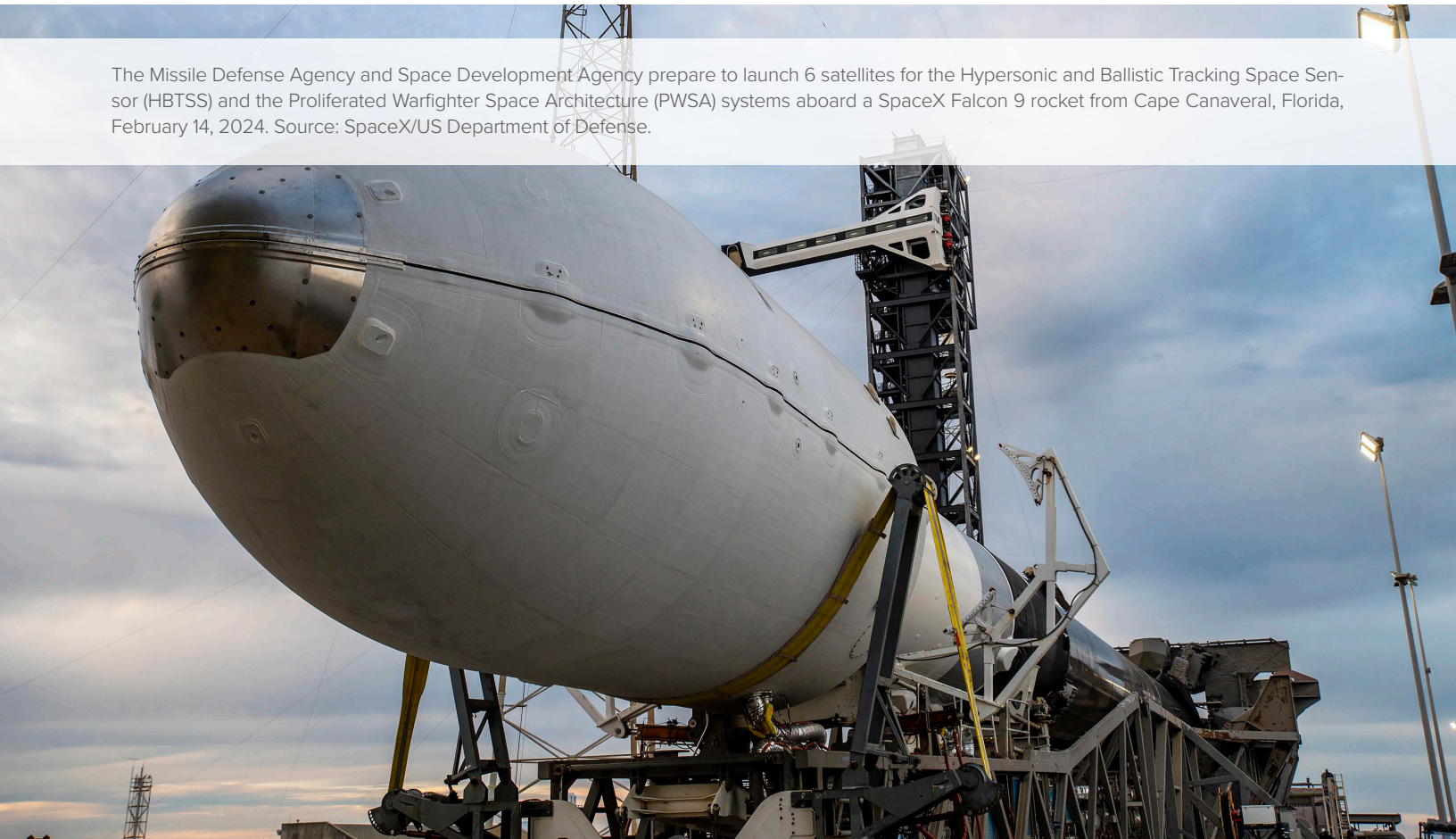
It is time for the United States to deploy space-based sensor defense tracking capability and "move the center of gravity (the major concentration of the tracking sensor architecture) from terrestrial-based sensors to space-based sensors."[360] Space Force's SDA has demonstrated that the United States can develop space-based sensors at much lower costs than previously thought feasible. The DOD is assessing SDA-developed tracking space sensors and the MDA-developed Hypersonic and Ballistic Tracking Space Sensor (HBTSS). Most of these will be Wide Field of View (WFOV) tracking satellites that will provide a cue to the more sensitive Medium Field of View (MFOV) satellites stated to be capable of providing target-quality data to mid-course interceptors. The HBTSS, a prototype for the MFOV missile-tracking capability, in June 2024, tracked its first hypersonic launch, a test vehicle built to prove the system's performance.[361] It is important that any follow-on capabilities can provide the precision needed for guiding interceptors for both ballistic and hypersonic defense, and that the MDA and the warfighter remain a strong voice in the requirements and capabilities of these sensors to ensure that they provide the needed precision.

The DOD should continue funding the SDA and MDA demonstrations and fund the rapid filling of low-Earth orbit (LEO) constellations to provide initial operational capability for detecting and tracking ballistic and hypersonic threat missiles as soon as possible. Based on current plans, an initial capability of eighteen to twenty-four MFOV satellites, or more, could be available by 2032.[362] Ultimately, orbital regimes will need to include survivability in their design considerations.

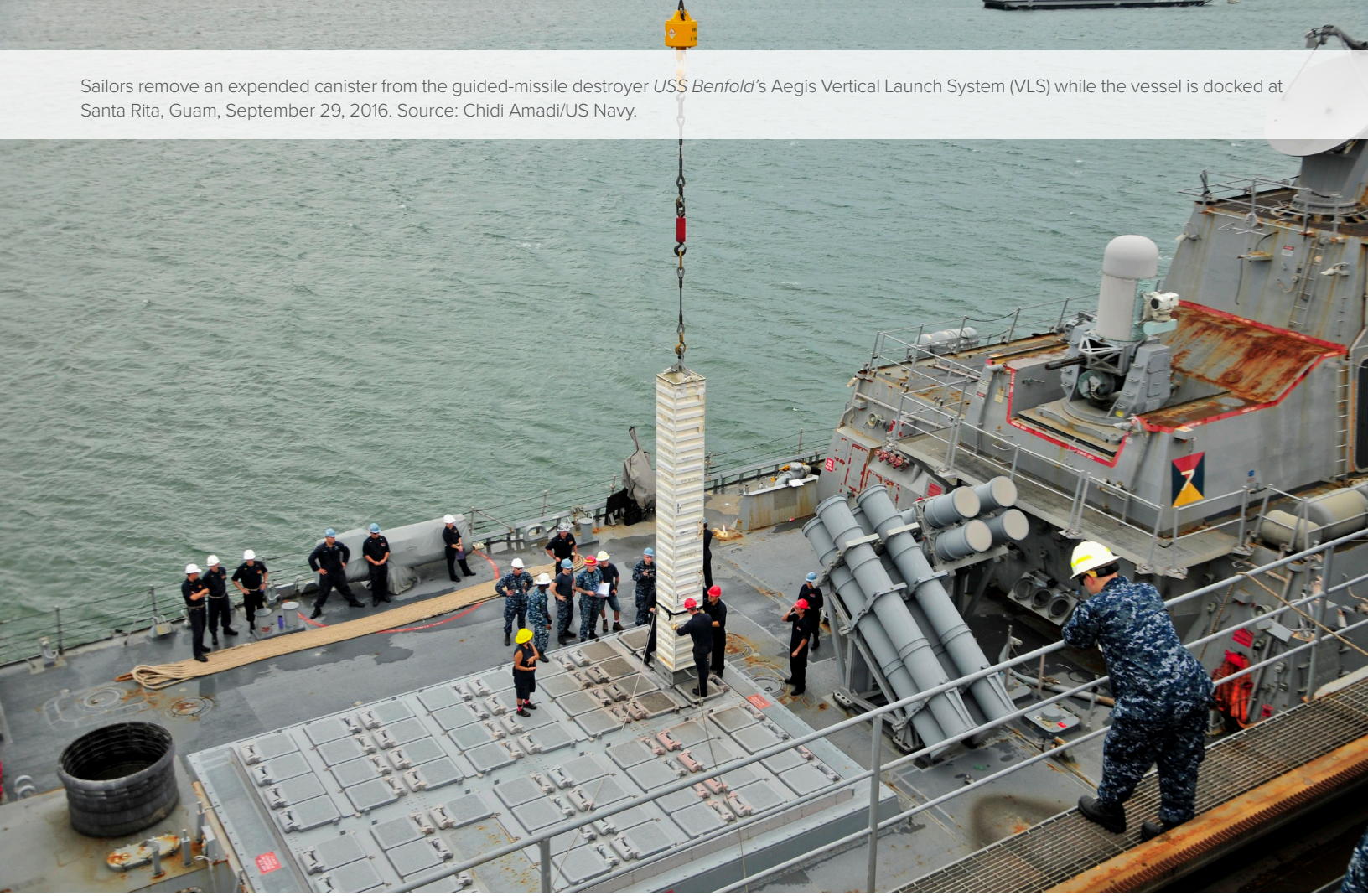
360 Steve Lambakis, *Space Sensors and Missile Defense*, National Institute for Public Policy, August 2023, https://nipp.org/wp-content/uploads/2023/08/Space-Sensors-2023.pdf.

361 Courtney Albon, "Missile Defense Agency Eyes Discriminating Space Sensor Launch by 2029," *Defense News*, August 19, 2024, https://www.defensenews.com/space/2024/08/19/missile-defense-agency-eyes-discriminating-space-sensor-launch-by-2029/.

362 "SDA Capability Roadmap," Space Development Agency, March 2024, https://www.sda.mil/wp-content/uploads/2024/01/SDA-Tech-Roadmap_Wide-v2.0-1.pdf; "Space Development Agency Makes Awards to Build 54 Tranche 2 Tracking Layer Satellites,"



The Missile Defense Agency and Space Development Agency prepare to launch 6 satellites for the Hypersonic and Ballistic Tracking Space Sensor (HBTSS) and the Proliferated Warfighter Space Architecture (PWSA) systems aboard a SpaceX Falcon 9 rocket from Cape Canaveral, Florida, February 14, 2024. Source: SpaceX/US Department of Defense.



Sailors remove an expended canister from the guided-missile destroyer *USS Benfold*'s Aegis Vertical Launch System (VLS) while the vessel is docked at Santa Rita, Guam, September 29, 2016. Source: Chidi Amadi/US Navy.

The DOD should also immediately begin developing and demonstrating satellite sensor concepts that can track ballistic missiles beyond booster burnout and distinguish warheads from decoys. The MDA has initiated a demonstration sensor, called the Discriminating Space Sensor (DSS), that will be able to execute both tasks. The DSS is vital to the MDA's vision for a space-based tracking layer and will complement HBTSS. The MDA stated that the DSS has completed ground concept testing with plans to launch a space-based demonstration sensor by 2029.[363] Continued funding for this work is a necessity, alongside its coordination with the SDA, ultimately fielding a constellation of discriminating space sensors that will result in the need to shoot fewer interceptors. The Pentagon must conduct development and demonstration activities during FYs 2025-30 to allow for initial operational capability in the 2032–35 timeframe. Upon successfully demonstrating discriminating space sensors, the DOD should, as soon as possible, supplement the missile defense space architecture with DSS. This capability will be a force multiplier, making each GBI/NGI and perhaps even SM-3 more effective and potentially reducing the wastage of costly interceptors.

Both sensor types (tracking and discriminating sensor capabilities) would provide significant multi-mission capability in support of other DOD missions, such as space domain awareness and counterspace, and their designs should keep those ancillary benefits in mind. These sensors should also be resilient. This study does not advocate eliminating terrestrial based sensors; rather, this section suggests adding space-based sensors to provide global "birth to death" coverage as well as additional phenomenology and redundancy while aiding in tracking and discrimination capability.

A counterargument to LEO-based space sensors is sometimes raised pertaining to the vulnerabilities of LEO-based sensors to anti-satellite (ASAT) capabilities. The most recent arguments in this vein have centered on the revelation of Russia developing a nuclear detonation device on a LEO satellite.[364] All sensors, whether space-based, ground-based, ship-based, or airborne, have unique location vulnerabilities. Space-based sensors could have increased robustness against nuclear threats incorporated into their design, albeit at a cost. Additionally, the space-based tracking constellation could switch to alternative orbits, such as medium-Earth orbit (MEO).

Space Development Agency, January 16, 2024, https://www.sda.mil/space-development-agency-makes-awards-to-build-54-tranche-2-tracking-layer-satellites/.

363 Albon, "Missile Defense Agency Eyes Discriminating Space Sensor."

364 Steve Trimble, "May 20 – June 2, 2024: What Is Cosmos 2553," *Aviation Week*, May 20, 2024, 14.

Space-based kill assessment

The MDA has deployed a demonstration constellation of Space-based Kill Assessment (SKA) satellites to provide confirmation of successful intercept in space. In its FY 2025 budget, the MDA is continuing to fund the integration of SKA into the overall missile defense system. This work should continue, with the goal of providing a credible capability for mid-course assessment to support kill confirmation sufficient to preclude the need for a second shot that creates interceptor wastage.

In summary, a robust space-based sensor system would provide a global stand-alone capability to support intercept when viewing by terrestrial-based systems is not feasible and provide an additional phenomenology for more robust tracking and discrimination capability. The MDA first demonstrated this potential in 2013, when an Aegis missile intercepted an MRBM with an SM-3 Block IA missile using a cue from only two Space Tracking and Surveillance System (STSS) demonstration satellites that detected the target before the onboard SPY-1 radar could detect it, exhibiting a launch-on-remote capability.[365] Launch-on-remote capability provides cueing from an off-board sensor to enable expanded battlespace and could allow for earlier intercepts facilitating layered defense. If the quality of the track is precise enough, space-based systems can enable the kill chain all the way to the end game with an engage-on-remote capability, eliminating the need for a land-based radar at all for SM-3 intercept.

Command-and-control

Future command-and-control improvements should continue the integration of the architectures described above. The DOD should immediately begin modifications to the C2BMC to integrate GMD with an Aegis underlayer for homeland defense. The DOD should continue work on the integration of the Army's Integrated Air and Missile Defense Battle Command System (IBCS) with the US BMDS, as well as Navy systems to ensure a fully integrated air and missile defense architecture for homeland defense, including cruise missile defense and missile defeat, to better use extant capabilities from the MDA, the services, and other government organizations. The MDA should continue to invest robustly in measures to protect the C2BMC against potential cyber, electronic warfare (EW) and electromagnetic pulse (EMP) threats.

Beyond ballistic missile defense, the DOD should pursue all needed upgrades to ensure that the C2BMC system can process data quickly enough to respond to and destroy an incoming hypersonic threat. The MDA should also assess and integrate additional Space Force sensor capabilities that enhance defense against ballistic and hypersonic glide threat weapons. The DOD should also consider the integration of the C2BMC with the Joint All Domain Command-and-control (JADC2) for a fully netted missile defense system architecture, including cruise, ballistic, and hypersonic missile defense. Lastly, DOD should consider the incorporation of tracking data from airborne sensors (e.g., fighters) into the ballistic missile defense portion of the architecture. Ultimately, the vision would be a single command-and-control network that would enable the choice of all useable/available sensors with all useable and available interceptors and that fully integrates IAMD capabilities across the DOD.

Interceptors

Terminal phase

Following this paper's recommendation to protect critical nuclear command-and-control sites, the DOD should consider terminal defense systems as part of a layered capability, including THAAD (against ballistic missiles), SM-6, and/or Patriot systems (against cruise missiles or HGVs). The key to preferential defense is enemy uncertainty about what the United States is defending and to what degree. The Aegis Vertical Launch System (VLS) is inherently ready to integrate SM-3, SM-6, and GPI to provide defense against cruise and hypersonic missiles but would require non-recurring engineering funding for this integration. It is important to note that both Aegis and THAAD have proven capable of intercepting IRBMs and those of shorter ranges. Testing these systems to prove an intercontinental-class ballistic threat defense option would increase their deterrent effect. But for true confidence in this expanded capability, they will need to be evolved and tested extensively in this role to give pause to an adversary and confidence to American citizens.

Terminal defense interceptors must be equipped with the appropriate tracking sensors and command-and-control to provide the firing solution for the interceptors. For THAAD, this would be the TPY-2 radar, and for Patriot the AN/MPQ-65 radar (or the Lower Tier Air and Missile Defense Sensor, LTAMDS, in the future). SM-3 and SM-6 will require a SPY radar for cueing, but, in the long term, could possibly leverage a space-based sensor for engage-on-remote capability. Any of these interceptors could receive modifications to use other sensors for potential launch-on-remote or even engage-on-remote capability if time, finances, or technology do not permit integration in VLS/Aegis-based regional defensive infrastructure.

Midcourse phase

The DOD should continue to fully fund the development of the NGI and begin fielding it as soon as possible. Under current plans, twenty new NGIs will supplement the existing GBI architecture. The NGIs will have improved reliability over GBI and will also have multiple kill vehicles within each interceptor, reducing the number of interceptors needed to confidently defeat a threat with complex countermeasures. The planned emplacement of the first twenty NGIs is at Alaska's Fort Greely.

The MDA could place additional NGIs at the California site or initiate an East Coast site for more robust defense against North Korean (or Iranian) threats, which, moreover, would en-

365 Tamir Eschle, "SM-3 Relies on Space-Based Tracking to Intercept a Ballistic Missile Target," *Defense Update*, February 13, 2013, https://defense-update.com/20130213_sm-3-relies-on-space-based-tracking-to-intercept-a-ballistic-missile-target.html.

hance defense against limited threats originating from Russia or China. In 2019, the DOD identified Fort Drum in New York as an optimum location for a third site.[366] For added survivability or, perhaps, to reduce cost, follow-on NGI designs might focus on making them transportable rather than silo based. These options would require engineering trade assessment in studies to determine the cost/performance trade of geographic diversity versus funding additional GBI/NGIs or other architecture options.

The DOD should also begin funding procurement of land- and/or sea-based Aegis radar systems supported by SM-3 interceptors to serve as an underlayer to the GMD system for intercepting in late midcourse. Ideally, this would include five total sites with three covering the contiguous United States and one each for Alaska and Hawaii that would follow from lessons learned as the DOD completes the system in Guam. This underlayer could defeat threat missiles not taken out by GBI/NGI or if the GBI/NGI interceptors have been exhausted.

In 2020, the success of a modified SM-3 IIA intercept test against an ICBM-class target demonstrated the feasibility of this opportunity.[367] Aegis ship-based SM-3 IIA interceptors could immediately serve during a crisis to expand the number of interceptors protecting the United States. The Army, in the mid-term, should build land-based Aegis systems, like Europe's Aegis Ashore sites that each field twenty-four SM-3 missiles, to provide a permanent second layer and eliminate the need to pull Navy assets for homeland missile defense. Regardless of whether by land or by sea, Aegis-based missile defense has the added benefit of being fully integrated to support surface defense against all missile types, whether surface-skimming cruise missiles or ultra-long-range ballistic missiles. While there is no estimate for how US industry could support the radar stations' construction, a recent study by Sen. Roger Wicker's (R-MS) office concluded that SM-3 IIA production could increase to thirty-six missiles per year.[368] In making architecture decisions, policymakers must consider the opportunity cost for new options and system-level tradeoffs.

Boost/ascent phase

Intercept in the boost and ascent phases has significant advantages, and can be best accomplished through SBIs or non-kinetic interception capabilities.

Space-based interceptors (SBI)

Space-based defenses should be the primary focus for next-generation missile defense. SBI could provide on-demand global coverage of missile launches with multiple opportunities to intercept threat missiles as they transit through space, and it offers the only feasible option for defeating missiles even earlier, during boost/ascent. Early intercept could deny the adversary the use of countermeasures or force early release, thus reducing their effectiveness. SBI would also provide a larger defensive footprint and supports a shoot-assess-shoot (S-A-S) firing doctrine. SBIs could provide boost and post-boost access in places where terrestrial weapons would have geographic constraints. The option to engage threats during the boost/ascent phase also offers the huge efficiency gain of an intercept before the missile can dispense countermeasures or, if it has them, multiple or even maneuvering warheads. This capability would also enable defense against direct-ascent antisatellite threats.

A space-based layer of interceptors could work synergistically with land- or sea-based defenses to provide a robust, highly effective, and layered missile defense. In the past, SBI has been deemed too expensive, but recent advances in the miniaturization of components and decreased launch costs make SBI a much more attractive option. Of course, this capability must also be proven with realistic testing.

This is not a "Battlestar Galactica" concept; rather, this would employ a limited number of SBIs that could achieve defense against a limited threat. Since SBIs would be in constant motion and spread around the globe, even deploying hundreds of SBIs would only enable a handful to be in position to defend against a few dozen attacking missiles or warheads. However, this natural limitation also offers a unique benefit: self-healing. The remaining SBIs could easily disperse to fill the hole left by the consumed SBIs, albeit at a slightly lower density than before.

An SBI testbed demonstration should begin as soon as possible. A nearer-term capability demonstration might begin by putting NGI kill vehicles in orbit with a small engagement booster, but ultimately, the kill vehicle weight would need further reductions for a viable SBI constellation. In the long term, compact megawatt-class lasers may have a role in defense operations in space. These concepts could also support other multi-mission functions.

Another option under consideration over the years is the development of an air-launched weapon that could engage threat missiles early in their trajectory. Prior assessments by the MDA and others concluded that air-launched weapons would re-

366 Loren Thompson, "Why The US Needs A Third Site For National Missile Defense," *Forbes*, January 16, 2024, https://www.forbes.com/sites/lorenthompson/2024/01/16/why-the-us-needs-a-third-site-for-national-missile-defense/.

367 "US Successfully Conducts SM-3 Block IIA Intercept Test Against an Intercontinental Ballistic Missile Target," US Department of Defense, press release, November 17, 2020, https://www.defense.gov/News/Releases/Release/Article/2417334/us-successfully-conducts-sm-3-block-iia-intercept-test-against-an-intercontinen/.

368 Sen. Roger Wicker, "21st Century Peace Through Strength: A Generational Investment in the US Military," Office of Senator Roger Wicker, 2024, 14, https://www.wicker.senate.gov/services/files/BC957888-0A93-432F-A49E-6202768A9CE0.

quire a very high-speed interceptor and close proximity to the launch site.[369]

Non-kinetic capabilities

More sophisticated threats challenge current US longer-range interceptors, while the proliferation of missiles that can be intercepted may exhaust and/or saturate current US systems. As the projected number of threats continues to increase, there is an ever-growing need exists for non-kinetic capabilities to supplement the kinetic interceptor inventory. The DOD should consider funding the development and fielding of non-kinetic capabilities, such as directed energy or high-power microwave (HPM), as a complement to kinetic kill concepts. These technologies' integration within the missile defense command-and-control architecture must receive funding as well.

Directed-energy weapons offer the potential of deep magazines, rapid reload, and low cost per shot to mitigate saturation. If directed-energy weapons were used to destroy threat missiles in the boost phase or early in midcourse, they could reduce the number of midcourse or terminal kinetic interceptors needed to destroy the adversary's remaining missiles. This could increase the likelihood of successfully countering the threat and would also complicate the enemy's attack calculus by creating uncertainty. The military services and the Office of the Under Secretary of Defense for Research and Engineering (OUSD[R&E]) are moving to rapidly develop and deploy directed-energy capabilities to counter uncrewed aerial vehicle (UAV) and cruise missile threats against ships, aircraft, and bases. For example, the Army is now testing laser weapons in the 300-kilowatt range.

The DOD should leverage the rapid advances that have been occurring to develop and demonstrate the capability to defeat ballistic missile threats with directed-energy weapons. For missile defense missions, the need exists for megawatt-class capability, and investments should focus on reducing size and weight, increasing laser efficiency, and executing a robust lethality experimentation and analysis effort. Diode-pumped alkali laser (DPAL) technology, in particular, offers the potential to achieve megawatt capability in an air or space-based platform due to its shorter wavelength for a more focused beam and higher efficiencies. While DPAL technology is less mature than other solid-state concepts, investments in the technology should continue and play a part in the trade space for future high-power directed-energy concepts.

It is worth noting that the MDA and its predecessor organizations since the Reagan administration have explored airborne directed energy. The Airborne Laser (ABL), initiated under the US Air Force, then transferred to the MDA in 2002, and had several successful showings of beam control and atmospheric compensation alongside demonstrations of shootdowns of airborne and ballistic targets. However, the high operational costs and complexities, such as power generation and cooling, led to the program's cancelation in 2011. Concepts currently explored include higher efficiency and shorter wavelength lasers. This, along with the rapid advances in higher power, atmospheric compensation, and beam control, suggest that the timing is right to reinvest in directed energy as a complement to kinetic weapons for defeating large raids in a robust and cost-effective manner. An incremental approach to achieve this would begin with using lasers for sensing and midcourse tracking, working up to an ability to address shorter-range threats, such as UAVs, and spiraling successes into capabilities for longer-range threats such as ballistic missiles once the technology and concepts of operation (CONOPS) evolve. In 2024, the MDA stated that its current approach is to do just this, first focusing on using low-powered lasers for tracking and working toward higher-powered systems for intercepts.[370]

Additions for defense against hypersonic glide weapons

The DOD must robustly fund defense against hypersonic weapons. For terminal defense, Patriot has some capability as demonstrated in the war in Ukraine.[371] The SM-6 can also provide terminal defense capability against hypersonic glide weapons. The MDA has begun development of the GPI for defense against hypersonic weapons in the glide phase. According to the MDA's FY 2024 budget request, this capability will not field until the 2035 timeframe. Based on conversations with defense industry, the study author found that, although the actual schedule has funding limitations, the capability could accelerate to have an initial operational capability in the late 2020s timeframe.

In the FY 2024 NDAA, Congress mandated that GPI achieve initial operational capability by the end of 2029 and full operational capability by 2032. Given Russia's and China's rapid fielding of hypersonic weapons, the DOD should accelerate this deployment plan for GPI to the end of the 2020s. It will only be a matter of time before North Korea has a credible hypersonic weapon program. The GPI would ideally, by design, work in a layered defense fashion with SM-6 as a terminal backup capability deployed within a VLS at sea, in harbor, or on land. If GPI cannot be accelerated, then the MDA should consider assessing other options, such as leveraging existing systems and using them in new ways (like the Strategic Capabilities Office [SCO] approach), for a nearer-term capability for intercepting hypersonic weapons prior to the terminal phase.

369 "Science and Technology Issues of Early Intercept Ballistic Missile Defense Feasibility," Defense Science Board, September 2011, https://apps.dtic.mil/sti/citations/ADA552472.

370 Theresa Hitchens, "Missile Defense Agency Has New Hope for Airborne Lasers," *Breaking Defense*, June 17, 2024, https://breakingdefense.com/2024/06/missile-defense-agency-has-new-hope-for-airborne-lasers/.

371 Marc Santora, Eric Schmitt, and John Ismay, "Ukraine Claims It Shot Down Russia's Most Sophisticated Missile for First Time," *New York Times*, May 6, 2023, https://www.nytimes.com/2023/05/06/world/europe/ukraine-russia-war-patriot.html.

For future hypersonic defense, the MDA should consider extending the range of GPI by adding a larger booster not limited by the Aegis VLS size constraints (e.g., a new launcher). This would allow for a longer-range defense, longer engagement timelines, and additional layered defense options. Air-launched hypersonic defense weapons should also be studied and developed, if proven feasible and cost-effective. Of course, if feasible, airborne lasers should also become part of the option space for hypersonic defense.

Missile defeat

The 2022 MDR calls for interceptor-based approaches as part of comprehensive missile defeat. John Plumb, then the assistant secretary of defense for space policy, provided the following definition of missile defeat: "It is a full-spectrum approach to prevent and defeat adversary missiles in all domains and along all timelines through a mix of kinetic and non-kinetic capabilities such as passive defense and electronic warfare."[372] The details of missile defeat concepts are beyond this paper's scope, but it should be pursued as a complement to kinetic defense options.

Technology investments

This discussion would not be complete without emphasizing the need for the MDA to get back into the technology business. The MDA's technology budget has been dismal over the past four to five years (in FY 2024 MDA's science and technology budget was at a historical low, below 1 percent of its Total Obligational Authority [TOA]). Incremental improvements alone cannot defeat a rapidly evolving threat. A high-priority technology investment should begin proving out the discriminating space sensor concept on orbit and rapidly fielding the capability, per the SDA model. Getting back into the technology business means the MDA should pursue an SBI testbed demonstration, along with increased investments in directed energy, and more robust funding for advanced discrimination techniques, as well as technological investments in lighter-weight, lower-cost interceptors to make kinetic interceptor options more affordable.

Conclusion: Investment priorities

As suggested by this study, defeating a threat with surging capability and capacity requires a new strategy based on layering defenses along with significant changes to the missile defense architecture. The DOD should place an increased emphasis on robust and global sensing capability, integrated command-and-control, and layered interceptor architectures that expand the battlespace, enabling flexible firing doctrines such as "shoot-assess-shoot" and enlarging defended areas. The DOD must also begin placing heavier emphasis on investing in future, revolutionary capabilities, such as space

372 Plumb, "Missile Defense in an Era of Strategic Competition."

Naval Mobile Construction Battalion 133 tests two containerized SM-6 missile launchers in Ronne, Denmark, September 20, 2023. Source: Andrew Waters/Naval Mobile Construction Battalion 133.

sensors, SBI, and non-kinetic options, to outpace adversary capability development.

The recommendations listed are a "menu" of options for the incoming administration to deliberate, bearing in mind funding considerations. While fully pricing out the recommendations is beyond this study's scope, the MDA would require a significant increase in funding to field these capabilities in the timeframes described above. Increasing the percentage of the defense budget devoted to homeland defense from the current one-third of one percent to a full one percent would certainly go a long way to accomplishing these goals.

- To address the rapidly evolving threat, priority should be placed on space-based tracking and discriminating sensors (HBTSS follow-on and DSS), investing in an SBI test bed, and funding the SM-3 IIA underlayer as quickly as possible.
- The MDA must also invest robustly in measures to protect the C2BMC, sensors and interceptors against potential cyber, EW and EMP threats. The development of GPI must accelerate as directed by Congress.
- If North Korean ICBM capacity projections warrant it, a third interceptor site on the East Coast and additional NGI purchases beyond the initial planned twenty should be pursued.
- After that, other options in the menu should be considered to strengthen ballistic missile defenses based on further study. All these options must be assessed in detailed engineering trade studies to determine the cost/performance trades and system-level benefits compared to other architecture options.

"Breaking the glass"

Homeland defense emergency option for improving defenses by 2030

Given the accelerating pace of air and missile threats of all types to the US homeland, allies, and deployed forces, it is worth exploring gap-filler options with adaptable capabilities in the next five years or less. The United States should consider a serious, concentrated effort to integrate existing air and missile defense assets (including missile defeat) to better utilize what already exists to protect the US homeland and critical infrastructure. The result would be a fully integrated air and missile defense and defeat architecture with significant capacity and resilience by 2030, with two-year incremental capability improvements after that. The initial organizing principle should be "any sensor and any shooter that can be used against any air and missile threats," integrating all systems together into a "system of systems" with a mosaic (or kill web) approach. The DOD's JADC2 effort could serve as a starting point for an overarching survivable and resilient network that enables this integration work. This effort would knit together existing RF and IR sensors, interceptors, and non-kinetic effectors to more efficiently use what already exists or is in development. This work would need implementation outside the usual DOD requirements and acquisition process and focus on rapid prototyping and fielding over the five-year period, with warfighter involvement from the start.

Congress has noted this need. The Senate's FY 2025 NDAA language directed the DOD to create a holistic "system of systems" Joint IAMD Command-and-control architecture to protect the US homeland against limited strikes on critical infrastructure and other important targets.

Section ten: Cruise missile defense of the homeland

Non-nuclear strategic attack

Notwithstanding the shortfalls in ballistic missile defense and the still-emergent hypersonic defense needs, one of the most under-resourced areas of US homeland missile defense has been that which could defend against long-range cruise missile and aerial attacks. Despite receiving some attention in recent years, meaningful cruise missile defense capability for the homeland is far from being realized.

One principal challenge for cruise missile defense has been at the conceptual level. Air and cruise missile threats to the homeland have, to a large degree, been seen as a lesser included threat to the larger problem of nuclear deterrence from major powers. In the past, cruise missiles were largely the province of major military powers. While aerodynamics was not especially challenging, other requirements, such as over-the-horizon guidance and reliability, previously impeded cruise missile proliferation.

The perceived salience of the cruise missile threat has now begun to change. Even Iran has demonstrated significant long-range cruise missile capability in its April 14, 2024 attack on Israel, even if most of those missiles were eliminated before they could reach their targets. The garden variety subsonic cruise missile is now one of the most frequent threats to Ukraine from Russia.

Recognition in the policy world has been slow in coming for what should have been a more prominent part of the missile defense discussion, but not for lack of warning from senior military officials. In 2015, Adm. James Winnefeld, then-vice chairman of the Joint Chiefs of Staff, remarked, "You might ask, if we choose to not invest the enormous resources that would be required to defend against a massive Russian ICBM attack coming over the North Pole, then why on earth would we care about cruise missile defense in the homeland?"[373]

He did so by emphasizing that, in his view, the need for cruise missile defense was becoming even more important than regional ballistic missile defense. That comment was especially notable, inasmuch as the Obama administration had conspicuously prioritized regional ballistic missile defense just five years earlier, in its 2010 BMDR.[374]

The answer to the question posed by Winnefeld—why defend against cruise missiles, if not ICBMs—lies in a recognition of the problem of non-nuclear strategic attack. It was not always so, however. The cancellation of the Nike missile programs in the 1960s had a certain logic: if the United States was not going to defend against nuclear-armed ICBMs from the Soviet Union, why would it make sense to defend against nuclear-armed bombers? The difference relative to today, however, is the appearance of non-nuclear aerial threats of various kinds. The decline of air defenses across the continental United States was felt on September 11, 2001.

The proliferation of reliable, precision-guided aerial threats—from UAVs to cruise missiles of various kinds—has changed the threat calculus. To consider how an adversary might use such threats against the United States, one need only consider how frequently the United States first reaches for cruise missiles in regional conflicts. Whether with the Trump administration sending fifty-nine Tomahawks into Syria to punish Bashar Al Assad, or the Biden administration doing the same to Houthis in Yemen after months of attacks, the low-flying, reliable, and accurate cruise missile is frequently the missile of choice.

The likely targets in the US homeland for such threats arguably include command-and-control, power generation, and military forces themselves. In 2019, Gen. Terrence J. O'Shaughnessy, then-commander of USNORTHCOM and NORAD, noted that Russia "has only recently developed and deployed capabilities to threaten us below the nuclear threshold … and its new generation of air- and sea-launched cruise missiles feature significantly greater standoff ranges and accuracy than their predecessors, allowing them to strike North America from well outside NORAD radar coverage."[375]

His successor, VanHerck, similarly described how Russia and China might employ these "below the nuclear threshold" capabilities to constrain US options and "limit [the] decision space for our senior leaders by holding national critical infrastructure at risk, disrupting and delaying our ability to project power from the homeland, and undermining our will to intervene in a regional crisis."[376]

373 Adm. James A. Winnefeld, Jr., "Missile Defense and US National Security" (speech presented by Admiral Winnefeld as vice chairman of the Joint Chiefs of Staff, May 19, 2015) Center for Strategic and International Studies, https://www.csis.org/events/missile-defense-and-us-national-security.

374 US Department of Defense, *2010 Ballistic Missile Defense Review*.

375 "Statement of General Terrence J. O'Shaughnessy, United States Air Force, Commander, United States Northern Command and North American Aerospace Defense Command," US House Armed Services Committee, 116th Cong. (February 26, 2019), 3, 6, https://www.armed-services.senate.gov/imo/media/doc/OShaughnessy_02-26-19.pdf.

376 "Statement of General Glen D. VanHerck, United States Air Force, Commander, United States Northern Command and North American Aerospace Defense Command," US House Armed Service Committee, 117th Cong. (March 8, 2022), 3, https://www.congress.

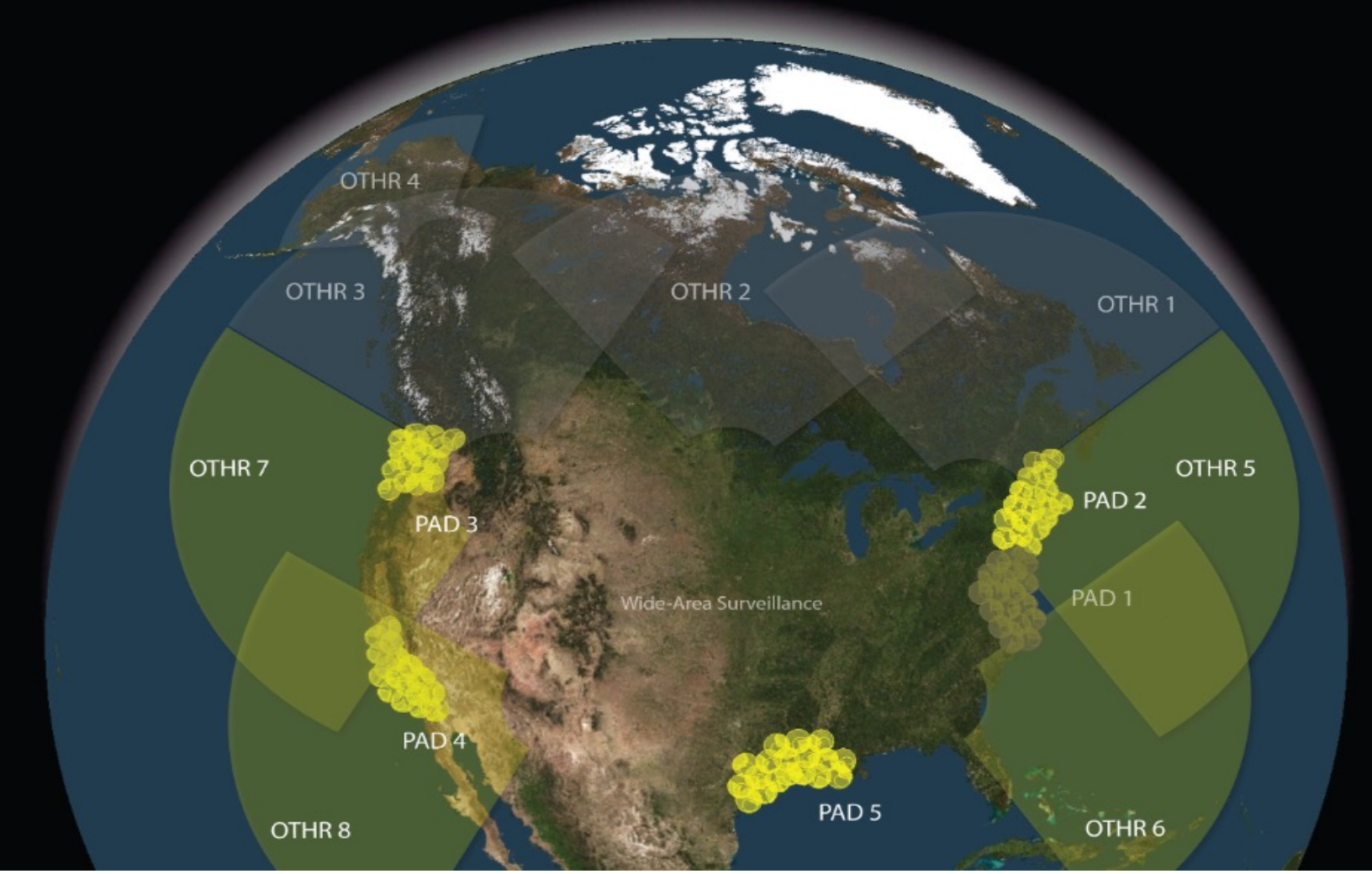


Figure 5: Conception of Homeland Cruise Missile Defense. Source: Center for Strategic and International Studies. PAD = Prioritized area defenses (includes medium-range surface-to-air interceptors and a second interceptor layer with Aegis-type interceptors, linked to sensor towers and other available sensors). OTHR = Over the horizon radar.

In particular, Russia possesses ALCMs with an "extended range that enables Russian bombers flying well outside NORAD radar coverage—and in some cases from inside Russian airspace—to threaten targets throughout North America."[377]

The specter of holding at risk conventional power projection stands as a major threat to the ability of the United States to service its broad deterrence and defense goals short of nuclear employment. An adversary may well and reasonably calculate that, even in the absence of an NFU policy pledge, the United States is unlikely to escalate first with nuclear weapons. A non-nuclear strategic attack targeting only US military forces, or the means to project them, could reasonably be seen as an action beneath the nuclear threshold. The 2023 Strategic Posture Commission, by referencing the challenge of "coercive" missile threats, appears to have adopted at least part of this concept.[378]

The near-total lack of cruise missile defense for the homeland (CMD-H) presents a deterrence problem. US adversaries may wish to employ a blunting strategy, or a strategy of deterrence by denial, so as to thwart the United States being even able to project power globally in aid of, say, an ally in the Indo-Pacific. The multi-billion-dollar effort to defend the military forces on Guam—itself both US territory and the home of forward operating bases—has been a microcosm of the problem. The long-term efforts to pursue what US Indo-Pacific Command (USINDOPACOM) calls the 360-degree defense for Guam has certainly included significant attention to cruise missile and aerial threats—the "360-degree" phrase is a specific reference to the sort of complex, multi-azimuth attack structure for which cruise missiles are perhaps best suited.

These threat developments and the specter of non-nuclear strategic attacks reverse the priority of defenses. The sort of aerial and cruise missile threats that have previously been regarded as "regional problems" have now become a homeland problem as well. As others have noted, North America is a region, too.[379]

gov/117/meeting/house/114486/witnesses/HHRG-117-AS00-Wstate-VanHerckG-20220308.pdf.

377 US House Armed Service Committee, "Statement of General Glen D. VanHerck," (March 8, 2022), 6.

378 Creedon et al., *America's Strategic Posture*, 66.

379 Karako et al, *North America is a Region, Too: An Integrated, Phased, and Affordable Approach to Air and Missile Defense for the Homeland*, Center for Strategic and International Studies, 2022, https://www.csis.org/analysis/north-america-region-too.

A renaissance for air defense

Another challenge for cruise missile defense is the perception that it is hopelessly expensive and difficult. As regions for missile defense go, North America is not a small one. How is it possible to defend everything from threats that are by nature unpredictable in their flight path and trajectory?

The answer is that it is not. Wisdom begins with recognizing that the United States cannot defend everything, and indeed it does not have to. Unlike the threat of nuclear blackmail, the logic of a non-nuclear strategic attack suggests high-value military or economic targets an adversary would hold at risk or incapacitate—not everything of value in the country. Attempting to defend everything is self-defeating, spreading defenses thin instead of prioritizing a thicker defense for certain key areas and assets.

Nevertheless, the approach to defending every acre of North America has been the approach of some in the past. The Congressional Budget Office's 2021 report, *National Cruise Missile Defense: Issues and Alternatives,* took such an approach.[380] As a result, its recommended architectures were prohibitively expensive, ranging between $77 billion and $466 billion (in 2021 dollars).

The necessary alternative is to adopt a policy of preferential defense, if not for specific points, then for broad areas. Winnefeld further noted in 2015, "We probably can't protect the entire country from cruise missiles, without breaking the bank, but there are important areas in this country that we need to make sure are defended from that kind of an attack."[381] By contrast to the GAO study, a 2022 report found that robust defense of five large prioritized areas might cost approximately $32 billion (in 2023 dollars) to acquire, operate, and sustain over 20 years.

As seen in Ukraine, air defense against cruise missiles is as eminently a soluble problem as it is urgent. The possibility of defense of critical areas depends, however, on a much different architecture and capabilities than that of homeland ballistic missile defense. Just as the characteristics of ICBMs—long-range, exo-atmospheric flight, and a predictable trajectory—dictate the shape of defense design, so too, the characteristics of cruise missiles dictate a different design altogether. Cruise missile defense is a species of air defense. The need to detect, control, and engage are similar, but the nature and location of the sensors and the interceptors are quite different.

To be sure, the 2019 MDR highlighted the rise of near-peer cruise missiles and other threats and directed senior defense officials to name an organization for cruise missile defense acquisition authority. Despite years of studies by NORAD/USNORTHCOM and the MDA, the pace of implementation has been glacial. That designation was finally made in July 2022, when Deputy Secretary of Defense Kathleen Hicks named the Air Force as executive agent for CMD-H.[382]

Since then, the Air Force has conducted several studies and analyses of alternatives. Initial efforts toward long-range OTHRs showed initial promise, but the US Air Force has recently slowed their procurement and could be reevaluating the concept altogether.[383] The benefit of OTHRs is significant, however, and the benefit of long-lead early warning time of incoming noncooperative aerial threats should not be underestimated. Additional sensors will also be required closer in, to complete the fire-control loop, whether they be ground- or tower-based radars, or other advanced forms of passive sensors. Ukraine has deployed a national acoustic sensor network to listen for the distinctive sound of Iranian Shahed cruise missiles. Similar area-wide surveillance will be necessary for the defense of North America as well.

In terms of effectors, the Ukraine conflict has also shown what works. The Army's Patriot family and the ground-launched AIM-120s for the National Advanced Surface-to-Air Missile System (NASAMS) are both capable of cruise missile defense. The Army's IFPC Enduring Shield launcher, carrying ground-launched AIM-9Xs and soon to have a second missile optimized for supersonic cruise missiles, is also quite relevant to this threat set.[384]

The centrality of cruise missile threats

As Iran's April 14, 2024 attacks on Israel showed, the present and future of missile threats will be one of complex and structured attacks. Within the missile threat spectrum, cruise missiles lie at the center, between UAVs and more complex hypersonic flight.

Despite numerous warnings from military officials and combatant commanders over the years and despite the numerous, ongoing examples of real-world employment against the homelands of Ukraine and Israel, the movement on cruise missile defense for the US homeland has been anemic. Its prioritization is necessary for the defense of Guam, but also for the defense of North America. Near-term needs to realize

380 David Arthur and Michael Bennett, *National Cruise Missile Defense: Issues and Alternatives*, Congressional Budget Office, 2021, 3. https://www.cbo.gov/system/files/2021-02/56950-CMD.pdf.

381 Winnefeld, Jr., "Missile Defense and National Security."

382 Jason Sherman, "Hicks Breaks Bureaucratic Logjam, Taps Air Force to Lead Homeland Cruise Missile Defense," *Inside Defense*, August 1, 2022, https://insidedefense.com/insider/free-story-hicks-taps-air-force-lead-homeland-cmd.

383 Jason Sherman, "DOD Eyes 2028 Completion for New OTHR in Construction Solicitation, a One-Year Delay," *Inside Defense*, August 23, 2023, https://insidedefense.com/daily-news/dod-eyes-2028-completion-new-othr-construction-solicitation-one-year-delay.

384 Jason Sherman, "Air Force, Army Readying FY-26 New-Start Proposal: Domestic Cruise Missile Defense Capability," *Inside Defense*, April 15, 2024, https://insidedefense.com/daily-news/air-force-army-readying-fy-26-new-start-proposal-domestic-cruise-missile-defense.

sensor coverage for domain awareness are of high priority, but these must be followed by the fielding of ground-based air defenses to significantly improve the coverage of the National Capital Region and other critical areas. The threat gets a vote, and it has voted. Cruise missile and aerial defense capabilities will represent a critical component of any homeland missile defense architecture.

Section eleven: Russian and Chinese strategic missile defense: doctrine, capabilities, and development

Introduction

When considering the future of US homeland missile defense, it is essential to understand the development of Russian and Chinese air and missile defenses which Moscow and Beijing could use to defend their respective homelands. This is true for three reasons. First, Russia's and China's extensive development of homeland missile defenses gives lie, to an extent, to their contention that US missile defenses are uniquely destabilizing. Second, numerically extensive Russian and Chinese missile defenses could alter the strategic-forces balance with the United States if not accounted for in US strategic forces policy. And finally, Russian and Chinese missile defenses could require qualitative improvements in US strategic forces to penetrate these defenses. (While important, this third factor is beyond the scope of this study.)

A primary point of contention in the homeland missile defense debate has been the reaction of the United States' main nuclear-armed strategic rivals, Russia and China. Critics have argued that US defenses against ICBMs and SLBMs could generate arms races or engender fears of a US preemptive first strike.[385] Russian and Chinese officials have complained that US ballistic missile defenses undermine the efficacy of their states' nuclear deterrents and therefore their security.[386]

The report argues that Russian and Chinese behavior, including the buildup of their strategic missile defenses, is a more important data point than these statements. Russia and China are hard at work developing their own strategic missile defense systems. There is a need for a better understanding of both countries' missile defense programs, to fully appreciate the strategic consequences.[387]

This section examines for each—Russia and China—the history, doctrine, and current and developmental capabilities of these states' strategic missile defenses. The section compares the missile defense architectures of the United States with both of its competitors, it then assesses the operational use cases of these defenses and their implications for strategic balance. The section concludes that these missile defenses complicate US conventional and limited nuclear operations—the same outcome which the United States could impose through enhanced US homeland missile defenses.

Russia

Strategic missile defense history and contemporary doctrine

The defense of the homeland against strategic air and missile attack has featured heavily in Russian military planning and doctrine since the early Cold War. This focus likely emerged from the experience of German mass air attacks in World War II, then continued into the twenty-first century due to a perceived US advantage in the air and space domains.[388] During the 1950s and 1960s, the USSR sought to defend its airspace against US strategic bombers by deploying hundreds of surface-to-air (SAM) missile batteries. Later, with the advent of ICBMs, the USSR developed a missile defense system around Moscow. The Soviet Union's primary goals for strategic defenses were to protect party leadership, prevent a decapitation of nuclear command-and-control, and limit damage in a strategic exchange.[389] It also likely saw a need to compete with the United States for technological reputational advantage, especially after the highly public announcement by the Reagan administration of the SDI in 1983.[390]

Since 1991, after observing US air campaigns, Russian doctrine has emphasized defense against complex air and space threats, especially a massed aircraft and missile attack by the United States and NATO that would incapacitate Russian military and

385 Leah Matchett, "Debating Missile Defense: Tracking the Congressional Record," Arms Control Association, March 2021, https://www.armscontrol.org/act/2021-03/features/debating-missile-defense-tracking-congressional-record.

386 For a Russian view see: "Deputy Foreign Minister Sergey Ryabkov's Opening Remarks at a Briefing at the Rossiya Segodnya International Information Agency on Arms Control and Strategic Stability," Ministry of Foreign Affairs of the Russian Federation, February 11, 2021, https://www.mid.ru/en/foreign_policy/news/1415641. For Chinese responses see: Jing-dong Yuan, "Chinese Responses to US Missile Defenses: Implications for Arms Control and Regional Security," *Nonproliferation Review*, Spring 2023, https://www.nonproliferation.org/wp-content/uploads/npr/101yuan.pdf.

387 One excellent recent treatment of the issue is conjoined papers in Tong Zhao and Dmitry Stefanovich, *Missile Defense and the Strategic Relationship among the United States, Russia, and China* (Cambridge, MA: American Academy of Arts and Sciences, 2023).

388 Victor Gobarev, "The Early Development of Russia's Ballistic Missile Defense System," *Journal of Slavic Military Studies* 14, no. 2 (2001): 29–48, https://doi.org/10.1080/13518040108430478.

389 Sayre Stevens, "Ballistic Missile Defense in the Soviet Union," *Current History* 84, no. 504 (1985): 313–316, https://doi.org/10.1525/curh.1985.84.504.313.

390 Stevens, "Ballistic Missile Defense in the Soviet Union."

civilian leadership.[391] To integrate air and space capabilities, then-Russian President Dimitry Medvedev created the Aerospace Defense Forces in 2011, which was ultimately merged with the Russian Air Force in 2015 to form the Russian Aerospace Forces (VKS).

Moscow's thinking on missile defense prioritizes protecting Russian leadership, critical command-and-control, and nuclear forces, with ballistic missile defense capabilities being a critical component. In the Russian Defense Ministry journal *Military Thought*, Mikhail Kumakshev and Aleksandr Kravtsov write: "The main direction of further development of the missile defenses of the Russian Federation is the creation of a layered system covering not only the high levels of leadership, but also the positions of the strategic nuclear forces."[392] Furthermore, the Russian Ministry of Defense has officially stated that:

> The main purpose of the missile defense system is to deter threats of use of missile weapons against Russia and to ensure the protection of state and military facilities, groups of troops, administrative and industrial centers, environmentally hazardous facilities and the civilian population from missile attacks.[393]

Within this expansive definition, the relative priority is on civil-military leadership. Furthermore, the DOD assesses that "Russia is developing a layered missile defense to enhance its anti-access/area denial capabilities, preserve its nuclear deterrent, and ensure regime survival."[394] Defending political leadership and nuclear forces from US and NATO strikes are clearly the primary roles for missile defenses, and missile defenses could also help Russia defend against possible future

391 Michael Kofman et al., *Russian Military Strategy: Core Tenets and Operational Concepts*, Center for Naval Analyses, August 2021, 56, https://www.cna.org/CNA_files/pdf/Russian-Military-Strategy-Core-Tenets-and-Operational-Concepts.pdf.

392 Mikhail N. Kumakshev and Aleksandr V. Kravtsov, "ПРОТИВОРАКЕТНАЯ ОБОРОНА КАК СОСТАВЛЯЮЩАЯ СИСТЕМЫ СТРАТЕГИЧЕСКОГО СДЕРЖИВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ" [Missile defense as a component of the strategic deterrent of the Russian Federation], Военное Мысль [Military Thought] 12 (December 2021): 21–26.

393 *Soviet Military Power 1990*, US Department of Defense, 1990, 56–59, https://apps.dtic.mil/sti/tr/pdf/ADA229299.pdf , cited in: Peppino DeBiaso, "Russia and Missile Defense: Toward an Integrated Approach," National Institute for Public Policy Information Series, No. 512 (2022): 4, https://nipp.org/information_series/peppino-debiaso-russia-and-missile-defense-toward-an-integrated-approach-no-512-january-18-2022/.

394 US Department of Defense, "Chinese and Russian Missile Defense: Strategies and Capabilities."

A Russian S-300 air defense system at the 2009 Moscow Victory Day Parade rehearsal, Red Square, April 28, 2009. Source: Vitaly V. Kuzmin.

contingencies involving Iran, China, North Korea, or even non-state actors.[395]

The Soviet Union's ballistic missile defense development began with the experimental "System A," developed and tested between 1957 and 1961.[396] The System A experiments led to the deployment of the Soviet Union's first early warning radar network and influenced the decision to develop the A-35 ABM system designed to protect Moscow. The A-35 system became operational fitfully, with various phases completed between 1967 and 1972; however, ultimately, it did not live up to the expectations of Soviet leaders, perhaps influencing Moscow's decision to sign the 1972 ABM Treaty.[397]

In 1989, the A-35 system was upgraded and replaced with the A-135 system, which was based around the Don-2N radar; sixty-eight short-range, endo-atmospheric 53T6 "Gazelle" interceptors; and sixteen 51T6 "Gorgon" long-range, exo-atmospheric interceptors, both armed with nuclear warheads.[398] These warheads were likely enhanced-radiation weapons, or neutron bombs, designed to use the radiation from their detonations to cause nearby incoming warheads to undergo partial fission and fail to detonate. In 1985, before the deployment of the A-135 system, Soviet official Vitalii Leonidovich Kataev described its capability as providing protection from "1–2 modern ICBMs and up to 35 Pershing 2-type intermediate-range missiles."[399] Kataev also described a planned A-235 follow-on system, which would be effective against eight to twelve ICBMs. The use of enhanced-radiation weapons for ballistic missile defense suggests that this system was primarily for the protection of military and political leadership in the city's center, given that these systems' detonations could spread dangerous radiation across much of the countryside and outskirts of Moscow itself.[400]

In the 1980s, concerned about increasingly accurate US ICBMs and intermediate-range weapons, the Soviet Union

395 Jana Honkova, *Current Developments in Russia's Ballistic Missile Defense*, George C. Marshall Institute, April 2013, https://web.archive.org/web/20140426201121/http://missilethreat.wpengine.netdna-cdn.com/wp-content/uploads/2013/04/Russian-BMD-April-13.pdf.

396 Gobarev, "The Early Development of Russia's Ballistic Missile Defense System," 33.

397 Gobarev, "The Early Development of Russia's Ballistic Missile Defense System," 33.

398 Honkova, *Current Developments in Russia's Ballistic Missile Defense*.

399 Pavel Podvig, "Very Modest Expectations: Performance of Moscow Missile Defense," *Russian Strategic Nuclear Forces* (blog), October 23, 2012, https://russianforces.org/blog/2012/10/very_modest_expectations_sovie.shtml.

400 Jim Garamone, "Missile Defense Becomes Part of Great Power Competition," DOD News, July 28, 2020, https://www.defense.gov/News/News-Stories/Article/Article/2291331/missile-defense-becomes-part-of-great-power-competition.

The Russian Don-2N radar conducting training with combat crews of the missile defense system of the 9th Anti-missile Defense Division near Moscow, January 24, 2018. Source: Mil.ru.

also experimented with terminal defenses to increase missile silo survivability. These terminal defenses involved launching a canister of metal balls or rods above the silos to disrupt an incoming RV.[401] These projects, alternatively referred to as "Sambo," "Mozyr," or "Active Defense Complex," ended shortly after the fall of the Soviet Union in 1991, but the Russian government may be considering development of a similar capability.[402] In the 1980s and 1990s, Moscow also continued to upgrade its national SAM network, including deploying the S-300 (SA-10) air defense system, with some early versions having limited terminal defense capabilities against MRBMs.[403] Moscow's approach to building missile defenses evinces a tendency to deploy systems with initially limited capabilities that could be upgraded over time or abandoned if progress proved unfeasible.[404] As discussed below, this pattern appears to continue, either by design or due to limitations of Russian defense industry.

Current capabilities and future development

Today, Russia deploys several systems that can provide layered missile defense across its territory. The A-135 system deployed around Moscow is currently Russia's only system specifically designed to defend against ICBMs. The system has at its center the Don-2N radar, which receives data from Russia's wider early warning system and provides targeting data for the sixty-eight silo-based 53T6 "Gazelle" endo-atmospheric interceptors, emplaced at five sites around Moscow.[405] As noted previously, the system originally had both endo- and exo-atmospheric interceptors; however, the sixteen 51T6 "Gorgon" exo-atmospheric interceptors were retired between 2006 and 2007.[406] The Gazelle interceptors were, until recently, equipped exclusively with nuclear warheads.

According to interviews with current and retired high-ranking Russian missile defenders, Russia is embarking on an overhaul of the entire A-135 system.[407] This redesigned system has been referred to as A-235 and, while it is unclear if this structure is still reflective of current Russian planning, it was described as including a long-, medium-and short-range interceptor.[408]

If the range reported for these interceptors is to be believed, then they could provide some capability to defend the Russian ICBM sites of the 28th Rocket Division headquartered in Kozelsk and the 54th Rocket Division in Teykovo (some 200 km southwest and northeast of Moscow, respectively).[409]

Russia is reportedly developing the long-range exo-atmospheric midcourse defense component of the A-235 system, which will succeed the 51T6.[410] While it is unclear what systems will specifically fill that role, the PL-19 "Nudol" direct-ascent ASAT weapon, which Russia tested in November of 2021, may become the basis of the eventual interceptor.[411] In the 2021 test, the Nudol impacted a defunct Soviet satellite at an altitude of around 480 km, placing it within the range described for the A-235 exo-atmospheric interceptor.[412] There is also evidence of a program for a midcourse interceptor referred to as "Aerostat," being developed by the same company, Almaz-Antey, but with a different subcontractor than the Nudol.[413]

The other recent development in Russian missile defenses is the first deployment of the S-500 missile systemin 2021 to defend the Moscow area.[414] The S-500 is Russia's latest mobile air and missile defense system, and is designed to target

401 "ОКР Мозырь/Изделие 171/Камчатская ПРО" [R&D Mozyr/Product 171/Kamchatka missile defense], Military Russia, November 15, 2011, http://militaryrussia.ru/blog/topic-604.html; BDM Federal Inc., "Soviet Intentions 1965–1985 Volume II: Soviet Post-Cold War Testimonial Evidence," National Security Archive, eds. John G. Hines, Ellis M. Mishulovich, and John F. Shull, George Washington University, September 22, 1995, accessed August 4, 2023, https://nsarchive2.gwu.edu/nukevault/ebb285/vol%20II%20Kalashnikov.PDF.

402 Alexey Mikhailov and Dmitry Balburov, "Последний рубеж ПРО вооружат стрелами и шариками" [The last line of BMD will be armed with arrows and pellets], *Izvestia*, December 11, 2012, https://iz.ru/news/541076.

403 DeBiaso, "Russia and Missile Defense."

404 Stevens, "Ballistic Missile Defense in the Soviet Union."

405 Sean O'Connor, *Russian/Soviet Anti-Ballistic Missile Systems*, *Air Power Australia*, December 12, 2009, updated April 2012, https://ausairpower.net/APA-Rus-ABM-Systems.html#mozTocId700952.

406 Honkova, *Current Developments in Russia's Ballistic Missile Defense*.

407 Vadim Matveyev, "New Missile Defences Being Developed," *Russia Beyond*, February 3, 2016, https://www.rbth.com/economics/defence/2016/02/03/new-missile-defences-being-developed_564505.

408 Matveyev, "New Missile Defences Being Developed."

409 Kristensen and Korda, "Russian Nuclear Weapons 2022."

410 Garamone, "Missile Defense Becomes Part of Great Power Competition."

411 Ankit Panda, "Russia Conducts New Test of 'Nudol' Anti-Satellite System," *The Diplomat*, April 2, 2018, https://thediplomat.com/2018/04/russia-conducts-new-test-of-nudol-anti-satellite-system/.

412 Ankit Panda, "The Dangerous Fallout of Russia's Anti-Satellite Missile Test," Carnegie Endowment for International Peace, November 17, 2021, https://carnegieendowment.org/2021/11/17/dangerous-fallout-of-russia-s-anti-satellite-missile-test-pub-85804.

413 Bart Hendrickx, "Aerostat: A Russian Long-Range Anti-Ballistic Missile System with Possible Counterspace Capabilities," *Space Review*, October 11, 2021, https://www.thespacereview.com/article/4262/1.

414 "First Regiment of S-500 Air Defense Systems to Defend Moscow—Source," *TASS*, October 12, 2021, https://tass.com/defense/1348691.

IRBMs, early warning aircraft, and satellites in low-Earth orbit.[415] In February 2024, the Russian Ministry of Defense announced a successful test of the weapon against an ICBM-representative hypersonic target.[416] The system was previously tested at a range of 481 km and has a claimed flight ceiling of 100–200 km, which may indicate that it fills the medium-range role envisioned for the A-235 project.[417] As currently deployed, it will complement the A-135 system and, in the future, could provide regional terminal ICBM defense across Russia or form the basis of a future sea-based missile defense capability.[418] The S-500 is designed to use the new 77N6 family of interceptors that likely have a kinetic energy hit-to-kill warhead, which is more effective against ballistic missile targets than the blast-fragmentation warheads of interceptors used by the S-400 and S-300s.[419] However, the first operational version of the S-500 reportedly has reduced capabilities, and the further ten units which were slated for production in 2022 have not yet been delivered.[420]

Members of the Russian defense industry are already discussing a planned upgrade, the S-550, which will be solely optimized for missile defense and be more capable against ICBMs.[421] Despite setbacks to the S-500, there have been several proposals for a national mobile nonstrategic missile defense

415 Missile Threat, "S-500 Prometheus," Missile Defense Project, Center for Strategic and International Studies, last updated July 1, 2021, https://missilethreat.csis.org/defsys/s-500-prometheus/.

416 "ВС РФ протестировали С-500 на способность сбивать гиперзвуковые цели" [The Russian Armed Forces tested the S-500's ability to shoot down hypersonic targets], *Izvestia*, February 27, 2024, https://iz.ru/1656259/2024-02-27/vs-rf-protestirovali-s-500-na-sposobnost-sbivat-giperzvukovye-tceli.

417 Miko V. Vranic, "Russia Begins Series Production of S-500 Air-Defence System," Janes, April 27, 2022, https://www.janes.com/osint-insights/defence-news/weapons/russia-begins-series-production-of-s-500-air-defence-system.

418 Yuri Smityuk, "New-Generation Missile Destroyer under Development in Russia," TASS, October 21, 2014, https://web.archive.org/web/20141024041212/http://en.itar-tass.com/russia/755539.

419 Missile Threat, "S-500 Prometheus"; Zhao and Stefanovich, *Missile Defense*.

420 Maxim Starchak, "Where is Russia's S-500 air defense system?" *Defense News*, October 5, 2023, https://www.defensenews.com/industry/2023/10/05/where-is-russias-s-500-air-defense-system/.

421 "Источники Раскрыли Особенности Новой Зенитной Ракетной Системы С-550" [Sources Reveal Features of New Anti-Air Missile System], РИА Новости [RIA Novosti], November 13, 2021, https://ria.ru/20211113/s-550-1758871100.html.

A Chinese DF-21A transporter erector vehicle on display at the Beijing Military Museum, August 1, 2007. Source: Max Smith.

system composed of S-500s, S-400s, and S-300VMs to protect cities and industrial centers from regional missile attacks.[422] Another notable Russian strategic capability is "Peresvet," a mobile, high-powered laser system designed to blind imaging satellites in orbit. Peresvet's emplacements near mobile ICBM bases, such as the one at Teykovo, suggest that the Kremlin intends the system to inhibit the targeting of those missiles.[423] Peresvet could also potentially have uses preventing adversaries from tracking mobile ballistic missile defense systems, like the S-500.

Russia fields a number of systems, including the S-400 as well as the S-300 PMU-2 and S-300VM variants, that have some capability against MRBMs but are primarily designed to defend against airbreathing cruise missiles, aircraft, and SRBMs.[424] The VKS had an estimated 584 S-300 launchers of various types and over 248 S-400 launchers in inventory before the 2022 re-invasion of Ukraine.[425] Furthermore, the S-300F variant integrates into many Russian Navy surface combatants, with newer ships equipped with the "Redut" air defense system that shares the same 9M96E interceptors with fragmentation warheads as the S-400.[426]

Despite a mixed record in Ukraine and severe resource constraints due to sanctions, Russia is moving to develop more advanced missile defense systems and modernize existing ones. Key metrics for assessing Russian progress will be further development of a midcourse interceptor, confirmation of a hit-to-kill capability for the existing Moscow defense system, or wider deployment of the S-500.

China

Strategic missile defense history and contemporary doctrine

Despite only recently beginning to deploy missile defenses, China's interest in the technology dates to the 1960s. In 1964, Mao Zedong ordered the commencement of Project 640, an effort to develop the technology necessary for a ballistic missile defense system, including research into kinetic kill vehicles, high-powered lasers, as well as early warning and tracking radars.[427] This research may have been prompted by observation of US and Soviet missile defense developments, as well as a fear that the United States might consider a preemptive attack to eliminate China's nascent nuclear deterrent.[428] Early Chinese nuclear planners worried about the survivability of their forces and the credibility of their retaliatory capabilities, a theme that would persist into the twenty-first century.[429] Project 640, hampered by technological challenges and the upheaval of the Cultural Revolution, ultimately ended without deploying any operational systems.[430] However, the project laid the groundwork for future Chinese missile defense and ASAT capabilities.

The announcement of the SDI by Reagan in 1983 prompted renewed Chinese research into missile defense, and particularly space-based technology, under Project 863 launched by then-Chinese President Deng Xiaoping.[431] From this point, Chinese missile defense technology research occurred in parallel with its development of counterspace capabilities designed to neutralize systems like the SDI. In the mid-1990s, the Central Military Commission initiated a ten-year program to develop an indigenous missile defense capability, including interceptors and early warning satellites.[432]

Compared to sources on Russian missile defense, there is less public information on Chinese missile defense doctrine; however, inferences are possible. China has strong incentives to develop nonstrategic air and missile defenses to help defend its airspace from hostile attacks and allow it to project power into the Pacific. However, China's interest in strategic ballistic missile defense and its associated technologies likely stems from several related objectives. Bruce MacDonald and Charles Ferguson published a 2015 study, for which they interviewed Chinese experts and officials, proposing the following possible PRC rationales for developing ballistic missile defense:[433]

422 Zhao and Stefanovich, *Missile Defense*.

423 Bart Hendrickx, "Peresvet: A Russian Mobile Laser System to Dazzle Enemy Satellites," *Space Review*, June 15, 2020, https://www.thespacereview.com/article/3967/1.

424 Garamone, "Missile Defense Becomes Part of Great Power Competition."

425 International Institute for Strategic Studies, *The Military Balance* (London: Routledge, 2022), 201, https://www.iiss.org/publications/the-military-balance/the-military-balance-2022/.

426 Honkova, *Current Developments in Russia's Ballistic Missile Defense*.

427 Brad Roberts, *China and Ballistic Missile Defense: 1955 to 2002 and Beyond*, Institute for Defense Analyses, September 2003, https://nuke.fas.org/guide/china/doctrine/bmd.pdf.

428 William Burr and Jeffrey T. Richelson, "Whether to 'Strangle the Baby in the Cradle:' The United States and the Chinese Nuclear Program, 1960–64," *International Security* 25, no. 3 (Winter 2000/01), https://doi.org/10.1162/016228800560525.

429 Wu Riqiang, "No Stability without Limits on Missile Defense," *Bulletin of the Atomic Scientists*, September 24, 2014, https://thebulletin.org/roundtable_entry/no-stability-without-limits-on-missile-defense/.

430 Roberts, *China and Ballistic Missile Defense*.

431 Qiang Zhi and Margaret M. Pearson, "China's Hybrid Adaptive Bureaucracy: The Case of the 863 Program for Science and Technology," *Governance* 30, no. 3 (2017): 407–424, https://doi.org/10.1111/gove.12245.

432 Mark A. Stokes, "Chinese Ballistic Missile Forces in an Age of Global Missile Defense," Strategic Studies Institute, US Army War College, 2002, https://www.jstor.org/stable/pdf/resrep11959.8.pdf.

433 Bruce W. MacDonald and Charles D. Ferguson, *Understanding the Dragon Shield: Likelihood and Implications of Chinese Strategic Ballistic Missile Defense*, Federation of American Scientists, September 30, 2015, 43, https://uploads.fas.org/2015/09/Dra-

- Enhancing the progress of, and providing international legitimacy for, its ASAT weapons program.
- Providing limited defenses of key objects such as political leadership, command-and-control, and nuclear forces against preemptive attack by the United States and possibly Russia.
- Providing a more robust defense against Indian intermediate-range and ICBM-class missiles.
- Gaining further understanding of the nature and vulnerabilities of US BMD technology and operations.
- Demonstrating international technological achievement and competitiveness.

Over the past decades, China developed ASATs, including kinetic interceptors, to prevail in a possible conflict with the United States.[434] The technology for kinetic ASAT weapons overlaps significantly with strategic ballistic missile defense, as both capabilities involve intercepting high-speed objects at various altitudes outside the Earth's atmosphere.[435] Strategic ballistic missile defense development may be a natural offshoot of China's efforts to enhance its ASAT capability or capitalize on its research investments. However, Chinese and Russian destructive ASAT testing has drawn international condemnation and provided the United States an avenue to push for limitations and bans on such systems.[436] Therefore, ballistic missile defense may serve as a useful cover for tests of would-be ASAT systems. For example, in 2014, China conducted what it claimed was a missile intercept test; however, the US Department of State later assessed that it was intended as an ASAT test.[437] China's incentive to misrepresent makes it difficult to categorize claimed Chinese ballistic missile defense tests or determine whether systems in development are primarily intended for ballistic missile defense or ASAT roles.

China may also be interested in strategic ballistic missile defense as one solution to long-standing concerns about its resilience to a first strike by the United States or Russia and the growing sophistication of India's nuclear arsenal. While a defense against the United States or Russia would be very limited for the foreseeable future, China may view it as beneficial for complicating a possible strike on Beijing or its ICBM silos.[438] Chinese nuclear forces expert Tong Zhao has suggested that one explanation for the relatively dense arrangement of China's newly constructed ICBM silos could be to facilitate a possible area defense for those weapons.[439] Other possible targets to defend might include military command-and-control locations during an ongoing conflict or critical infrastructure, such as the Three Gorges Dam.[440]

China may wish to develop strategic ballistic missile defense as part of a broader technology development strategy beyond the immediate benefits of a ballistic missile defense capability. Given its outspoken concern over US missile defense capabilities on strategic stability and interest in defeating them, China may hope to gain a greater understanding of how to conduct ballistic missile defense operations and the limitations of the technology through its own research and development.[441] Chinese experts have argued that, as long-range strike missiles become increasingly sophisticated and proliferated, it is necessary for China to be competitive in all areas of advanced air and missile defense technology.[442] As such, achieving an ICBM midcourse intercept capability would be a strong signal of Chinese military technology parity with the United States.

Finally, Chinese development of the necessary sensor architecture for ballistic missile defense could complement its interest in the capability to adopt a launch-on-warning (LOW) nuclear posture.[443] The ability to detect and accurately characterize an incoming missile attack is a prerequisite of both a launch on warning (LOW) posture and a strategic BMD capability. As noted below, China is actively expanding its number of ground-based large, phased-array radars and has recently launched satellites for missile detection. In MacDonald and

gonShieldreport_FINAL.pdf.

434 US Department of Defense, *Military and Security Developments Involving the People's Republic of China:* (2023), 98–99.

435 Ashton B. Carter, "The Relationship of ASAT and BMD Systems," *Daedalus* 114, no. 2 (Spring 1985): 171–189, http://www.jstor.org/stable/20024984.

436 Heather Foye and Gabriela Rosa Hernández, "UN First Committee Calls for ASAT Test Ban," Arms Control Association, December 2022, https://www.armscontrol.org/act/2022-12/news/un-first-committee-calls-asat-test-ban.

437 Frank A. Rose, "Ballistic Missile Defense and Strategic Stability in East Asia," (remarks by Frank A. Rose as assistant secretary of the Bureau of Arms Control, Verification and Compliance to the Federation of American Scientists, February 20, 2015), US Department of State, https://2009-2017.state.gov/t/avc/rls/2015/237746.htm.

438 MacDonald and Ferguson, *Understanding the Dragon Shield*, 23–25.

439 Tong Zhao, "Managing the Impact of Missile Defense on US-China Strategic Stability," in Tong Zhao and Dmitry Stefanovich, *Missile Defense and the Strategic Relationship among the United States, Russia, and China* (Cambridge, MA: American Academy of Arts and Sciences, 2023), 11.

440 Wan Yung-Kui, "Can the Chinese Armed Forces Successfully Protect the Three-Gorges Dam?" *Hong Kong Tangai*, no. 31, October 15, 1993, 72–80, cited in Roberts, *China and Ballistic Missile Defense*.

441 MacDonald and Ferguson, *Understanding the Dragon Shield*, 23.

442 Z澎 [Chen Xiang], ㇀乏善 [Dong Liyong], and 赊护沈 [Yu Ningyu], "鼓耽ミヒê " 升督耻蔫见ы私禁朗彳您" [Analysis of the development trend of US military missile defense interceptor weapons], 耽榔娜水 [*Military Digest*], no. 23 (2020): 44–47. Cited in Zhao, "Managing the Impact."

443 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023), 112.

Ferguson's study, they noted that "a Chinese move to deploy early warning satellites would be a significant indicator of greater interest in BMD deployment."[444] If China does deploy strategic ballistic missile defense, it will be notable which PLA branch is responsible for its operation—the PLA Strategic Support Force, which is responsible for counterspace capabilities, or the PLAAF, which operates China's ground-based air defense.[445]

Current capabilities and future development

Since 2010, China has been actively developing a ground-based midcourse interceptor, with the first tests occurring in 2010, 2013, and 2014. While these early tests may have been primarily oriented around ASAT capabilities, China's latest interceptor, designated the Dong Neng-3 (DN-3), has undergone recent successful BMD tests in 2018, 2021, and 2023.[446] The DN-3 is a hit-to-kill interceptor that has been used to intercept a target DF-21 MRBM and has been compared to the US SM-3.[447] It has yet to be tested against an ICBM-class target, but the DOD assesses that the DN-3 will "form the upper-layer of a multi-tiered missile defense."[448] The DN-3 may be a variant of earlier Chinese ASAT weapons (sometimes referred to as DN-1 and DN-2).[449] China has also tested the HQ-19, a kinetic interceptor derived from the HQ-9, which has the capability to intercept ballistic missiles with a range of 3,000 km in their midcourse and terminal flight stage and has been called "roughly analogous to the US [THAAD] system."[450] The HQ-19 has not yet publicly been deployed and is presumed not to have the capability to defeat an ICBM-class target; however, it could possibly be adapted to do so.[451] Notably, China has also expressed interest in purchasing the S-500 system from Russia, which would likely be complementary to the HQ-19.[452] Furthermore, the PLAN is reportedly planning to develop the HQ-26, a midcourse interceptor designed to defend against IRBMs, to be installed on its Type 055 destroyers.[453]

China is moving quickly to develop various types of missile defense technology including strategic ballistic missile defense. The defining feature of its ballistic missile defense development, however, is its overlap with ASAT testing, an area which likely is a greater priority than missile defense.[454] One of the key enablers of China's progress is its ability to rely on Russian technology and expertise both in developing its interceptors and sensor architecture. While China has made large strides in exo-atmospheric interception with hit-to-kill technology, it still must develop a robust sensing and data processing system as well as trained personnel to create a true capability.

Implications and conclusion

Comparison with US capabilities

US ballistic missile defense capabilities remain more advanced than those of Russia or China. While both Russia and China are developing the capabilities for midcourse interception of ICBMs, only the United States deploys both the interceptors and sensors to achieve a degree of ballistic missile defense coverage over its entire territory in the form of the GMD system. Furthermore, only the United States maintains a sea-based midcourse defense and missile tracking capability through the Aegis BMD system. Both Russia and China, however, are actively pursuing parity. China is continuing tests for midcourse interception capability, and Russia has development plans for a similar system. Both countries also aim to match the US THAAD system with the Russian S-500 system and Chinese HQ-19 designed for high-altitude terminal defense. The United States, Russia, and China are also all carrying out programs to update their early warning and tracking capabilities. The United States is embarking on an ambitious plan to modernize its space-

444 MacDonald and Ferguson, *Understanding the Dragon Shield*, 4.

445 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023). After the writing of this report, the SSF was split into several constituent parts. The point stands.

446 "China says conducted mid-course missile interception test," AP, April 15, 2023, https://apnews.com/article/china-interceptor-missile-test-defense-c77ae53a43f5e74bc48c4be45e46af80.

447 Ankit Panda, "Revealed: The Details of China's Latest Hit-To-Kill Interceptor Test," *The Diplomat*, February 21, 2018, https://thediplomat.com/2018/02/revealed-the-details-of-chinas-latest-hit-to-kill-interceptor-test/.

448 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2023).

449 Jennifer DiMascio, "China May Have Operational ASAT Program, Reports Say," *Aviation Week*, March 31, 2020, https://aviationweek.com/shows-events/space-symposium/china-may-have-operational-asat-program-reports-say.

450 *Hearing on China's Nuclear Forces before the before the US-China Economic and Security Review Commission*, 117th Cong. (June 10, 2021) (testimony by Phillip C. Saunders, director Center for the Study of Chinese Military Affairs, Institute of National Strategic Studies, National Defense University), https://www.uscc.gov/sites/default/files/2021-06/Phillip_Saunders_Testimony.pdf.

451 Hans M. Kristensen, Matt Korda, and Eliana Johns, "Chinese Nuclear Weapons 2023," *Bulletin of the Atomic Scientists* 79, no. 2 (2023): 108–133, https://doi.org/10.1080/00963402.2023.2178713.

452 "India, China may be first buyers of Russia's latest S-500 air defense system," TASS, November 2, 2021, https://tass.com/defense/1356905.

453 Thomas Corbett and Peter W. Singer, "China's Big New Warship Is Missing an Important New Weapon," *Defense One*, January 23, 2023, https://www.defenseone.com/ideas/2023/01/chinas-big-new-warship-missing-important-new-weapon/382082/.

454 MacDonald and Ferguson, *Understanding the Dragon Shield*, 23.

based tracking for a wide variety of threats, such as HGVs.[455] Russia is also recapitalizing its space-based early warning satellites and ground-based radars but faces serious resource and sanction constraints. China is moving quickly to improve its early warning system but is still far from a comprehensive architecture.

The United States, unlike Russia and China, does not deploy significant ground-based defenses on its homeland territory, aside from the GMD system. Other than a THAAD deployment on Guam and cruise missile defense of the national capital area, the United States typically does not deploy terminal defenses near domestic military facilities or critical infrastructure.[456] In contrast, both Russia and China deploy a larger number and wider variety of ground-based area air and missile defense systems than the United States. Russia has deployed the S-400 and S-300 systems at military facilities, including those in Kaliningrad, Belarus, Crimea, and the Arctic Circle. China deploys several varieties of air and missile defense systems around Beijing and near military facilities, including basing the HQ-9 at its contested border with India and on artificial islands in the South China Sea.[457]

Strategic and operational use cases

Ground-based air defenses remain central to Russian and Chinese military thought. Unlike the United States, Russia and China have historically relied on SAMs for homeland defense. Russia and China have clear incentives to develop advanced nonstrategic air and missile defense systems such as the S-400 and HQ-9. These systems are primarily aimed at denying US, allied, and partner aircraft operations or cruise missile strikes on Russian or Chinese territory.[458] As the United States begins to develop longer-range conventional ballistic missiles over the next decade, such as the Precision Strike Missile, the ability of Russian and Chinese systems to defeat these threats will become increasingly operationally relevant. Furthermore, Russia and China likely view US conventional precision-strike capabilities as having strategic deterrence implications. The United States has previously signaled that it would consider responding to limited nuclear escalation with a massed conventional precision-strike campaign.[459] Russia and China may fear that, under various scenarios, US conventional munitions could target their political and military leadership, command-and-control systems, and/or nuclear forces.[460] Therefore, systems that might be referred to as nonstrategic or tactical could have strategic significance.

Russia and China share many motivations for developing strategic ballistic missile defense systems but emphasize different applications in their approach. Russia's A-135 system defense of Moscow likely has the primary goals of providing a degree of protection for political and military leadership in case of nuclear attack and also complicating US targeting of the Moscow region. However, once completed, the system's planned modernization could also provide a degree of defense for several Russian ICBM bases in the region. Furthermore, systems like Peresvet and the S-500 can serve as protection for mobile ICBMs. These capabilities coincide with the overarching program of nuclear modernization that Russia is undertaking to increase the survivability and effectiveness of its nuclear deterrent. China may also see a role for strategic ballistic missile defense in defending its strategic forces and political leadership. China's pursuit of the capability intertwines with its development of sophisticated ASAT capabilities. China may frequently label tests of ASATs as BMD efforts. Russia's Nudol system has also been referred to as both an ASAT and ballistic missile defense system. In fact, most exo-atmospheric missile defense systems are at least theoretically usable as ASAT weapons, although the reverse is not always true. This dual functionality likely makes these systems a more attractive investment for Russia and China.

Most troublingly, missile defenses could backstop Russian or Chinese limited nuclear or nonnuclear strategic aggression against the United States or its allies and partners. While this option is not discussed explicitly in Russian or Chinese doctrine, in a conflict, either country might consider using nuclear weapons in a limited manner to coerce war termination and rely on missile defenses to deny a proportionately limited US response. In this case, Russia or China would gamble that the United States would be unwilling to consider a response that would be guaranteed to overcome any missile defenses as doing so would require using a large enough number of

455 Masao Dahlgren and Tom Karako, *Getting on Track: Space and Airborne Sensors for Hypersonic Missile Defense*, Center for Strategic and International Studies, December 18, 2023, https://www.csis.org/analysis/getting-track-space-and-airborne-sensors-hypersonic-missile-defense.

456 Trevor Wild, "THAAD Battery in Guam Successfully Completes Table VIII Evaluation," US Army, March 21, 2024, https://www.army.mil/article/274693/thaad_battery_in_guam_successfully_completes_table_viii_evaluation.

457 Jenevieve Molenda, "Chinese HQ-9 SAMs No Longer Visible on Woody Island," CSIS, June 11, 2018, https://missilethreat.csis.org/chinese-hq-9-sams-no-longer-visible-on-woody-island.

458 Kofman et al., *Russian Military Strategy*.

459 Edward Helmore, "Petraeus: US Would Destroy Russia's Troops if Putin Uses Nuclear Weapons in Ukraine," *Guardian*, October 2, 2022, https://www.theguardian.com/world/2022/oct/02/us-russia-putin-ukraine-war-david-petraeus; Matthew Kroenig, "Memo to the President: How to Deter Russian Nuclear Use in Ukraine—and Respond if Deterrence Fails," Atlantic Council, October 2, 2022, https://www.atlanticcouncil.org/content-series/memo-to-the-president/memo-to-the-president-how-to-deter-russian-nuclear-use-in-ukraine-and-respond-if-deterrence-fails/.

460 US Department of Defense, *Military and Security Developments Involving the People's Republic of China* (2022), 158.

weapons to risk provoking a strategic exchange.[461] (This, of course, is precisely the dilemma which this paper proposes that Washington attempt to impose on Moscow and Beijing.)

In conclusion, both Russia and China have far greater missile defense capabilities and ongoing development programs than are often acknowledged and are pursuing closer parity with the United States. Ballistic missile defense will likely become a feature of the strategic relationship between the three countries, which could have both positive and negative implications for US national security. Understanding Russian and Chinese reasons for developing this capability will yield insights into their broader defense priorities.

461 Sanders, Massa, and Marine, *The Impact of the Evolving Sino-Russian Relationship.*

Section twelve: Conclusions and policy recommendations

The aim of this study is to determine if changes in the strategic environment and evolution in the long-range missile threat warrant a reconsideration of US homeland missile defense (HMD) policy. The current policy of staying ahead of the North Korean long-range ballistic missile threat while relying *only* on nuclear retaliation to deter Russian and Chinese ballistic missile threats is incoherent and no longer tenable given Russian and Chinese doctrine and capabilities for limited nuclear and conventional strikes against the homeland. Furthermore, it makes no sense to rule in defense against Russian and Chinese cruise missile strikes while ruling out defense against ballistic missiles.

To explain how the United States arrived at this point, one must appreciate the decades-long, sometimes emotional, debate over missile defenses—a debate that was set aside momentarily at the end of the Cold War, but which has resurfaced with the expansion of missile threats to the homeland and the return of great-power competition. The promise of a new relationship with Russia and China at the turn of the century reduced the urgency for missile defenses against those countries, while the expansion of regional nuclear threats from rogue states, such as Iraq, Iran, and North Korea, made homeland defenses against these more limited threats increasingly imperative. A compromise of convenience was forged on the faulty assumption that large-scale defenses were no longer needed, while defenses against countries such as North Korea were not only needed but also more feasible, given the low numbers and less sophisticated threat.

Today, the geopolitical landscape and threat picture is different, and one needs look no further than the Biden administration's defense strategy documents and pronouncements to appreciate the implications for US HMD. Defending the nation is the priority, and missile defenses are a critical enabler of US grand strategy. Congress, too, has called attention to the growing vulnerability of the United States to new and expanding missile threats. Most recently, the Senate Armed Services Committee recommends a provision in the FY 2025 National Defense Authorization bill requiring the DOD "to develop a comprehensive integrated architecture for defending the United States against all forms of missile attacks."[462] In its companion bill, the House Armed Services Committee recommends an additional GBI site on the East Coast of the United States to address the growing threat from North Korea and possibly Iran in the future.[463] Perhaps most significant are the calls from the congressionally mandated bipartisan Strategic Posture Commission and the Commission on the National Defense Strategy for the United States to enhance missile defense for the homeland and develop and field homeland IAMD capabilities that can deter and defeat coercive attacks by Russia and China.[464]

Russia and China have become major power rivals with competing interests and expanding nuclear arsenals, requiring the United States to deter two major nuclear powers at the same time. Russian and Chinese doctrine and forces, as discussed in this study, require the United States to think more clearly about deterring not only large-scale nuclear attacks against the United States but also more limited strikes—nuclear and conventional—against targets in the United States. Civilian and military officials talk quite openly and more frequently about this new threat to critical infrastructure meant to stymie US reinforcement of allies and break the will of a US leadership perhaps unwilling to take risks because of its near-total vulnerability to missile and other threats. Likewise, the United States must ensure the survivability of its nuclear forces against two major nuclear powers, guarding against a combined preemptive nuclear attack (however unlikely) while ensuring that US nuclear forces can endure a general nuclear war with one and at the same time deter the other from opportunistic aggression against a diminished and potentially devastated United States.

Furthermore, US nonproliferation strategies have failed to stem the growth of North Korea's nuclear arsenal and its ability to reach the United States with long-range ballistic missiles. US military leaders warn that the capacity of current missile defense systems may not be sufficient to pace the threat as North Korea develops solid fuel and multiple warheads for its mobile ICBMs. Programs are in place to modernize and expand the US GMD system starting in 2028—but will a total of sixty-four Next-Generation Interceptors suffice? This study argues that a truly layered defense and an expansion in the size of the GMD system will be necessary, while more advanced technology and space-based sensors will be needed to stay ahead. Critics will argue this has the makings of an arms race,

462 National Defense Authorization Act for Fiscal Year 2025, S. 4638 at 849, 118th Cong. (2024), https://www.congress.gov/bill/118th-congress/senate-bill/4638.

463 H.R. 8070 at 1055 (2024).

464 Creedon et al., *America's Strategic Posture*; Jane Harman (chair) et al., *Report of the Commission on the National Defense Strategy,* Commission on the National Defense Strategy, July 2024, https://www.armed-services.senate.gov/imo/media/doc/nds_commission_final_report.pdf.

President Ronald Reagan addresses the nation to announce the initiation of the Strategic Defense Initiative (SDI), colloquially known as "Star Wars," from the Oval Office, March 23, 1983. Source: Ronald Reagan Presidential Library.

but the United States can afford to compete and win against a country that has difficulty feeding its people. Failure to do so would have long-lasting consequences for a US grand strategy that depends on allies to defend US vital interests abroad. If allies were to perceive the United States as unwilling to defend itself against North Korean attacks, they may also start to wonder whether the United States would be willing to run risks on their behalf.

The argument

This study advances the following argument:

- First, the requirement for homeland missile defense is clearly defined by the 2022 NDS, which designates defense of the homeland as the *first* priority, followed by deterring strategic attacks against the homeland.[465] More to the point, the 2022 MDR provides that missile defenses "are critical to the top priority of defending the homeland and deterring attacks against the United States."[466]
- Second, the threat driving that requirement is growing. According to senior administration officials, Russia and China are "fielding more advanced offensive missiles—ballistic, cruise, and hypersonic—in greater numbers to not only deter [US] involvement in a regional conflict but also to directly target the US homeland. The scale and scope of these multi-dimensional threats present significant risks to the American people and the homeland."[467] The North Korean ICBM threat continues apace and may include missiles with multiple warheads in the future. Senior US military commanders are starting to fear that currently planned missile defense capabilities will not be able to maintain the advantageous US position against North Korea and potentially Iran.
- Third, the strategy behind these threats is clear. Potential adversaries will seek to exploit vulnerabilities in the "American way of war" by posing threats to the US homeland "in an effort to jeopardize the US military's ability to project power and counter regional aggression."[468] These states' intent also is to break the will

465 US Department of Defense, *2022 National Defense Strategy*, 7.
466 US Department of Defense, *2022 Missile Defense Review*, 5.
467 Plumb, "Missile Defense in an Era of Strategic Competition."
468 US Department of Defense, *2022 National Defense Strategy*, 4.

of US political leaders who may be unwilling to fulfill commitments to allies if it means running extraordinary risks to the homeland.

- Fourth, if left unaddressed, these threats to the homeland could significantly narrow US decision-making and curtail a president's freedom of action during crisis and conflict. Adversaries know that the United States depends on its allies and partners to maintain its "global strategic advantage," and that allies, in turn, depend on US security commitments.[469] Russia and China hope to weaken US alliance ties by creating doubt about US security commitments in the minds of its allies. Allies, fearing a weakening of US commitment due to its increasing vulnerability to attack, could seek accommodation with challengers in their region or develop their own nuclear weapons to deter these threats.
- Fifth, the objective or purpose of US homeland missile defense is not to create an impregnable missile shield for the American public, but rather to frustrate adversary strategies that rely on threatening missile attacks against the United States. Missile defense systems are meant to supplement the deterrence value provided by US nuclear forces and the prospect of an overwhelming conventional response to attacks against the homeland—not to replace deterrence by the threat of punishment. The objective of the missile defense system is to create enough doubt in the adversary's mind about the prospect of a successful attack that the adversary concludes the strike is not worth the risk—this is especially effective when considered alongside fears of enormous consequences. In other words, a coercive attack would be futile and fatal.
- Sixth, to solve the missile problem, the United States incorporates other military means in its comprehensive missile defense and defeat strategy. In addition to active defenses meant to intercept warheads after launch, the United States will employ means to stop an adversary from successfully launching its offensive missiles when possible. In this way, "offensive measures add credibility to our defensive efforts and reduce the possibility of continued attacks."[470] This comprehensive approach compensates for vulnerabilities and shortcomings in the missile defense architecture, so the United States need not rely only on active defenses.
- Seventh, modest, though important, improvements to current homeland defenses are available over the next five years to address these threats if policymakers choose to do so. More advanced technologies for missile defense and defeat are on the horizon and could be exploited with sufficient funding. Increasing the funding for homeland missile defense—to a full one percent of the annual defense budget—may be sufficient to achieve the missile defense objectives discussed in this study.
- Eighth, arguments against expanding US homeland missile defense because it could stoke an arms race with Russia and China need to be put in perspective. Not only are Russia and China pursuing their homeland air and missile defenses against limited US missile strikes (Russia deploys more homeland defense interceptors than the United States), but it is counterfactual to assume that US missile defenses will provoke an "action-reaction" arms race. Quite the opposite occurred. Following the US withdrawal from the 1972 ABM Treaty in 2002, US and Russian nuclear arsenals declined by two-thirds. The New START Treaty, in effect since February 2011, took numbers even lower. Nevertheless, the United States should work with Russia and China to make its missile defense plans as transparent as possible. In the final analysis, policymakers must weigh the arms racing risks of deploying less-than-comprehensive defenses as outlined in this study with the consequences of the United States' growing vulnerability to missile threats from small and major powers.
- To summarize, the missile threat to the homeland is real and growing and, if left unaddressed, could seriously undermine US grand strategy and the very basis of national defense strategy. Since the objective of missile defense is to supplement and enhance deterrence by complicating the plans of the attacker—rather than comprehensive population protection—the defensive architecture does not need to be leak-proof. Rather, a layered architecture with certain key attributes, based on existing and future technology, can provide an affordable defense to restore the basis for US defense strategy while reassuring allies.

A change in policy

The principal recommendation of this study is to update US homeland missile defense policy to remove the false distinction between rogue state and major power missile threats and to eliminate sole reliance on nuclear retaliation to deter Russian and Chinese limited coercive missile attacks against the homeland. Improving the survivability of US nuclear forces and nuclear command-and-control also should be a policy objective. Likewise, the distinction between ballistic, cruise, and hypersonic glide threats no longer makes sense: If the United States is going to defend against Russian cruise missiles, then Washington should defend against Russian ballistic missiles and HGVs.

In fact, Congress updated the national missile defense policy in the FY 2024 NDAA along these lines. It is now the policy of the United States to deploy missile defense "systems that provide effective, layered missile defense capabilities to defeat in-

469 US Department of Defense, *2022 National Defense Strategy*, 2.

470 Plumb, "Missile Defense in an Era of Strategic Competition."

creasingly complex missile threats in all phases of flight."[471] But a second clause in this policy, "to rely on nuclear deterrence to address more sophisticated and larger quantity near-peer intercontinental missile threats to the homeland of the United States," creates some ambiguity, allowing an administration to forgo defenses against Russia and China.[472] This study emphasizes that a successful policy includes elements of both defense and deterrence: missile defense protection against rogue threats and limited/coercive strikes by Russia and China combined with the credible threat of nuclear retaliation.

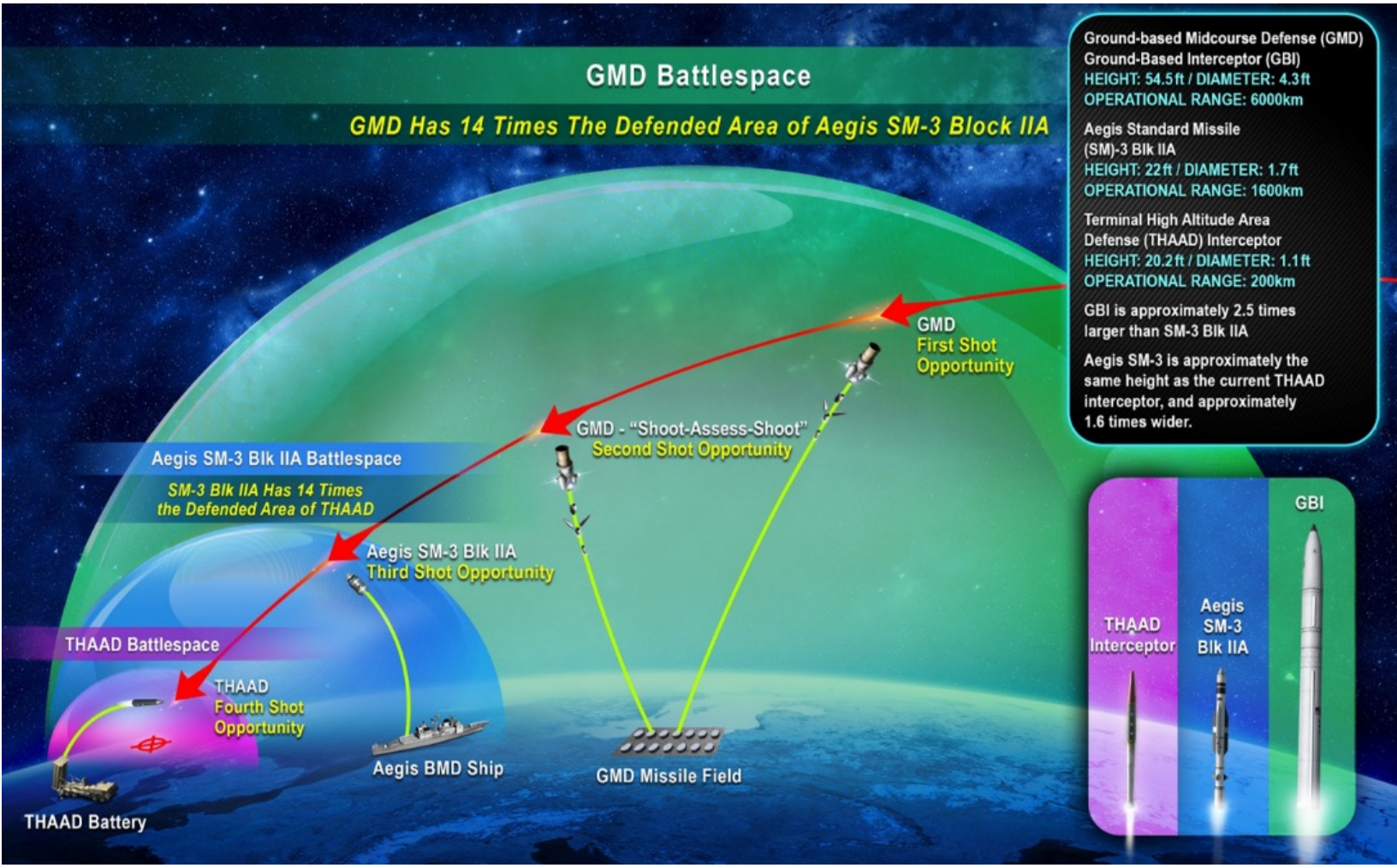
The new policy must be explicit about the goals for homeland missile defense; which countries and threats to defend against; and the planned scope for deployment over a given period. The objective of homeland missile defense is not an impregnable missile defense shield for the country, but rather sufficient defenses to counter adversary missile threats of coercion—to enable US regional defense strategy—and defenses adequate to ensure the survivability and endurance of US nuclear retaliatory forces and nuclear command-and-control against any combination of adversaries. This requires some tailoring of the missile defense mission depending on the strategy objectives and missile capabilities of potential adversaries.

The study outlines three categories of threats or scenarios for which missile defense must provide a solution: first, there are the smaller and possibly undeterrable threats presented by accidental and unauthorized launches as well as by countries such as North Korea that have limited nuclear capabilities; the second category is limited Russian and Chinese missile threats meant to coerce the United States (to provoke but not enrage); finally, there is the larger scale (but still limited) preemptive attack against US nuclear forces and command-and-control designed to prevent nuclear retaliation.

471 NDAA FY 2024, Pub. L. No. 118-31; emphasis added.

472 NDAA FY 2024, Pub. L. No. 118-31; 31 USC. 137 § 136 (2023); emphasis added.

Figure 6: Concept for Layered Homeland Ballistic Missile Defense. Source: Missile Defense Agency (2024).



Accordingly, it should be US policy to:

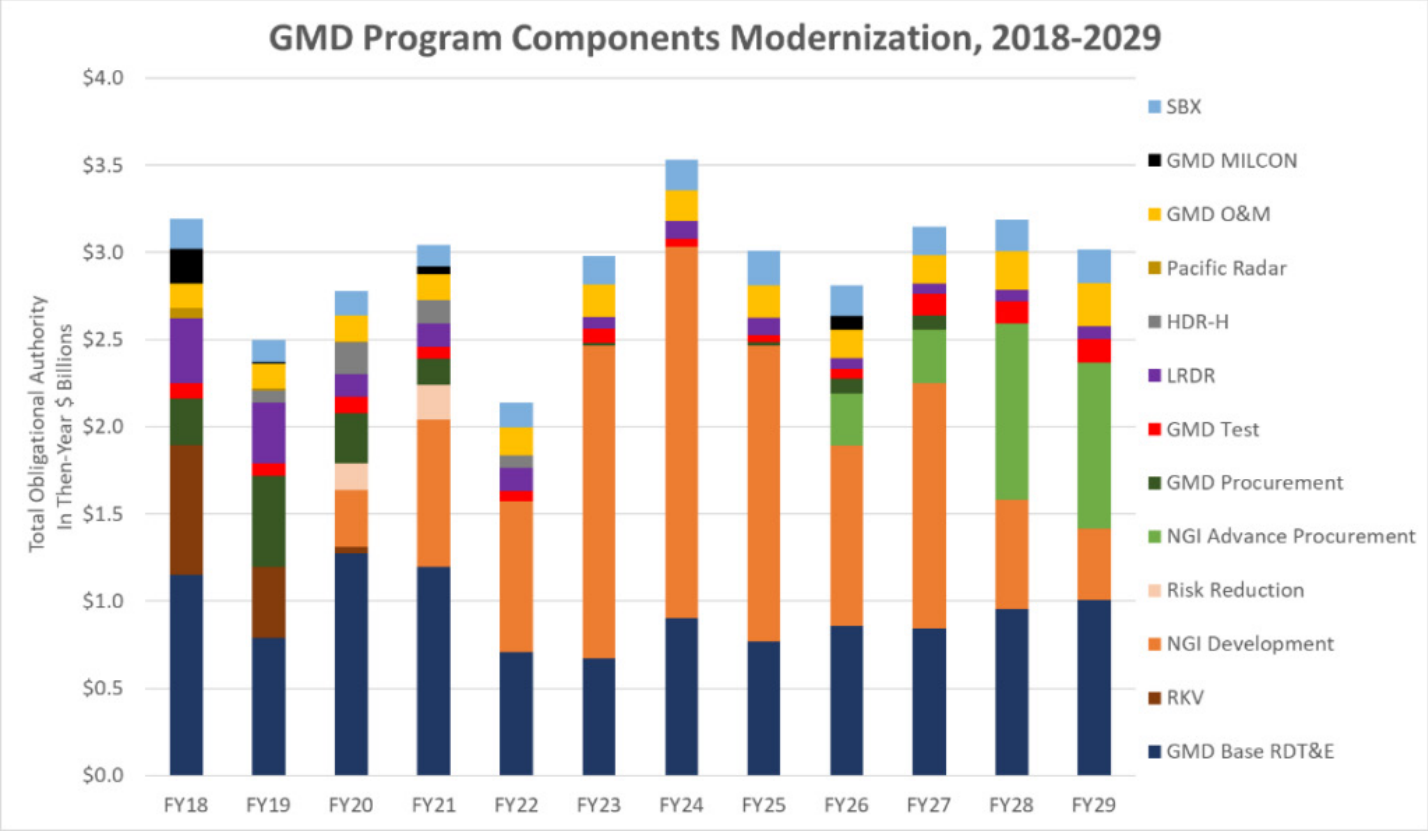
1. Stay ahead of the North Korean long-range missile threat through a comprehensive strategy of layered missile defense combined with offensive measures to prevent launches before they occur.
2. Deploy a layered land, sea and space-based missile defense system to thwart Russian and Chinese coercive strikes (as well as unauthorized or accidental launches), sized to about one hundred Russian or Chinese warheads, delivered by about twenty missiles, including missiles armed with HGVs. The objective is not to replace nuclear deterrence provided by US nuclear forces, but to strengthen deterrence by invalidating Russian and Chinese limited coercive threats. Accordingly, a leak-proof defense against two hundred warheads is not necessary; instead, the United States requires a level of defense capability sufficient to convince an adversary (or create enough uncertainty) that its contemplated attack upon the United States will be both futile and fatal.
3. Enhance the survivability of US nuclear forces and nuclear command-and-control through a layered missile defense composed of GBIs, SM-3 block IIA missiles deployed on land and at sea, THAAD missiles for preferential terminal defense of US nuclear forces, and requisite defenses against cruise missiles.
4. Protect critical US civilian and military infrastructure against air- and sea-launched cruise missile attacks by Russia and China to the extent feasible and necessary to allow the United States to stay in the fight.
5. Continue research on next-generation missile defense capabilities to stay ahead of the threats, including improved space-based sensors, SBIs, and directed-energy capabilities.

Homeland defense system design

Far too much stress has been placed on the efficacy of the GMD system with its GBIs and radars for the defense of the homeland. Originally intended to be regularly upgraded after its initial deployment in 2004, the elements of today's GMD sys-

Figure 7: Homeland Defense Mission Budget. Source: Center for Strategic and International Studies (2024).

GMD = Ground-Based Midcourse Defense
LRDR – Long-Range Discrimination Radar
HDR-H = Homeland Defense Radar-Hawaii
NGI = Next-Generation Interceptor
RKV = Redesigned Kill Vehicle
RDT&E = Research, Development, Test, and Evaluation.
SBX = Sea-Based X-band radar



tem are regrettably based on outdated technologies. Moreover, the GMD system was never meant to stand alone against the threat—defenses in other phases of flight were contemplated to compensate for the GMD system's shortcomings and to provide additional intercept opportunities as part of a layered defense.

Layering is essential to a successful missile defense architecture because it improves overall effectiveness by intercepting warheads during different phases of flight and with different interceptor missiles supported by a range of radars and sensors. Intercept at each layer "thins the herd" for the following layers. Attacking warheads containing countermeasures that may fool the defense in one layer may prove useless in another. Multiple layers greatly complicate the calculations of the attacker, while reducing the technical requirements for any given interceptor because it does not have to work perfectly or in all conditions and against all countermeasures.

Though layered missile defense has been a long-standing MDA mission, the homeland today is protected only by GBIs. The SM-3 and THAAD missiles can bolster homeland protection by providing additional shot opportunities against incoming warheads that penetrate the GBI defense, but these systems have not been integrated with the GMD system. Sensor support from satellites under development can substantially improve the viability of layered missile defense early in the next decade by helping to distinguish between real warheads and countermeasures. When viewed from the attacker's perspective, a layered missile defense system presents a very difficult challenge that cannot be solved simply with increased numbers.

It is difficult in an unclassified study—without access to the threat picture and the performance characteristics of defensive systems—to offer specific recommendations on the number and types of sensors and interceptors required to pace the threat. Still, based on unclassified statements by current and former USNORTHCOM commanders, current plans will presumably not suffice. Sixty-four GBIs—of which twenty will be the modernized NGI variant—by 2032 should be just the start of a much broader deployment sized to the anticipated threat. To put this in context, the Clinton administration proposed (in the late 1990s) the deployment of one-to-two hundred GBIs to defend against a few dozen North Korean ICBMs.[473] Yet the United States now struggles to bring the total to sixty-four GBIs, and there are no plans to add additional layers to the defensive architecture.

A notional limited and layered homeland missile defense

Considerable rhetorical blood has been spilled over the phrase "limited missile defense," made notable in the 1999 National Missile Defense Act, which declares that it is US policy to "deploy as soon as technologically possible a National Missile Defense (NMD) system capable of defending US territory against **limited** ballistic missile attack (whether accidental, unauthorized, or deliberate)."[474] Some advocates of missile defense have long viewed this language as a policy constraint against the development of more robust missile defenses systems, including those designed to defend against large Russian and Chinese attacks. The word "limited" has since been expunged from the statutory language.

Yet "limited" is in the eye of the beholder (or presidential administration). The very first missile defense architecture based on Reagan's 1983 SDI (the Phase I Strategic Defense System) called for a defense that could stop at least 30 percent of a limited first-wave Soviet attack comprising as many as five thousand warheads.[475] The next major architecture, proposed by the George H.W. Bush administration in the early 1990s was known as Global Protection against Limited Strikes, the objective of which was to defend against up to two hundred Soviet warheads with ground- and space-based interceptors.[476] Then, in the late 1990s, the Clinton administration proposed a limited system of one-to-two hundred GBIs to defend against a few dozen North Korean ICBMs.[477] Today's deployment of only forty-four GBIs has not been constrained by "policy," but rather by technological challenges and a lack of funding commitment by successive administrations. There is nothing in current law that would prohibit the development or deployment of any of the concepts proposed in this study, especially if their design objective was only to defend against up to 100 attacking warheads.

A layered homeland defense system may be feasible within the five-year defense planning horizon based on existing technology (Figure 6). Deployments of NGI beginning in 2028 could be augmented earlier with the less expensive SM-3 IIA missile in a layered fashion to make the architecture more effective and

473 James M. Lindsay and Michael E. O'Hanlon, *Defending America: The Case for Limited National Missile Defense* (Washington, DC: Brookings Institution Press, 2001).

474 National Missile Defense Act of 1999, Pub. L. 106-38, 113 Stat. 205 (1999); emphasis added.

475 Steven A. Hildreth, *The Strategic Defense Initiative: Issues for Phase I Deployment,* CRS Issue Brief, Congressional Research Service, 1990, 4, cited in Baker Spring, *For Strategic Defense: A New Strategy For the New Global Situation*, Heritage Foundation, April 18, 1991, https://www.heritage.org/defense/report/strategic-defense-new-strategy-the-new-global-situation.

476 Patty-Jane Geller and Jack Kraemer, *40 Years After Reagan, Neglected US Missile Defense Is Dangerously Obsolete,* Heritage Foundation, March 23, 2023, https://www.heritage.org/missile-defense/commentary/40-years-after-reagan-neglected-us-missile-defense-dangerously-obsolete.

477 "National Missile Defense," White House Archives, last updated September 1, 2000, https://clintonwhitehouse5.archives.gov/WH/new/html/Wed_Oct_4_141122_2000.html.

affordable, while the deployment of THAAD missiles could provide an additional layer of protection for US nuclear retaliatory forces and command-and-control against Russian and Chinese missiles. Current production rates for SM-3 IIA and THAAD missiles, about twelve per year, are driven by funding constraints.[478] According to industry sources and Congress, yearly production could double or even triple with appropriate funding.[479]

In addition to adding an SM-3 and THAAD underlayer, the DOD should speed the fielding of the hypersonic boost tracking sensor system and accelerate research and development of the discriminating space sensor. These satellite sensors are critical to keep pace with the North Korean missile threat and may provide an opportunity for missile defense systems to defend against limited Russian and Chinese ballistic missile strikes.

The DOD also should make long-lead plans to expand NGI production early in the next decade. Additional long-range interceptors will be required beyond the sixty-four currently planned, especially if a third site on the East Coast is deemed necessary and the threat from North Korea and Iran continues to expand. Depending on when new technologies are available for homeland defense, replacing the existing forty-four GBIs may be advisable. Additional NGIs—when combined with new space-based sensors—could also help counter limited Russian and Chinese threats as part of a layered defense with the SM-3, THAAD, and a potential Glide-Phase Interceptor.

The recommended near-term steps are meant to be a bridge to follow-on technologies necessary to create a next-generation missile defense capability to defend the homeland.

The DOD must place more emphasis on investing in future, revolutionary capabilities, such as space sensors, SBIs, and non-kinetic options (such as lasers) to outpace adversary capability development. Another option that has been considered over the years is the development of an air-launched weapon that could engage threat missiles early in their trajectory, either with missiles or directed energy.

MDA also needs to get back into the technology business. The MDA's technology budget has been dismal over the past four to five years (in FY 2024, the MDA's S&T budget was at a historical low, below 1 percent of its TOA). Incremental improvements alone cannot defeat a rapidly evolving threat. A high-priority technology investment should begin proving out the discriminating space sensor concept on orbit and rapidly fielding the capability, per the SDA model. Getting back into the technology business means the MDA should pursue an SBI testbed demonstration, along with increased investments in directed energy, and more robust funding for advanced discrimination techniques, as well as technological investments in lighter-weight, lower-cost interceptors to make kinetic interceptor options more affordable.

Determining costs for a defensive architecture is beyond the scope of this study. Such a determination would depend significantly on classified threat predictions and the objective of the chosen defensive architecture. This is unsatisfying, but the intent of this study was to make a strategy-based case for expanded homeland missile defense and provide a sense for how current and future capabilities could be combined to provide the defensive benefits discussed herein. Nevertheless, some context could be helpful. According to the DOD, the cost for sixty-four NGIs would run approximately $7.0 billion, while the cost of the SM-3 IIA and THAAD missile in 2023—based on the current production rate—is about $23.7 million and $10 million, respectively.[480]

The MDA devotes about one-third of its approximately $10 billion annual budget to the homeland defense mission. See Figure 7. This amounts to about a third of one percent of the annual defense budget. Raising that figure to a full one percent would go a long way toward achieving the layered defense recommendations in this study and provide sufficient funding for advanced technology exploration.

Addressing Russian and Chinese concerns

The central concern or objection voiced by homeland missile defense critics is the fear of an arms race with Russia and China. Some critics can accept the strategic argument for homeland missile defense for reasons outlined in this study, yet still want assurances that expanded US homeland missile defenses will not make the United States less secure due to the Russian and Chinese response. That is a reasonable expectation, but regrettably hard to satisfy with any confidence.

Russia and China will react negatively to any expansion of US homeland missile defenses, even if intended only to address the North Korean missile threat. The extent of that reaction is unknowable, despite past rhetoric. If history is any guide, an arms race is not the guaranteed result. Russia could have expanded its nuclear forces when the United States withdrew from the ABM Treaty in 2002, yet Moscow chose not to do so. Instead, the United States and Russia reduced their respective deployed strategic nuclear forces by some two-thirds. Some have argued that Russia's new novel nuclear systems and China's new ICBM silos are meant to hedge against future US missile defenses. Meanwhile, other experienced US diplomats reason that political, rather than strategic, imperatives explain these actions.[481] In this regard, Russia and China have long expressed concern

478 Andrew Feickert, *The Terminal High Altitude Area Defense (THAAD) System,* Congressional Research Service, last updated July 18, 2024, https://crsreports.congress.gov/product/pdf/IF/IF12645.

479 Wicker, "21st Century Peace Through Strength," 14.

480 Missile Defense Agency, "Department of Defense Fiscal Year (FY) 2025 Budget Estimates: Defense-Wide Justification Book Volume 2b of 2" (Washington, DC: US Department of Defense, March 2024): 91–156, https://comptroller.defense.gov/Portals/45/Documents/defbudget/FY2025/budget_justification/pdfs/02_Procurement/PROC_MDA_VOL2B_PB_2025.pdf.

481 Gottemoeller, "Russia Is Updating Their Nuclear Weapons: What Does That Mean."

about US conventional precision strike weapons and other nonnuclear technologies that also could threaten their retaliatory forces. However, the United States has not deployed missile defense or these other systems in significant numbers in recent years, suggesting to some China experts "that additional factors lie behind Xi's decision to embrace nuclear expansion."[482] Rather than grow their nuclear forces, Russia and China could choose to expand their existing homeland defense coverage to a level comparable to future US deployments, putting them on an equal footing with the United States while avoiding an offensive arms race.

Russia's and China's vocal objections to US missile defenses often reflect strategic posturing rather than genuine security threats. Both nations have invested heavily in their missile defense systems and possess substantial offensive capabilities, suggesting their concerns are more about maintaining geopolitical influence than reacting to a direct threat. The frank answer is that one cannot know for certain how Russia and China will respond beyond the anticipated negative rhetoric. Nevertheless, the United States could consider sharing its intentions and missile defense plans in a more formal way with Russia and China. The United States could make it clear that its aim is not an impregnable defense intended to eliminate Russia's and China's assured second-strike capability and that US missile defense plans would be apparent and predictable based on the annual defense appropriations process. This effort could be combined with US-Russian talks aimed at replacing the New START Treaty when it expires in 2026. In the final analysis, policymakers must weigh the arms racing risks of deploying less-than-comprehensive defenses as outlined in this study with the consequences of the United States' growing vulnerability to missile threats from small and major powers.

The politics of missile defense

Russian and Chinese criticism will not be the only stumbling block to pursuing the recommendations in this study. The challenges ahead to secure funding, develop and integrate new technology, and build congressional support are daunting. It is not by accident that twenty years after withdrawing from the ABM Treaty, the United States has only forty-four homeland defense interceptors to show for it. To be sure, senior leadership commitment and focus will be required by the president and, through him or her, the secretary of defense.

Costs will be significant, but a reasonable starting point for the efforts recommended herein is an additional $4–5 billion per year above the approximately $3 billion allocated for homeland missile defense within the MDA budget. Combined, this would amount to about one percent of the defense budget for the number-one national defense priority. Providing a layered defense over the next five years would not require developing new technology—only increased procurement and integration of interceptors, radars, and battle management systems currently in service. Procurement of additional THAAD and SM-3 missiles is feasible and should be pursued for both regional and homeland defense, as determined by the threat.[483] Additional long-lead funding to procure NGIs beyond the first twenty should be considered. Finally, additional funding for research and development of next-generation missile defense systems should be included, leading to deployment decisions toward the end of the decade.

Congressional debate is to be expected. House Armed Services Committee Republicans want to go beyond the planned sixty-four homeland defense interceptors and SBIs as part of the solution, whereas some Democratic members appear to be wary of any significant expansion of homeland defenses for fear of starting an arms race with Russia and China. Moreover, there appears to be little appetite for additional significant missile defense funding in the appropriations process unless total defense spending receives a commensurate boost. It may be possible to distinguish between less controversial near-term efforts to build out layered defenses based on existing interceptor and radar technology, and those longer-term efforts for next-generation missile defense capabilities, such as directed energy and SBIs. Support for the former is more likely because it is less expensive and less fraught with missile defense ideology. It is too early to tell if the recommendations of the Strategic Posture Commission, to build defenses against the Russian and Chinese coercive/limited threat, will gain any traction, or whether opposition to defending against Russia and China will continue to hold influence.

Most importantly, the immediate future course of US homeland missile defense will depend largely on the direction of President-elect Trump—who made statements favorable to US homeland missile defense on the campaign trail—and his administration. One of the most consequential shifts in US missile defense policy occurred when Bush made the decision to withdraw the United States from the ABM Treaty and begin fielding GBIs in 2004 to address the rogue state ICBM threat. Today, the missile threat to the homeland is growing not just from North Korea, but also from Russia and China, which have military doctrines that include the threat of limited missile strikes against the US homeland. Considering these new threats and the priority to defend the homeland, the next administration will want to consider whether planned missile defense capabilities are sufficient to the task. The ability of the United States to assure its allies and deter, and if necessary, prevail in great-power conflict depends on it.

482 Tong Zhao, "The Real Motives for China's Nuclear Expansion," *Foreign Affairs Magazine*, May 3, 2024, https://www.foreignaffairs.com/china/real-motives-chinas-nuclear-expansion.

483 The Trump administration, in fact, had prepared a $3.5 billion five-year spending plan to integrate, test, and procure SM-3 and THAAD missiles and associated sensors but was set aside by the incoming administration (Robert M. Soofer, private papers (unclassified), "Layered Homeland Defense Summary, FY21–26").

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