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Missile defense strategy, policies, and programs in review of the Defense Authorization Request for fiscal year 2022 and the Future Years Defense Program

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Chairman King, Ranking Member Fischer, members of the subcommittee, it is my honor to testify before you today on the present and future of missile defenses in the national defense strategy of the United States. My testimony will cover three matters germane to the matter at hand today. First, I describe the full extent of U.S. missile defense capabilities today and near-future plans. Second, I explain how homeland missile defense—perhaps counterintuitively—harms rather than enhances U.S. national security interests by increasing the odds of nuclear escalation in a crisis and by increasing the costs of peacetime competition with our adversaries. Third, I describe the advantages and disadvantages of introducing missile defense as a topic for consideration in future arms control negotiations with Russia and possibly China. I conclude by recommending potential approaches to limitations that maximize U.S. national security interests and with suggestions for how Congress may proceed in studying these matters.

U.S. Missile Defense Capabilities and Plans

The United States deploys a multi-tiered missile defense system to defend against ballistic and cruise missile threats across the full array of range classes. Despite the commonplace reference to a "layered" missile defense system, it is important to underscore that most currently deployed systems and interceptors are designed and optimized to manage a portion of the full range of ballistic missile threats. In other words, specific systems are optimized to defeat and destroy missiles of a specific range class, with limited overlap in capability across systems. Currently deployed interceptors and missile defense systems cover ballistic missile threats in the midcourse and terminal phases of their flight trajectories. These systems are supported by a complex array of command and control, battle management, and communications systems. A diverse array of land-, sea-, and space-based sensors provides early warning, tracking, and discrimination for the missile defense mission. Air-based sensors additionally support the testing and evaluation of missile defense-related test activities.

The primary missile defense systems in use today are the Ground-Based Midcourse Defense (GMD) system; the ship-based Aegis Ballistic Missile Defense (BMD) and Aegis Ashore

platforms; Terminal High Altitude Area Defense (THAAD); and Patriot Advanced Capability-3 (PAC-3) and other Patriot variants.

Each of these systems employs a varying array of interceptor missiles and types: GMD relies on the Ground-Based Interceptor, based in Fort Greely, Alaska, and Vandenberg Air Force Base, California; Aegis BMD relies on the Standard Missile 3 (SM-3) Block IA/IB interceptors and the Standard Missile 6. The SM-3 Block IIA is being procured in limited numbers and will deploy at sea and ashore. THAAD, PAC-3, and other Patriot variants use system-specific interceptors. All interceptor types in use today rely on direct kinetic impact through either a kill vehicle or interceptor—or an interceptor-mounted blast fragmentation warhead in the case of older Patriot systems—to destroy inbound missile threats.

GMD is the sole system developed from the ground-up to address intercontinental-range ballistic missile threats to the U.S. homeland, but, in November 2020, an Aegis BMD-equipped U.S. Navy *Arleigh Burke*-class destroyer successfully employed an SM-3 Block IIA interceptor to destroy what the Missile Defense Agency described as a "threat representative" ICBM-class target. This test, codenamed FTM-44 and carried out as a result of a congressionally mandated test pursuant to the 2018 National Defense Authorization Act, set up SM-3 Block IIA as potentially the second such system available for potential homeland missile defense. It is and has been the policy of the United States since the 2002 decision by the Bush administration to exit the Cold War-era Anti-Ballistic Missile Treaty to rely on homeland missile defense for "limited" ballistic missile threats to the homeland. To this end, the 2019 *Missile Defense Review* (MDR) notes "the GMD system is designed to defend against the existing and potential ICBM threat from rogue states such as North Korea and Iran."[1] The 2019 MDR adds that "in the event of conflict, [the GMD system] would defend, to the extent feasible, against a ballistic missile attack upon the U.S. homeland from any source."

Efforts to generate a layered homeland missile defense system, incorporating GMD and Aegis with SM-3 Block IIA, remain underway. MDA's FY 2022 plans include pursuing a layered

[1] Missile Defense Review, U.S. Department of Defense, 2019, https://www.defense.gov/Portals/1/Interactive/2018/11-2019-Missile-Defense-Review/The%202019%20MDR_Executive%20Summary.pdf, pp. XII.

homeland defense approach that will further assess SM-3 Block IIA's suitability for a counter-ICBM mission. MDA further plans to evaluate THAAD's capability to participate in the defense of the contiguous United States, with a THAAD-specific flight test to this end planned for as early as FY 2023.

THAAD, PAC-3, other Patriot systems, and sea- and land-based Aegis BMD systems provide in-theater missile defense in Europe and Asia to protect U.S. servicemembers, military facilities, and allied territory from ballistic and, in certain cases, cruise missile threats. Successive U.S. administrations have maintained cooperative ballistic missile defense programs with key allies. This includes the European Phased Adaptive Approach (EPAA), which features land- and sea-based sensor, interceptor, and battle management system deployment to defend NATO territory against evolving threats as ballistic missiles proliferate. In Asia, successive administrations have cooperated extensively with Japan on ballistic missile defense, with Tokyo notably having codeveloped the SM-3 Block IIA with the United States. South Korea and Australia have also been close partners on missile defense in Asia. Finally, for more than three decades, the United States has supported Israel's indigenous missile defense programs.

Apart from these existing capabilities, the Missile Defense Agency continues to study, research, develop, and evaluate a range of new sensors, interceptors, and other missile defense-related technologies. Some of these programs cover hypersonic defense, sensor integration, new kill vehicles (the Common Kill Vehicle Technology program), and the THAAD-PAC-3 Missile Segment Enhancement (MSE) integration. In FY 2021, MDA requested $9.187 billion to support these activities in addition to the sustainment and procurement of deployed missile defense capabilities.[2]

[2] Missile Defense Agency, Budget Estimates Overview: Fiscal Year (FY) 2021, https://www.mda.mil/global/documents/pdf/budgetfy21.pdf.

Since the mid-1980s, Congress has appropriated in excess of $200 billion[3] for the Missile Defense Agency (MDA) and its predecessors, the Ballistic Missile Defense Organization (1974-2002; renamed MDA) and the Strategic Defense Initiative Organization (1984-1993).

Homeland Missile Defense

The highest-end missile defense mission today is that of protecting the U.S. homeland from limited nuclear attacks. In 2002—four years after North Korea's first-ever test of a satellite launch vehicle—the George W. Bush administration announced the deployment plan for the GMD system. As the system was announced, the administration sought to achieve an initial operational capability before 2005. This timeline—unusually compressed for a program with the ambition and challenging technical goals given to GMD—was nominally met, with MDA declaring a "limited defensive capability" by the end of 2004, though just how limited was not admitted.[4] The nominal claim was not based on any realistic testing of the system against ICBM-class targets. In the 16 years since, GMD has endured delays, unexpected technical hurdles, cost overruns, and exhibited irregular successes over its limited testing history.[5]

GMD has been tested just twice against what MDA has described as "threat representative" targets—targets emulating potential ICBM threats to the homeland. Both tests—FTG-15 in 2017 and FTG-11 in 2019—were declared successful by MDA, but the target missile in both did not faithfully emulate the trajectory, velocity, or potential countermeasures that might accompany a real North Korean ICBM launch against the continental United States.[6]

Across the 19 intercept tests in the program's history, MDA has assessed a success in 11 cases, including the three most recent tests. Technical and programmatic hurdles have complicated

[3] Estimate derived from collating FY2018, FY2019, and FY2020 appropriation with available MDA historical funding data. For more, see Historical Funding for MDA FY85-17, U.S. Missile Defense Agency, https://www.mda.mil/global/documents/pdf/FY17_histfunds.pdf.
[4] Missile Defense Agency, Annual Financial Statements, FY 2004, https://comptroller.defense.gov/Portals/45/documents/cfs/fy2004/FY_2004_MDA_Financial_Report.pdf.
[5] Laura Grego, George N. Lewis, and David Wright, "Shielded from Oversight: The Disastrous US Approach to Strategic Missile Defense," Union of Concerned Scientists, July 2016, https://www.ucsusa.org/sites/default/files/attach/2016/07/Shielded-from-Oversight-full-report.pdf.
[6] Laura Grego and David Wright, "Analysis of GMD Missile Defense Test FTG-15," Union of Concerned Scientists, March 15, 2018, 15, https://www.ucsusa.org/resources/analysis-gmd-missile-defense-test-ftg-15.

GMD's planned development. For instance, a notable set of technical hurdles were found to be associated with faulty divert thrusters—small rockets meant to offer fine in-flight trajectory adjustments—across multiple tests.[7] Most notably, plans to replace the program's older, troubled exoatmospheric kill vehicle (EKV) with the Redesigned Kill Vehicle (RKV) were canceled in 2019.[8] Instead, the Department of Defense now plans to procure a new interceptor—the Next-Generation Interceptor, or NGI—to phase-in as a replacement for the GMD system's silo-based Ground-based Interceptors (GBIs). According to MDA Director Vice Adm. Jon Hill, NGI was "the result of the first holistic technical assessment of homeland defenses the department has conducted since initial system operations began in 2004."[9]

Despite GMD's test record and trouble programmatic history, U.S. civilian and military leaders alike have expressed confidence in the system. General John E. Hyten, Vice Chairman of the Joint Chiefs of Staff, has stated that he has "100 percent confidence in those capabilities against North Korea."[10] Lt. General James Dickinson, commander of the U.S. Army Space and Missile Defense Command, has expressed "no concerns" regarding GMD's capabilities.[11] While these statements appear to be subjective expressions of confidence in the system, GMD's actual testing record does not indicate anywhere close to a perfect level of system effectiveness. Even the most effective U.S. missile defense systems as evaluated through testing—notably, THAAD—can be expected to offer a perfect defense.

Arms Control Today and Missile Defense

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[7] David Willman, "A Test of America's Homeland Missile Defense System Found a Problem. Why Did the Pentagon Call It a Success?," Los Angeles Times, July 6, 2016, http://www.latimes.com/projects/la-na-missile-defense/.
[8] Jen Judson, "Pentagon Terminates Program for Redesigned Kill Vehicle, Preps for New Competition," Defense News, August 21, 2019, https://www.defensenews.com/pentagon/2019/08/21/dod-tanks-redesigned-kill-vehicle-program-for-homeland-defense-interceptor/.
[9] "Contracts Awarded for Next Generation Interceptor Program," U.S. Department of Defense, accessed May 26, 2021, https://www.defense.gov/Newsroom/Releases/Release/Article/2547665/contracts-awarded-for-next-generation-interceptor-program/.
[10] "A Conversation with General John Hyten, Vice Chairman of the Joint Chiefs of Staff," CSIS Event, January 17, 2020, https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/200121_John_Hyten.pdf.
[11] Jason Sherman, "Army's Top Air Defender Remains Confident in GBI Fleet after RKV Termination," InsideDefense.com, October 22, 2019, https://insidedefense.com/daily-news/armys-top-air-defender-remains-confident-gbi-fleet-after-rkv-termination.

No arms control treaty currently proscribes the United States' pursuit of homeland or theater missile defense systems. The first and last major treaty to do so—the 1972 ABM Treaty between the United States and the Soviet Union—was discarded by the Bush administration to augment homeland missile defense capabilities against what was then seen as a potential North Korean intercontinental-range nuclear threat. The ABM Treaty, an outcome of the first U.S.-Soviet Strategic Arms Limitation Talks (SALT I, 1969-1972), did not completely ban missile defenses, but limited each of its parties to 200 deployed, fixed interceptors at two sites; a 1974 protocol halved this to 100 interceptors at a single site.[12]

The 2010 Strategic Arms Reduction Treaty (New START) between the United States and the Russian Federation—the sole strategic arms reduction treaty in force between the two and due for expiration in 2026—does not provide for meaningful limitations on missile defense, but the preambulatory text to the Treaty notes that both countries "recognize the interrelationship between strategic offensive and strategic defensive arms and that this interrelationship would become more important as strategic nuclear arms were reduced." Since the Bush administration's decision to exit the ABM Treaty in 2002, no U.S. administration has proposed exploratory talks with any U.S. nuclear-armed adversary—Russia, China, or North Korea—on the matter of limiting missile defenses.

Strategic Stability and Missile Defense

For any two adversarial states practicing nuclear deterrence, strategic stability between them exists when both arms race stability and crisis stability exist. These subsidiary conditions for strategic stability govern the incentives each side has—in peacetime—to expand its available set of offensive weaponry (arms race stability) and, in a crisis, to employ nuclear weapons first (crisis stability). Strategic stability is desirable because it reduces the financial and opportunity costs of competition in peacetime and, in a crisis, lowers the probability that either side will seek to

[12] Protocol To The Treaty Between The United States Of America And The Union Of Soviet Socialist Republics On The Limitation Of Anti-Ballistic Missile Systems, available at https://2009-2017.state.gov/t/avc/trty/101888.htm#protocolabm.

deliberately escalate a crisis in pursuit of strategic advantage. Ultimately, this reduces the odds of a devastating nuclear war.

Missile defenses—particularly homeland missile defenses—interact with these subsidiary requirements for strategic stability in important ways.

First, one side's investments in missile defenses in peacetime will prompt the other to reassess its force size and posture. Because stable nuclear deterrence depends on a shared acceptance between adversaries of a "balance of terror,"[13] the introduction of any new defensive capability that is perceived as upsetting this balance will create incentives for further investment in offensive capabilities to restore balance. This "action-reaction phenomenon" between offensive and defensive investments was once recognized as the foundation of the U.S.-Soviet arms race during the Cold War.[14]

In the years since withdrawal from the Anti-Ballistic Missile Treaty in 2002 and as early as the National Missile Defense Act of 1999[15], the United States has maintained that existing homeland missile defense capabilities are designed to cope with "limited" threats from so-called rogue states like North Korea, and should not be seen as threatening to Russia or China, and therefore causative of arms racing. Finally, in 2017 North Korea did acquire a rudimentary intercontinental-range nuclear delivery capability. Iran may one day acquire such a capability.

The origins of U.S. intentions to focus missile defense on countries other than Russia (whose offensive forces are too numerous to defend against) can be traced back to the post-Cold War GPALS—or Global Protection Against Limited Strikes—program, which was introduced by the George H.W. Bush administration as a successor to the Reagan administration's Strategic Defense Initiative.

U.S. messaging on the limited objectives of homeland missile defense, however, has been inconsistent at times. Notably, during the public unveiling of the 2019 MDR, former President

[13] Albert Wohlstetter, "The Delicate Balance of Terror," Product Page, 1958, https://www.rand.org/pubs/papers/P1472.html.
[14] Robert McNamara, quoted in Morton H. Halperin, "The Decision to Deploy the ABM: Bureaucratic and Domestic Politics in the Johnson Administration," *World Politics* 25, no. 1 (1972): 62–95, https://doi.org/10.2307/2010431.
[15] National Missile Defense Act of 1999, Pub. L. No. 106-38, 113 Stat. 205 (1999).

Donald J. Trump indicated that it was the goal of the United States "to ensure that we can detect and destroy any missile launched against the United States — *anywhere, anytime, anyplace*."[16] (emphasis added)

This marked an authoritative endorsement of a much more far-ranging set of objectives for current and future missile defense plans in the United States—even as it appeared to be inconsistent with the published text of the 2019 MDR which reiterated the "limited" objective for homeland missile defense and explicitly stated that "nuclear deterrence" (as opposed to missile defense) would "address the large and more sophisticated Russian and Chinese intercontinental ballistic missile capabilities."[17] The 2019 MDR is somewhat internally inconsistent on this question. In the case of ballistic missile attacks against the U.S. homeland from countries other than North Korea or Iran, the 2019 MDR notes that GMD would defend "to the extent feasible, against a ballistic missile attack upon the U.S. homeland from any source" (implying that GMD would endeavor to limit damage in a strategic nuclear war with Russia and China). In any case, Russian and Chinese military planners (who like their American counterparts tend to plan on the basis of worst-case scenarios) never were reassured that U.S. missile defenses would not be directed against them.

Second, beyond stimulating arms racing, once missile defenses are developed, tested, and deployed, they can introduce deleterious sources of uncertainty in decision-making during a crisis, prompting escalatory behavior where restraint might otherwise have prevailed. In a system of bilateral nuclear deterrence where survivable offensive systems exist under conditions of relative parity, each side might seek to avoid deliberate escalation because of the inability to assure the complete destruction of the other side's arsenal—thereby subjecting oneself to the adversary's retaliatory strike. In broad strokes, numerical parity of this kind is stabilizing because it deprives each side of the incentive to ever strike first, promoting stability in a crisis.

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[16] Remarks by President Trump and Vice President Pence Announcing the Missile Defense Review, White House, January 17, 2019, https://trumpwhitehouse.archives.gov/briefings-statements/remarks-president-trump-vice-president-pence-announcing-missile-defense-review/.

[17] Missile Defense Review, U.S. Department of Defense, 2019, https://www.defense.gov/Portals/1/Interactive/2018/11-2019-Missile-Defense-Review/The%202019%20MDR_Executive%20Summary.pdf.

The introduction of strategic missile defenses—even in modest numbers—can upset this. Whereas one side's first strike would otherwise have left the other with an assured retaliatory capability, the attacker's defenses would now have the capability to degrade and absorb this retaliation. As a result, the victim's retaliatory capability would no longer be assured because their ballistic missile reentry vehicles (RVs) might be intercepted long before they are able to detonate on or near the attacker's territory. In recognition of this dilemma, the would-be victim, in a crisis, faces strong incentives to employ their nuclear arsenal first—to maximize the destruction of the would-be attacker's nuclear arsenal and limit damage to their own territory. These dynamics can manifest even if both sides possess missile defense capabilities. As a result of the introduction of strategic missile defenses, crises are thus prone to instability and deliberate escalation.

It was these dangers that once prompted a shared recognition of the dangers of unrestrained investments in defensive homeland missile defense technologies by the United States and the Soviet Union. In 1968, then-U.S. Secretary of Defense Robert McNamara and Soviet premier Alexei Kosygin arrived at a shared understanding of these dangers, noting that the nature of the offense-defense balance necessitated limits on anti-ballistic missile (ABM) systems.[18] This, among broader concerns about the costs of peacetime arms racing, laid the groundwork for the 1972 ABM Treaty.

Importantly, behaviors and postures that are stabilizing are often not those that confer unilateral, absolute advantage. In other words, what is most stable for the *system* of deterrence is not always what is perceived to be the best of all worlds for the United States. Because stable nuclear deterrence is predicated on a shared investment by the United States and each of its nuclear-armed adversaries in the "balance of terror," strategic missile defense—even as it might mitigate and limit damage to the United States in a nuclear conflict—is destabilizing. Even as the U.S. has emphasized the "limited" objectives of homeland missile defense in the post-Cold War era, Russia and China harbor anxieties about the future strategic direction of our missile defense

[18] "Foreign Relations of the United States, 1964–1968, Volume XIV, Soviet Union," Office of the Historian, U.S. Department of State, February 21, 1968, https://history.state.gov/historicaldocuments/frus1964-68v14/d238.

investments and the potential for technological breakthroughs. These nations, ultimately, reason about their own security and deterrence needs based on what we do rather than what we say.

Russian, Chinese, and North Korean Responses to U.S. Missile Defenses

Several ongoing investments and modernization processes in Russia, China, and North Korea present challenges to current and future U.S. missile defense systems. Each of these countries sees the need to assure the ability of its nuclear warheads to penetrate U.S. homeland missile defenses as an essential requirement of nuclear deterrence.

Russia

Russia's ongoing strategic nuclear modernization includes several qualitative investments that are explicit responses to advances in U.S. homeland missile defense capabilities. These include the so-called 'March 1' set of systems memorably introduced by Russian President Vladimir Putin in speech to the country's Federal Assembly on that date in 2018. These systems include a nuclear-powered cruise missile and a nuclear-powered autonomous thermonuclear torpedo, among others. In his speech, Putin justified these investments as a response to the U.S. withdrawal from the ABM Treaty, which he described as the "cornerstone of the international security system."[19]

Five of the six systems introduced by the Russian president that day are designed to either directly evade midcourse missile defenses, or support the evasion of midcourse defenses by other systems. The under-development SS-X-29 *Sarmat* heavy ICBM, based in a hardened silo, is a traditional approach to countering missile defenses, featuring penetration aids and multiple warheads. The thermonuclear warhead-toting Poseidon unmanned underwater vehicle—designed for release by a submarine—bypasses midcourse missile defenses and potential future threats to manned submarines near their ports. The SS-19 Mod 4 *Avangard* introduces a hypersonic glide vehicle payload, which employs a nonballistic trajectory to deliver a

[19] President of Russia, "Presidential Address to the Federal Assembly," March 1, 2018, http://en.kremlin.ru/events/president/news/56957.

thermonuclear payload while spending the majority of its flight path at altitudes below GMD's engagement envelope. Despite apparent difficulties in testing, the SSC-X-9 *Burevestnik* nuclear-propelled cruise missile appears designed to leverage its apparent limitless range to introduce unpredictable azimuths of attack and possibly even loiter outside U.S. airspace in a crisis; as a cruise missile, it could be vulnerable to point defenses, but not to midcourse defenses. (It is largely infeasible for the United States to develop and deploy point defenses in sufficient quantities to defend all valuable targets.) Finally, the *Peresvet* road-mobile directed energy weapon appears designed to 'dazzle' and degrade U.S. space-based optical and radar sensors that might be used to track Russian road-mobile ICBMs for targeting or possibly cueing missile defenses. (The sixth and final system, *Kinzhal*, is a theater-range air-launched aeroballistic missile.)

One of the above systems, *Avangard*, is deployed and is accountable under New START. *Peresvet* is also deployed. The others are unlikely to be deployed during the remaining treaty lifespan of New START and, as a result, may be contentious topics in the pursuit of a follow-on treaty.

China

Sequential annual reports on the Chinese military, produced by the Department of Defense pursuant to a congressional requirement, have emphasized that recent qualitative nuclear modernization efforts in China—including the adoption of multiple warheads on certain Chinese ICBMs and the development of hypersonic boost-glide systems—are in part a response to current and future U.S. missile defenses. In 2014, DoD observed that China was "working on a range of technologies to attempt to counter U.S. and other countries' ballistic missile defense systems."[20] The 2020 iteration of this report further observed that Beijing's efforts to develop hypersonic and directed energy weapons were, among other rationales, driven by a Chinese interest in enabling the "defeat of missile defense systems."[21] U.S. investments in missile defense are also promoting

[20] *Military and Security Developments Involving the People's Republic of China 2014,* Office of the Secretary of Defense, *https://archive.defense.gov/pubs/2014_DoD_China_Report.pdf, pp. 30.*
[21] *Military and Security Developments Involving the People's Republic of China 2020,* Office of the Secretary of Defense, *https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF, pp. 148.*

China's ongoing modernization from a primarily land-based nuclear force to a full-scale triad, incorporating more survivable ballistic missile submarines and the PLA Air Force, which has readopted a nuclear mission as of 2019 after having no nuclear delivery role since the 1980s. Authoritative Chinese documents, including the 2013 edition of the People's Liberation Army's *Science of Military Strategy*, note that the "active development of a missile defense system by the U.S. and some of [China's surrounding nations" necessitates the "development of sea-based nuclear strength."[22] As Lt. Gen. Scott Berrier testified earlier this year before this committee, the U.S. Defense Intelligence Agency has assessed that China will double the size of its nuclear arsenal in the next decade.[23]

Chinese strategists have been particularly concerned about U.S. missile defenses in parallel with the development of increasingly precise conventional offensive weapons. Given the country's lean nuclear force size—estimated to be in a "low-200s,"[24] according to an unclassified Department of Defense assessment—one of the scenarios that Chinese strategists fear is a U.S. conventional strike, which might succeed in the destroying many of China's available land-based nuclear systems and associated command-and-control infrastructure, leaving whatever retaliatory capability then available subject to absorption by U.S. missile defenses. Chinese thinking on the nuclear relationship with the United States concedes the vast quantitative and qualitative advantages U.S. nuclear forces enjoy over Beijing's own nuclear capabilities. The predominant concerns that appear to have driven Chinese investments in nuclear modernization over the last decade are strategic missile defenses and advanced convention precision strike capabilities. In addition to its concerns regarding strategic missile defense, Beijing has expressed strong objections to the U.S. deployment of theater missile defense systems. In 2016 and 2017, Chinese officials strongly objected to the U.S. deployment of a THAAD battery in South Korea,

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[22] *Science of Military Strategy* (2013), unofficial translation by the China Aerospace Studies Institute, https://www.airuniversity.af.edu/Portals/10/CASI/documents/Translations/2021-02-08%20Chinese%20Military%20Thoughts-%20In%20their%20own%20words%20Science%20of%20Military%20Strategy%202013.pdf?ver=NxAWg4BPw_NylEjxaha8Aw%3d%3d, pp. 269.

[23] Scott Berrier, Statement for the Record: Worldwide Threat Assessment, Armed Services Committee, U.S. Senate, 2021, https://www.armed-services.senate.gov/imo/media/doc/2021%20DIA%20Annual%20Threat%20Assessment%20Statement%20for%20the%20Record.pdf.

[24] *Military and Security Developments Involving the People's Republic of China 2020.*

pointing to the possibility that the battery's powerful AN/TPY-2 radar could be integrated with current and future U.S. homeland missile defense systems to better enable the tracking and discrimination of Chinese nuclear warheads.[25] Despite its concerns, China rebuffed U.S. invitations to bilateral technical talks on the THAAD system.[26]

North Korea

As the most resource-constrained of the three nuclear-armed U.S. adversaries, North Korea's options are most limited for qualitatively coping with American missile defenses. However, Pyongyang appears to be investing in countermeasures and continues a quantitative build-up in its nuclear forces that was called for by leader Kim Jong Un directly during his January 1, 2018, New Year's Day address. As of May 2021, at least 10 unique launchers for intercontinental-range ballistic missiles have been seen in the country—six based on modified logging trucks imported from China in 2011 and four apparent indigenous ones. North Korea possesses two ICBM designs that have been flight-tested three times and has introduced three other ICBM designs that have yet to be flight-tested. The newest of these untested designs—seen at a military parade in October 2020—may be capable of accommodating advanced payloads, including multiple reentry vehicles[27] (MRVs) or a single large reentry vehicle supplemented by ballistic missile defense countermeasures. Pyongyang continues to maintain a network of survivable shelters, tunnel networks, and underground facilities in its mountainous northern provinces to complicate U.S. efforts to track and target its ICBM and other long-range missile launchers in a crisis. At the 8th Party Congress of the Workers' Party of Korea in January 2021, Kim Jong Un called for the development of more responsive solid propellant-based ICBMs and more advanced warheads. In these ways, the ballistic missile threat from North Korea remains significant and continues to grow.

[25] Ministry of Foreign Affairs of the People's Republic of China, "Wang Yi Talks about US's Plan to Deploy THAAD Missile Defense System in ROK," February 13, 2016, https://www.fmprc.gov.cn/ce/cgla/eng/topnews/t1340525.htm.
[26] Andrea Shalal, "U.S. Hopes for Talks with China about Possible THAAD Move to South Korea," *Reuters*, March 23, 2016, https://www.reuters.com/article/us-southkorea-usa-missiledefense-china-idUSKCN0WO2P2.
[27] MRVs are not to be conflated with MIRVs. The former release multiple reentry vehicles along the flight vehicle's ballistic trajectory while the latter allows for the independent targeting of multiple reentry vehicles at varied targets—through the use of a separate, powered "bus".

According to the Missile Defense Agency, 44 of a planned 64[28] Ground-Based Interceptors (GBI) for the GMD system—the BMD system chiefly designed to cope with the North Korean threat to the homeland—are currently emplaced.[29] Assuming that four such interceptors are available for use against each incoming North Korean reentry vehicle in a contingency, North Korea could saturate the existing GMD system in its ideal engagement mode with just 11 reentry vehicles. With 10 known ICBM launchers—at least four of which appear capable of accommodating a larger ICBM capable of delivering multiple reentry vehicles—Pyongyang's path to this goal is eminently achievable. At 64 deployed GBIs, the saturation point would shift to 16 reentry vehicles. The GMD system could cope with greater numbers by relying on two- or three-interceptors per incoming reentry vehicle, but this would come at the cost of reducing the system's overall expected effectiveness. The lack of robust North Korean flight-testing and the lack of any non-lofted flight-testing for its RVs lower the probability that all of Pyongyang's available ICBMs would perform as desired, but the risk of successful nuclear delivery by North Korea to the U.S. homeland is great enough to merit serious consideration in current and future planning. As Gen. Mark Milley, the chairman of the Joint Chiefs of Staff, emphasized in recent congressional testimony, North Korea's ICBMs present a "real danger" to the U.S. homeland.[30] Moreover, as early as 1999—one year after Pyongyang's launch of the *Taepodong-1* satellite launch vehicle, which birthed current U.S. homeland missile defense efforts—a U.S. intelligence community National Intelligence Estimate suggested that even resource and technology constrained states like North Korea would find the means to develop countermeasures.[31] NORTHCOM is aware of the shifting challenge from North Korea and has indicated that new

[28] Following the cancellation of the RKV, the next 20 interceptors for GMD are planned to be of the new NGI type.
[29] U.S. Missile Defense Agency, Ground-based Midcourse Defense (GMD), https://www.mda.mil/system/gmd.html.
[30] Statement of General Mark. A Milley, USA, 20th Chairman of the Joint Chiefs of Staff, Department of Defense Budget Hearing, House Appropriations Committee, Defense Subcommittee, May 27, 2021, https://docs.house.gov/meetings/AP/AP02/20210527/112682/HHRG-117-AP02-Wstate-MilleyM-20210527.pdf.
[31] U.S. National Intelligence Council, "Foreign Missile Developments and the Ballistic Missile Threat to the United States Through 2015," September 1999, https://fas.org/irp/threat/ missile/nie99msl.htm. The estimate offers the following assessment: "Many countries, such as North Korea, Iran, and Iraq probably would rely initially on readily available technology—including separating RVs, spin-stabilized RVs, RV reorientation, radar absorbing material (RAM), booster fragmentation, low-power jammers, chaff, and simple (balloon) decoys—to develop penetration aids and countermeasures."

qualitative developments in North Korea's missile capabilities could create "increased risk" for GMD as early as 2025.[32]

North Korea may be exploiting certain perceived gaps in the existing GMD system. For instance, GMD has yet to exhibit success against a target reentry vehicle in an intercept test carried out at "night"—where the exoatmospheric target in midcourse flight would be obscured by the earth's shadow and, as a result, exhibit a differing infrared signature from a daytime test, where it would be illuminated by the Sun. (Ground-based radar sensors are indifferent to these lighting conditions, but sensors on the interceptors' kill vehicle are not.) In 2017, North Korea conducted two of its three ICBM tests at nighttime (in July and November). These tests may have been designed to indicate a North Korean interest in operationalizing an ability to launch under conditions that Pyongyang may perceive to be least favorable for U.S. homeland missile defense capabilities as teste d and evaluated.

Separately, a new suite of quasiballistic short-range ballistic missiles in development in North Korea appear to be designed to stress U.S. and South Korean missile defense capabilities. Some of these missiles—including a system the U.S. intelligence community calls the KN23—appear to spend most of their flight path at altitudes above the maximum engagement altitude of Korean Peninsula-based PAC-3 systems, but below the minimum engagement altitude of THAAD. These systems could be armed with nuclear weapons should North Korea choose to do so in the future.

Limiting Defenses Amid Great Power Competition

The absence of any formal limits on U.S. homeland missile defense plans and deployments is harming U.S. national security interests by promoting our adversaries to pursue meaningful qualitative force build-ups. Relatedly, a lack of limitations is leading to ever-growing peacetime opportunity costs as MDA's ambitions continue to grow in response to evolving missile threats. During the Cold War, the United States and the Soviet Union were able to arrive at a shared

[32] Jason Sherman, "NORTHCOM: U.S. to Assume 'increased Risk' against North Korean ICBMs in 2025," InsideDefense.com, January 29, 2020, https://insidedefense.com/daily-news/northcom-us-assume-increased-risk-against-north-korean-icbms-2025.

understanding on the perils of mutual investment in ABM systems amid the arms race of the time in an environment of mistrust and amid competition. Matters are considerably more complicated today, for some of the reasons outlined above. Because the core source of insecurity for American adversaries—and the most likely source of arms race instability and crisis instability—is homeland, or strategic, missile defense, it would be prudent and sensible for Congress to consider and study the role of possible limitations in this area to support U.S. national security objectives, including in future arms control processes with Russia and/or China.

Candidate Approaches for Limitations

The planned 64 interceptors for GMD—even assuming they perform ideally—are wholly insufficient to neutralize anything but a small tranche of Russia's strategic nuclear forces. Nevertheless, Moscow's concerns about U.S. homeland missile defense remain prominent. China fears the effect GMD might have in a conventional or nuclear first-strike scenario, where its remaining retaliatory forces may be small enough to be fully absorbed by available GMD interceptors. At North Korea's current known ICBM force size, GMD remains nominally sufficient, but the system's less-than-ideal test record raises questions about its ability to perform in real world conditions. The replacement for GMD's currently deployed GBIs—the Next-Generation Interceptor (NGI)—has an uncertain future and independent cost estimates have suggested a roughly $13 billion figure.[33] These reasons make GMD the most obvious candidate system for potential limitation in exchange for reciprocal concessions from Russia and/or China.

Beyond GMD, the November 2020 test of an SM-3 Block IIA interceptor from an Aegis BMD guided-missile destroyer against an ICBM-class target complicates matters. This congressionally-mandated test has revealed that the Block IIA interceptor's latent counter-ICBM capability—a capability that had been acknowledged by MDA as early as 2008—may be more than nominal.[34] Because SM-3 Block IIA is designed for basing in the widely used and manufactured Mark 41

[33] Jen Judson, "Next-Gen Intercontinental Ballistic Missile Interceptor Estimated Cost? Nearly $18B," Defense News, April 27, 2021, https://www.defensenews.com/pentagon/2021/04/27/next-gen-intercontinental-ballistic-missile-interceptor-estimated-to-cost-nearly-18-billion/.
[34] Ankit Panda, "A New U.S. Missile Defense Test May Have Increased the Risk of Nuclear War," Carnegie Endowment for International Peace, November 19, 2020, https://carnegieendowment.org/2020/11/19/new-u.s.-missile-defense-test-may-have-increased-risk-of-nuclear-war-pub-83273.

Vertical Launch System canister, which exists on U.S. Navy ships, allied ships, and at Aegis Ashore installations alike, verifiably limiting this system will be an immense challenge. The United States might voluntarily limit further testing of the Block IIA interceptor against other ICBM-class targets; such a measure would require a radical rethinking of current plans for a layered homeland defense approach. The target missile used in the November 2020, despite being described as "threat representative" by MDA, exhibited a far shorter range and hence speed than the vast majority of notional Russian and Chinese ICBMs. (ICBMs are understood to be any missiles capable of ranging more than 5,500 kilometers; in practice, Russian, Chinese, and North Korean ICBMs would range greater distances to reach targets in the 48 contiguous U.S. states.) MDA could declassify details about the target used in the FTM-44 test, which could demonstrate that its "threat-representative" nature may be overstated. It could further refrain from testing the SM-3 Block IIA against any longer-range target missiles in the future.

Despite the verification difficulties associated with the Block IIA, one approach could be to explore, as part of an arms control process, a formal delineation of strategic and nonstrategic missile defense systems through certain technical parameters. One such approach was included in the September 1997 demarcation agreement between the United States and the Soviet successor states that remained party to the ABM Treaty (including Russia), which specified thresholds for interceptor and ballistic missile target missile velocities.[35] Given notional divergences between the burnout velocity of an SM-3 Block IIA interceptor and burnout velocities for current and future anticipated interceptors for the GMD system, such an approach could create the means to exclude SM-3 Block IIA from a broader cap on homeland missile defense interceptors. It bears noting, however, that SM-3 Block IIA's burnout velocity is greater than the 3 km/s threshold negotiated and agreed between the former ABM states parties in 1997.

Neither concession above should be on offer unilaterally or prior to the acceptance by either negotiating counterparty—Russia and/or China—to serious, sustained talks on the full range of

[35] First Agreed Statement Relating To The Treaty Between The United States Of America And The Union Of Soviet Socialist Republics On The Limitation Of Anti-Ballistic Missile Systems Of May 26, 1972, available at https://2009-2017.state.gov/t/avc/trty/101888.htm#sccdocuments.

issues that merit coverage in a future arms control agreement. Because such an agreement is far more likely to materialize with Russia in the short-term—given decades of bilateral experience in arms control—than with China, Congress and the administration should focus energies here. The basic requirement is to recognize that there is little chance to limit, let alone reverse, offensive nuclear arms racing if the United States is not willing at least to explore trade-offs that could be negotiated between offensive and defensive capabilities.

With Moscow, a willingness to discuss limitations on homeland missile defense could be useful leverage to address the matter of Russia's large inventory of Treaty-unaccountable nonstrategic nuclear weapons. It is possible that beyond the apparent strategic benefits of Russia's new 'March 1' systems in their ability to challenge U.S. midcourse missile defenses, Russia has pursued their development to seek leverage in future arms control talks. The Russian position ahead of potential talks on a New START-successor agreement has emphasized the role of offensive and defensive capabilities alike. Russian Foreign Minister Sergey Lavrov emphasized in May 2021 that "[e]verything that affects strategic stability (nuclear and non-nuclear arms, offensive and defensive weapons) must be on the negotiating table."[36]

With China, U.S. national interests could similarly be served by leveraging an opening on missile defense to seek additional transparency from Beijing on its nuclear and missile activities of concern. This is especially the case given the ongoing and future anticipated growth of China's nuclear warhead stockpile—a trend driven in large part due to anxieties over U.S. missile defense capabilities. Even if China's inexperience in bilateral arms control and aversion to transparency regarding its nuclear arsenal stand to lower the odds of formal talks, U.S. willingness to address missile defense through such a process can only serve as a useful inducement given strong Chinese interest in the matter. Arms control manifests out of a *mutual* interest in restraint, after all.

[36] "Foreign Minister Sergey Lavrov's Statement and Answers to Media Questions at a Joint News Conference Following Talks with Minister of Foreign Affairs and International Cooperation of the Republic of Sierra Leone David John Francis," May 17, 2021, https://www.mid.ru/foreign_policy/news/-/asset_publisher/cKNonkJE02Bw/content/id/4736245.

Finally, despite the long list of U.S. concerns with ongoing Russian and Chinese nuclear modernization, subjecting missile defense to possible limitations will allow for usefully limiting adversary investments in these technologies as well. As the U.S. Department of Defense has noted, both China and Russia possess and are developing missile defense systems that could pose a challenge for U.S. nuclear delivery systems.[37] Given that one of the core arguments in favor of proceeding with the Ground-Based Strategic Deterrent (GBSD) next-generation ICBM concerns its ability to better pace evolving adversary missile defenses, limitations could provide meaningful flexibility to U.S. nuclear modernization options.

The Risks of Limitations

Given that current homeland missile defenses exist to protect the homeland from a "limited" North Korean attack, the most serious short-term risk associated with limiting existing homeland missile defenses pertains to Pyongyang's force-sizing. Under a hypothetical arrangement with Russia that freezes GMD in its current stage and results in the cancellation of NGI, North Korea would need to produce just two more ICBM launchers to reach a point where its capabilities could theoretically, under ideal conditions, overwhelm GMD's optimal engagement mode of four-interceptors-per-reentry-vehicle.[38] (For the purposes of simplicity, this assumes no effort to destroy or degrade North Korea's launchers and command-and-control early in a conflict, and also that U.S defensive systems will be effective in realistic wartime conditions.) Efforts by Pyongyang to introduce multiple warheads or even modestly complex countermeasures and penetration aids (in the vein of the United Kingdom's Cold War-era *Chevaline* penetration aid, for instance) could complicate this further. This could be assuaged by simply readopting the 1974 ABM Treaty protocol quantitative limitation of 100 interceptors, which would allow U.S. homeland missile defenses to meaningful react to North Korean force changes in the coming

[37] "Missile Defense Becomes Part of Great Power Competition," U.S. Department of Defense, accessed May 26, 2021, https://www.defense.gov/Explore/News/Article/Article/2291331/missile-defense-becomes-part-of-great-power-competition/.

[38] An ongoing service life extension project is likely to lower the interceptor requirement per incoming reentry vehicle. Open sources do not indicate whether this has been implemented to date. Jason Sherman, "MDA: GMD SLEP Will Improve Interceptor Fleet While Waiting for NGI," InsideDefense.com, May 18, 2021, https://insidedefense.com/daily-news/mda-gmd-slep-will-improve-interceptor-fleet-while-waiting-ngi.

years. Pyongyang seeks to retain, at a minimum, a rudimentary capability to deliver nuclear weapons to the U.S. homeland and this is unlikely to change short of an unlikely transformation in the nature of the U.S.-North Korea relationship. As a result, it is conceivable that GMD interceptor constraints could grant North Korea an assured capability to hold the U.S. homeland at risk, which would represent a major source of risk to the homeland should strategic deterrence with Pyongyang fail. However, like Russia and China, the United States can seek to manage the risks posed by North Korea's growing arsenal by relying on nuclear and conventional deterrence. But by retaining a poorly tested homeland missile defense system, we risk the worst of all worlds: immense spending in peacetime on a capability that cannot perform as required in a conflict.

More National Security With Less National Missile Defense

Allow me to conclude with the idea that fewer missile defenses might manifest substantially greater national security for this country: this is not necessarily intuitive, but if the United States continues to be invested in the enterprise of nuclear deterrence and seeks *stable* nuclear deterrence, then it is in our interest to contemplate limitations.

With regard to future investments in missile defense, Congress should take a leading role in assessing the consequences of missile defense programs on strategic stability. **It would be prudent, for instance, to ask that the Department of Defense study and assess in depth the extent to which U.S. missile defenses are promoting adversary qualitative investments in more sophisticated offensive weapons.** Such a study could better inform U.S. investments in missile defense and the pursuit of future arms control.

Congress should further adopt a resolution acknowledging the inherent action-reaction relationship between strategic offensive and defensive arms in a global context. This premise already appears in the preamble to the 2010 New START Treaty and, as mentioned earlier, was the basis of early U.S.-Soviet arms control efforts. Adopting such a resolution would not be tantamount to an admission by this country that missile defense would have no role in the

defense of the nation; it would simply acknowledge, as Republicans and Democrats alike once did during the Cold War, that the arms race is fundamentally driven by perceived imbalances in offensive and defensive arms. It would also empower the ability of the United States to credibly seek limitations on existing and future Russian and Chinese homeland missile defense systems, reducing the need for the United States to expend additional resources on assuring our own ability to penetrate those defenses.

Finally, with regard to the future development pertaining to GMD, Congress should take a more active role in mandating that MDA conduct future tests with environmental and other stressors more reflective of real-world conditions. Future budgets should additionally demand transparency from MDA concerning the types of target missiles used in specific tests and the parameters used to evaluate success and failure. In particular, MDA witnesses before this chamber should be asked to offer technical justifications for why certain target missiles can be considered "threat-representative" given significant apparent divergences with real intercontinental missile threats. More specifically, given North Korea's observed flight-testing of ICBMs at nighttime, **Congress should mandate that MDA fully evaluate the ability of the GMD system to cope with nighttime intercepts.**[39] Congress should additionally require the testing of GMD against target missiles with countermeasures that are likely to be reflective of actual adversary practices (such as multiple dummy reentry vehicles exhibiting physical and infrared signatures similar to the target reentry vehicle). Some of this testing can also be incorporated into budgeting for the NGI, if that program proceeds as planned.

It strikes me as especially prudent to consider the opportunity costs associated with missile defense as we enter this decade. The trajectory of our relations with both Russia and China—and to a lesser extent, North Korea—remains poor. As a result, minor and major crises leading up to and crossing the threshold into war are not unimaginable. Given that these crises will be most sensitive to the U.S. military's efforts, in conjunction with our allies, in the realm of *conventional* deterrence, any measures that might moderate or slow the nuclear arms race can liberate

[39] The IFT-10 test in December 2002 for GMD did involve nighttime conditions, but resulted in a failed intercept due to the inability of the kill vehicle to successfully separate from the booster.

essential resources for allocation elsewhere. In addition to their salutary effects on strategic stability, strategic missile defense limitations can be fiscally prudent and facilitate ongoing efforts to deter, through conventional means, great power conflict. Theater missile defenses need not be subject to limitation, given their meaningful contribution to augmenting deterrence-by-denial in critical theaters.

In the case of the U.S. Navy and sea-based missile defenses, Congress should also be cognizant of the opportunity costs associated with the missile defense mission: any Aegis BMD-capable ship armed with interceptors and tasked with a homeland missile defense mission is unable to fulfill other requirements, including providing in-theater missile defense and, for instance, defending a carrier strike group against anti-ship ballistic missiles. **Congress should, as a result, request that the Secretary of Defense report annually on homeland ballistic missile defense operations by U.S. Navy assets, including the impact of these operations on overall force readiness.** These opportunity costs are likely to grow especially acute in the Indo-Pacific region.

The above recommendations can ensure that Congress plays a leading a role in steering this nation toward a strategically prudent and responsible missile defense policy—one that maximizes our national security interests while averting an unnecessary nuclear arms race at a time when conventional challenges loom large. In this regard, our choices with regard to homeland missile defense in the coming years stand to be immensely consequential: not solely with regard to nuclear stability, but also with regard to the ability of the United States to deter and manage the consequences of intensifying great power rivalries.