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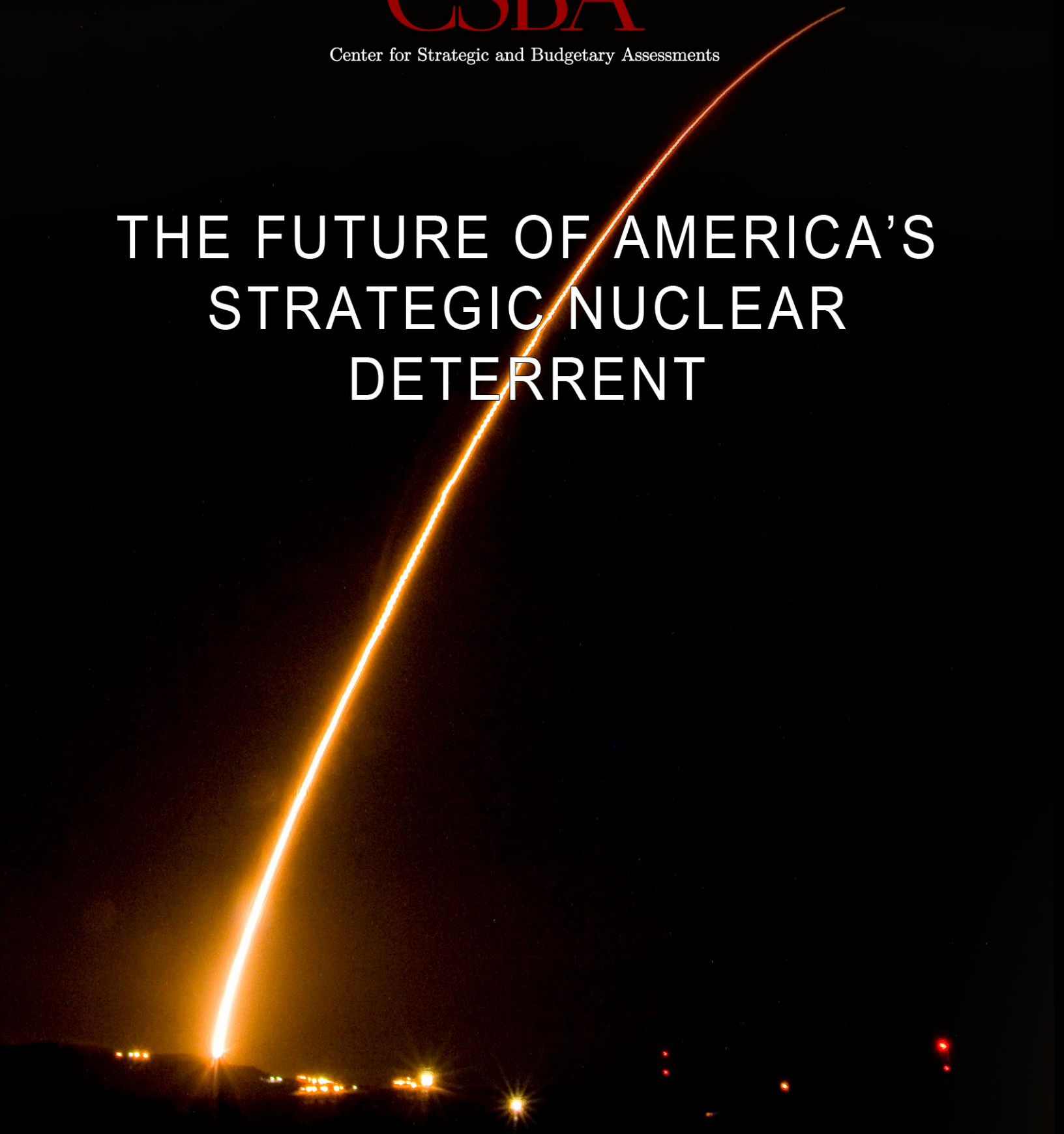
THE FUTURE OF AMERICA'S STRATEGIC NUCLEAR DETERRENT



EVAN BRADEN MONTGOMERY

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BY EVAN BRADEN MONTGOMERY

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Cover Picture: A Minuteman III intercontinental ballistic missile successfully launches at 1 a.m. Nov. 5 from Vandenberg Air Force Base, California. U.S. Air Force photo by Airman 1st Class Andrew Lee.

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EXECUTIVE SUMMARY

Nuclear weapons have played a critical role in American defense strategy and military planning for more than 60 years. Thanks to a confluence of factors, however, such as changing threats and growing fiscal constraints, U.S. nuclear forces are now under considerable scrutiny. For example, as great power competition has receded and concerns over proliferation and terrorism have increased, calls for the United States to substantially reduce the size of its arsenal and pursue the eventual elimination of nuclear weapons have become more prevalent. Meanwhile, declining defense budgets and looming recapitalization costs have also made nuclear weapons a popular target for potential funding cuts. Yet Washington still confronts a diverse array of nuclear security challenges: preserving strategic stability with a nuclear peer competitor, deterring nuclear use by rogue nations, dissuading arms races by smaller nuclear powers, and preventing non-nuclear states from crossing the nuclear threshold. What type of strategic nuclear arsenal does the United States need under these conditions? Should it retain the triad of bombers, land-based intercontinental ballistic missiles (ICBMs), and nuclear-powered ballistic missile submarines (SSBNs)? Must it replace its aging nuclear forces?

In general, arguments for a further drawdown in U.S. nuclear forces—either through cuts in arsenal size, reductions in force structure, the abandonment of modernization programs, or all three—suffer from several flaws. First, they reflect outdated and potentially counter-productive Cold War-era thinking. The theory that the two superpowers could preserve strategic stability with far fewer weapons, and should therefore maintain parity but at progressively lower force levels, made sense in the past. As Washington's quantitative margin of advantage over other nuclear powers declines, however, some friendly nations might lose confidence in its extended deterrence commitments (giving them an incentive to develop their own nuclear weapons), while potential competitors might build toward parity with the United States for strategic or symbolic reasons (taking advantage of a window of opportunity). Second, these arguments often focus on arsenal size at the expense of arsenal composition. But cutting force structure (for instance by eliminating bombers or ICBMs and relying more on SSBNs) would make it increasingly difficult to achieve a balance between survivability, promptness, flexibility, lethality, and visibility—some of the many weapons attributes that enable the United States to deter a variety of potential adversaries across a range of possible scenarios. Finally, by arguing that existing U.S. nuclear forces will remain

adequate in the decades ahead critics of planned modernization programs implicitly assume that the future security environment will not differ greatly from the present. Yet the conditions that have enabled the United States to make due with fewer nuclear weapons and avoid serious modernization efforts over the past two decades—including the absence of a hostile peer competitor and conventional military superiority over potential rivals—might not last.

This report contends that the United States should avoid significant reductions in the size of its nuclear arsenal below the ceiling established in the New START Treaty, forgo substantial cuts in nuclear force structure, and implement planned nuclear modernization programs across all three legs of the triad.

Ultimately, there are compelling reasons for the United States to maintain an arsenal that is large enough to dissuade other nations from pursuing nuclear parity, diverse enough to deter nuclear use across a wide range of scenarios, and viable long into the future. This report contends, therefore, that the United States should avoid significant reductions in the size of its nuclear arsenal below the ceiling established in the New START Treaty, forgo substantial cuts in nuclear force structure, and implement planned nuclear modernization programs across all three legs of the triad.

Specifically, SSBNs will continue to be the most important element of the United States' strategic nuclear deterrent. Not only are bombers at their bases and ICBMs in their silos more vulnerable to a disarming first strike, but the former cannot retaliate immediately in the event of an attack, while the latter offer comparatively limited targeting options given their high yield warheads as well as launch trajectories that would carry them over Russian territory to strike most potential targets in East Asia and the Middle East. Nevertheless, the need to modernize the existing but aging undersea fleet has generated controversy, largely because of the costs associated with designing and building a replacement for the current Ohio-class SSBNs. What critics of this program often fail to appreciate, however, is that forgoing the development of a new ballistic submarine would force the United States to rely on less stealthy platforms. Moreover, reducing the number of submarines the United States plans to purchase could create pressure to consolidate remaining boats at a single base, which would in turn leave them bound to a single ocean. Either scenario would reduce the survivability of the undersea deterrent—its most important attribute.

The bomber force, by contrast, has arguably been the least important leg of the triad since the deployment of intercontinental and submarine-launched ballistic missiles in the 1960s. Not surprisingly, this has fueled criticism of the Pentagon's modernization plans, which include fielding a new penetrating bomber, refurbishing many of the nuclear gravity bombs in the U.S. inventory, and replacing the air-launch cruise missile (ALCM) with a new standoff strike munition. Nevertheless, the bomber leg is likely to become far more relevant in the future, particularly if conventional precision-strike systems and nuclear weapons proliferate more widely. Specifically, the penetrating component will have the increasingly important role of providing conventional military options in highly contested environments. Because the spread of extended-range guided weapons could threaten the United States' ability to conduct expeditionary military operations by holding forward bases and non-stealthy aircraft at risk, platforms that can operate from range and penetrate defended airspace will become more critical for conventional deterrence, crisis stability, and power-projection. Both the penetrating and standoff components will also be tasked with providing limited nuclear options if necessary. Because the United States has no plans to build new nuclear warheads, bombers will remain the only strategic delivery systems capable of employing the only low-yield weapons that will remain in the U.S. stockpile—weapons that might be the most credible deterrent to a limited nuclear attack by a minor nuclear power.

Finally the importance of ICBMs has undoubtedly declined since the end of the Cold War. Yet significant cuts to this leg of the triad could introduce a source of instability in the future. In particular, the role of the ICBM leg as a potential "missile sink"—a force-in-being that maximizes the number of aim points an adversary would have to target in a first strike on U.S. nuclear forces—still has value. Ultimately, no opponent can seriously degrade the U.S. ICBM force without expending a disproportionate share of its own nuclear arsenal given the number of targets it would have to strike and the number of times it would have to strike them. The United States should, therefore, continue to extend the life of its Minuteman III ICBMs, although it should not yet embark on a wholesale replacement program.

In the end, there are credible reasons for the United States to forgo deep reductions in the size of its nuclear arsenal, avoid significant cuts in its nuclear force structure, and move ahead with planned nuclear modernization programs. By shrinking the arsenal and divesting force structure, Washington could find it increasingly difficult to simultaneously preserve strategic stability with a nuclear peer, deter nuclear use by hostile regional powers, and dissuade other nations from building nuclear weapons. Moreover, abandoning modernization efforts would be tantamount to major nuclear cuts given the age of existing warheads and delivery systems, the long timelines associated with developing new capabilities, and the fact that the United States no longer has the infrastructure or personnel in place to quickly begin producing nuclear weapons if necessary—a situation that will only grow worse over time.

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INTRODUCTION

Nuclear weapons have played a critical role in American defense strategy and military planning for more than 60 years. Nevertheless, they have always been surrounded by controversy. Despite a broad consensus on the necessity of strategic nuclear deterrence during the Cold War, policymakers and analysts in the United States consistently wrestled with a host of difficult questions: To what extent should Washington rely on nuclear weapons rather than conventional military forces to prevent wars if possible and fight them if necessary? What types of nuclear weapons provide the most secure, credible, and effective deterrent? How should extended deterrence commitments to American allies in Europe and Asia influence U.S. nuclear posture? What is the appropriate balance between countervalue targeting against an opponent's civilian population and counterforce targeting against its nuclear weapons and infrastructure?[1] Today, however, many of these issues seem antiquated. As a result, debates over the utility, role, and shape of U.S. nuclear forces are now characterized by a very different set of questions: Can the United States continue to shrink its nuclear arsenal? How many weapons can it cut, and which ones? How should it implement further reductions?

This is hardly surprising. In the aftermath of the Cold War, the spread of nuclear weapons to regional powers, fragile nations, and non-state actors became a much more pressing threat than great power arms races, brinkmanship, and war. As concerns over nuclear proliferation and nuclear terrorism increased, calls for the United States to substantially reduce the size of its arsenal and pursue the eventual elimination of nuclear weapons became more prevalent.[2] Advocates of nuclear abolition even found support at the highest levels of government.

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[1] Overviews of U.S. nuclear capabilities and strategy and how both have changed over time include Fred Kaplan, *The Wizards of Armageddon* (Stanford: Stanford University Press, 1983); Scott D. Sagan, *Moving Targets: Nuclear Strategy and National Security* (Princeton: Princeton University Press, 1989); and Lawrence Freedman, *The Evolution of Nuclear Strategy*, 3rd ed. (New York: Palgrave Macmillan, 2003).

[2] For example, see George P. Shultz, et al., "A World Free of Nuclear Weapons," *Wall Street Journal*, January 4, 2007; "Toward a Nuclear-Free World," *Wall Street Journal*, January 15, 2008; and "Deterrence in the Age of Nuclear Proliferation," *Wall Street Journal*, June 1, 2011.

President Barack Obama, for example, has declared his intention to move toward a nuclear weapons-free world, signed the New START Treaty with Russia, and announced his willingness to make additional reductions in U.S. strategic and tactical nuclear forces.[3] Thanks to the confluence of declining defense budgets and looming recapitalization costs, nuclear weapons have also become a popular target for potential funding cuts.[4]

Washington arguably confronts a more diverse array of security challenges than it did in the past: preserving strategic stability with a nuclear peer competitor, deterring nuclear use by rogue nations, dissuading arms races by smaller nuclear powers, and preventing non-nuclear states from crossing the nuclear threshold.

Yet these trends do not mean that the complexities of nuclear strategy, doctrine, and force structure are now irrelevant, or that additional nuclear reductions are necessarily warranted. Admittedly, the possibility of a massive nuclear attack on the United States or its allies has receded dramatically over the past two and a half decades. Nevertheless, Washington arguably confronts a more diverse array of security challenges than it did in the past: preserving strategic stability with a nuclear peer competitor, deterring nuclear use by rogue nations, dissuading arms races by smaller nuclear powers, and preventing non-nuclear states from crossing the nuclear threshold. In light of these changing conditions, this report explores what type of strategic nuclear arsenal the United States requires to meet existing, emerging, and prospective threats. Can it implement deep reductions in strategic nuclear weapons and still deter rivals, dissuade competitors, and discourage proliferation? Should it retain the strategic triad of bombers, land-based intercontinental ballistic missiles (ICBMs), and nuclear-powered ballistic missile submarines (SSBNs)? Finally, must it replace its aging nuclear forces?[5]

Reconsidering Nuclear Reductions

Proponents of a nuclear drawdown are not a uniform group. While some call for major cuts as an important step on the road to nuclear abolition, others support comparatively modest reductions in an effort to conserve resources. To varying degrees, however, most proponents of a drawdown advocate three distinct (but not mutually exclusive) measures: decreasing the size of the U.S. nuclear arsenal through reductions in deployed and reserve strategic warheads; divesting force structure by eliminating bombers, ICBMs, and/or SSBNs; and deferring, scaling back, or abandoning planned nuclear modernization programs. Yet arguments for cutting warheads, shedding force structure, and forgoing modernization suffer from serious limitations, including an outdated and potentially counterproductive emphasis on the U.S.-Russia nuclear balance, an excessive focus on arsenal size rather than arsenal

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[3] "Remarks by President Barack Obama," Prague, Czech Republic, April 5, 2009, available at http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered; and "Remarks by President Obama at Brandenburg Gate," Berlin, Germany, June 19, 2013, available at http://www.whitehouse.gov/the-press-office/2013/06/19/remarks-president-obama-brandenburg-gate-berlin-germany.

[4] For example, see Editorial, "The Bloated Nuclear Weapons Budget," *New York Times*, October 29, 2011; Michael O'Hanlon, "To Save Money, Look to Nukes," *Los Angeles Times*, November 16, 2011; and Walter Pincus, "Cutting the U.S. Nuclear Arsenal Can Help Cut the Deficit," *Washington Post*, November 12, 2012.

[5] Importantly, these issues are closely interrelated. Deep cuts in deployed warheads, delivery vehicles, or both could eventually make keeping all three legs fiscally unsustainable and operationally irrelevant. Likewise, failure to modernize existing nuclear weapons could eventually lead to obsolescence, attrition, and abandonment.

composition, and an optimistic assumption that the future will look much like the present, respectively.

Take the case for additional reductions in the number of strategic nuclear warheads, which rests on a simple premise: because the size of the U.S. arsenal was originally driven by the need to deter a Soviet attack, and because Washington and Moscow are no longer adversaries, it is possible to preserve strategic stability with far fewer weapons. Thus the two sides should continue to cap or reduce warhead numbers in tandem. Unfortunately, Cold War-era solutions may no longer be appropriate for post-Cold War challenges.

When the American and Soviet (and later Russian) arsenals dwarfed the arsenals of other nuclear powers by orders of magnitude, maintaining parity at progressively lower force levels made sense. After decades of reductions, however, further cuts could have unintended and unwelcome consequences, namely spurring both defensive and offensive nuclear proliferation. With the United States and Russia deploying fewer and fewer nuclear warheads, the differential in size between their arsenals and those of lessor nuclear powers (several of which are currently building up rather than drawing down) will progressively narrow.

If Washington's quantitative margin of advantage over its rivals and competitors continues to decline due to cuts in both its deployed and reserve warhead stockpiles, some friendly nations might lose confidence in its extended deterrence commitments, and could pursue their own nuclear programs to guarantee their security. At the same time, other nations might be tempted to move closer toward parity with the nuclear "superpowers," either for strategic or symbolic reasons. Eventually, this dynamic could lead to a multipolar world with three or more nearly equal nuclear-armed nations—a potentially unstable environment where shifting coalitions could quickly upend the nuclear balance.[6]

Conversely, one of the chief arguments for shedding force structure is that the United States could eliminate platforms and delivery systems *without* necessarily reducing the size of its nuclear arsenal. For instance, additional warheads could be deployed on individual submarine-launched ballistic missiles (SLBMs), enabling the United States to field a smaller fleet of SSBNs, decrease the number of ICBMs and bombers in its inventory, or both.[7] In principle, the United States could even eliminate ICBMs or bombers entirely, moving to a strategic dyad or monad without going to significantly fewer warheads.

Arsenal size is only one metric that can be used to judge the adequacy of U.S. nuclear forces, and it may not be the most appropriate one. Equally important is the composition of that arsenal.

Yet arsenal size is only one metric that can be used to judge the adequacy of U.S. nuclear forces, and it may not be the most appropriate one. Equally important is the composition of that arsenal. From this perspective, cutting force structure while preserving arsenal size could leave the United States with more vulnerable and less effective nuclear forces. For instance,

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[6] Evan Braden Montgomery, "Rethinking the Road to Zero," *Center for Strategic and Budgetary Assessments Backgrounder*, June 2013.

[7] For example, see Daryl G. Kimball, "Defuse the Exploding Costs of Nuclear Weapons," *Arms Control Today,* December 2012; Michael O'Hanlon, *A Moderate Plan for Additional Defense Budget Cuts,* Policy Paper No. 30 (Washington, DC: The Brookings Institution, February 2013), p. 21; and Tom Z. Collina, "Nuke the Budget," *Foreign Policy*, August 9, 2013.

by putting the same number of "eggs" in fewer "baskets," eliminating platforms and delivery systems has the potential to be destabilizing. If those reductions are large enough, then a nuclear peer competitor might one day believe that a counterforce attack has a better chance of degrading the United States' retaliatory capability, creating a dangerous first-strike incentive in a future crisis.

While the triad is a product of an earlier era, it still serves valuable functions. In particular, it guarantees that the United States would have the means to retaliate against an attacker if one or more legs were rendered non-functional, for example due to the discovery of a technical problem that afflicted the United States' aging warheads.

A diverse arsenal also enables nuclear planners to achieve a balance between a variety of attributes in addition to survivability, such as promptness (the ability to launch a nuclear strike immediately after the decision to do so), flexibility (the ability to hold at risk different types of targets), lethality (the ability to reliably neutralize those targets), and visibility (the ability to use nuclear forces to signal during a crisis). Maintaining that balance is likely to remain important. As discussed in greater detail below, not only must the United States preserve strategic stability with Russia while also deterring nuclear use by minor nuclear powers like North Korea, but the types of weapons that are most useful for the former may not be particularly suitable for the latter.

At the same time, while the triad is a product of an earlier era, it still serves valuable functions. In particular, it guarantees that the United States would have the means to retaliate against an attacker if one or more legs were rendered non-functional, for example, due to the discovery of a technical problem that afflicted the United States' aging warheads. It also provides a hedge against the prospect of a technological breakthrough that renders one or more legs increasingly vulnerable or much less reliable, such as new anti-submarine warfare (ASW) systems that place SSBNs at greater risk, or advances in air and missile defenses that decrease the likelihood of warheads reaching their targets.[8] In addition, the ability to deliver nuclear weapons via multiple delivery systems imposes costs on potential adversaries by forcing them to defend against several different methods and avenues of attack.[9]

Finally, by arguing that existing U.S. nuclear forces will remain adequate in the decades ahead, critics of planned modernization programs implicitly assume that the future security environment will not differ greatly from the present. Yet the conditions that have enabled the United States to make due with fewer nuclear weapons and forgo serious modernization efforts over the past two decades—including the absence of a hostile peer competitor and conventional military superiority over potential rivals—might not last. As former Secretary of Defense Robert Gates noted while in office, the U.S. nuclear arsenal is a crucial hedge against an uncertain future. Although it is impossible to predict how the world might change, one thing that is certain is that "adversaries and other nations will always seek whatever

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[8] William J. Perry (Chairman) and James R. Schlesinger (Vice-Chairman), *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States* (Washington, DC: United States Institute of Peace Press, 2009), pp. 25-26.

[9] The Obama administration has explicitly declared its intention to retain a nuclear triad, although this could become increasingly difficult to justify if the United States moves to a significantly lower number of warheads. Department of Defense, *Report on Nuclear Employment Strategy of the United States Specified in Section 491 of 10 U.S.C.* (Washington, DC: U.S. Congress, June 12, 2103), available at http://www.defense.gov/pubs/reporttoCongressonUSNuclearEmploymentStrategy_Section491.pdf.

advantages they can find." U.S. policymakers must, therefore, "be prepared for contingencies we haven't even considered."[10]

For instance, the United States could actually become *more* reliant on nuclear weapons over time due to a confluence of factors. Most importantly, additional regional powers might acquire nuclear weapons or the ability to produce them. As a result, Washington could take on extra security commitments to discourage those nations from committing acts of aggression and to dissuade their neighbors from pursuing their own nuclear capabilities. Meanwhile, the proliferation of precision-strike systems could erode the United States' military edge and make it increasingly difficult to uphold its expanding commitments with conventional forces alone. And downward pressure on military spending could grow. With manpower and procurement consuming the largest shares of the defense budget, the United States might do what it has done in the past, namely look to nuclear weapons to get more "bang for the buck." As outgoing Deputy Secretary of Defense Ashton Carter recently reminded an audience, "nuclear weapons don't actually cost that much."[11]

Under these conditions, forgoing critical modernization programs could be a dangerous gamble. In fact, because the United States faces tight timelines to ensure that new nuclear capabilities are available as existing capabilities reach the end of their projected service lives, and because it has not designed a new nuclear warhead or delivery system in approximately two decades, deferred modernization could be equivalent to deep and difficult-to-reverse nuclear cuts in both arsenal size and force structure.

Ultimately, there are compelling reasons for the United States to maintain an arsenal that is large enough to dissuade other nations from pursuing nuclear parity, diverse enough to deter nuclear use across a wide range of scenarios, and viable long into the future.

Ultimately, there are compelling reasons for the United States to maintain an arsenal that is large enough to dissuade other nations from pursuing nuclear parity, diverse enough to deter nuclear use across a wide range of scenarios, and viable long into the future. This report contends, therefore, that the United States should avoid significant reductions in the size of the U.S. nuclear arsenal below the ceiling established in the New START Treaty, forgo substantial cuts in nuclear force structure, and implement planned nuclear modernization programs across all three legs of the triad—although some programs should be prioritized over others given the changing strategic environment and growing budgetary constraints.

Plan of the Report

The remainder of this report assesses U.S. strategic nuclear forces in greater detail, including the past roles, changing missions, and relative importance of each leg of the triad. Chapter One argues that SSBNs will continue to underpin strategic nuclear deterrence as the most survivable element of the U.S. arsenal, but their survivability could be called into question if the size of the fleet shrinks over time. Although the bomber force has arguably been the least important leg of the triad since the deployment of ICBMS and SLBMs in the 1960s, Chapter Two argues that it is likely to become far more relevant as the threat from minor nuclear-armed powers grows. Put simply, because the United States has no plans to build new

[10] Federal News Service, "Gates: Nuclear Weapons and Deterrence in the 21st Century," *Carnegie Endowment for International Peace*, October 28, 2008, available at http://carnegieendowment.org/files/1028_transcrip_gates_checked.pdf.

[11] "Remarks by Deputy Secretary of Defense Carter at the Aspen Security Forum," Aspen, Colorado, July 18, 2013, available at http://www.defense.gov/transcripts/transcript.aspx?transcriptid=5277.

nuclear warheads, bombers will remain the only strategic delivery system capable of employing the only low-yield weapons that remain in the U.S. nuclear stockpile—weapons that might be the most credible deterrent to a limited nuclear attack by a minor nuclear power. Finally Chapter Three argues that the importance of ICBMs has undoubtedly declined since the end of the Cold War. Yet significant cuts to this leg of the triad could introduce a source of instability in the future because an adversary might be able to hold a large portion of the United States' remaining nuclear forces at risk with a much smaller number of its own nuclear weapons.

CHAPTER 1: UNDERSEA FORCES

The undersea leg of the U.S. strategic nuclear deterrent consists of 14 Ohio-class SSBNs, all of which are equipped with the Trident II D5 SLBM. Each boat contains 24 missile tubes, and each D5 missile can be armed with up to eight warheads—either the 100-kiloton W76 or the 455-kiloton W88. In reality, however, most SLBMs are equipped with only three to five warheads. To meet the limits on deployed strategic launchers outlined in the New START Treaty, four tubes in each SSBN will also be modified so that they can no longer be used to fire ballistic missiles.[12] Nevertheless, when the New START requirements take effect in 2018, the SSBN fleet will still account for an estimated 1,090 deployed strategic nuclear warheads, or approximately 70 percent of the total number allowed by the treaty.[13]

The Enduring Importance of the Undersea Deterrent

In addition to being armed with a significant portion of the nation's nuclear arsenal, the SSBN fleet has a number of qualitative characteristics that contribute to strategic stability. First and foremost, ballistic missile submarines are much less vulnerable to a preemptive, disarming strike than either bombers (which are no longer kept on alert status) or land-based

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[12] Amy Woolf, "U.S. Strategic Nuclear Forces: Background, Development, and Issues," *Congressional Research Service*, January 14, 2013; and Hans M. Kristensen and Robert S. Norris, "U.S. Nuclear Forces, 2013,"*Bulletin of the Atomic Scientists*, Vol. 69, No. 2 (2013).

[13] The 1,090-warhead estimate comes from the Obama administration's planned nuclear force structure and the New START Treaty's counting rules. The administration has announced that it will retain all 14 of the Navy's SSBNs but only 240 operationally deployed SLBM launchers, an average of 20 deployed launchers on each of the 12 SSBNs that are not in long-term overhaul at any one time. With 460 additional bombers and ICBMs available under the New START limit of 700 deployed strategic launchers, each bomber counting as only one warhead according to the treaty, and the administration's decision to "download" all ICBMs to a single warhead configuration, the undersea leg of the triad will account for 1,090 of the 1,550 operationally deployed warheads permitted by New Start. Of course, given the actual payload capacity of bombers (each B-52 is capable of carrying up to 20 ALCMs and each B-2 can carry up to 16 gravity bombs), in reality SSBNs will account for less than 70 percent of the deployed nuclear arsenal. On the administration's planned force structure, see Robert M. Gates, "Remarks to the Senate Armed Services Committee on New START," June 17, 2010, available at http://www.defense.gov/speeches/speech.aspx?speechid=1489.

Due to a number of factors it would be extraordinarily difficult for an opponent to locate, track, and destroy an SSBN at sea, let alone several SSBNs patrolling two oceans.

ICBMs (which are stored in fixed silos). Due to a number of factors—including the inherent opacity of the undersea environment, decades of investment in signature reduction technologies to avoid detection, operational deployment patterns, and the limited ASW capabilities of most potential adversaries—it would be extraordinarily difficult for an opponent to locate, track, and destroy an SSBN at sea, let alone several SSBNs patrolling two oceans. Survivability, of course, is crucial for deterrence because it ensures that nuclear weapons will always be available to launch a devastating retaliation, even in the aftermath of an attack on U.S. nuclear forces. Moreover, as the total number of warheads and delivery systems in the nuclear arsenal has declined, the importance of preserving the most survivable elements of that arsenal has correspondingly increased.

Second, SSBNs can hold a variety of targets at risk. Traditionally, U.S. nuclear strategy and doctrine have emphasized countervalue as well as counterforce targeting. The former seeks to deter adversaries by threatening their urban and industrial areas. By contrast, the latter is intended to limit the amount of damage the United States would sustain during an initial or follow-on attack, lend credibility to its extended deterrence commitments by providing limited nuclear options, and convince opponents that "winning" a nuclear conflict would be impossible because their leadership would be eliminated and their military forces destroyed. Importantly, ballistic missiles submarines offer some targeting flexibility because they carry two kinds of warheads with two different explosive yields. For example, the W88 warhead is one of the most powerful weapons in the U.S. nuclear arsenal and therefore provides a countervalue retaliatory option (although it was originally intended for use against hard counterforce targets during the Cold War).[14] Alternatively, because of their lower yield, W76 warheads are more likely to be used in a counterforce capacity if necessary (particularly now that several hundred of these warheads and their reentry vehicles have been modified to give them a hard-target kill capability that they originally lacked).[15] Like survivability, moreover, as the U.S. nuclear arsenal has diminished in size the importance of maintaining the most flexible weapons and delivery systems has only grown.

Finally, because SSBNs are mobile platforms that can operate over a vast area, they can also launch their SLBMs from locations that avoid sensitive and potentially dangerous flight paths, for instance trajectories that would carry ballistic missiles over the territory of one nuclear-armed nation to reach targets located in another. This ensures that the United States would not be self-deterred from conducting a nuclear strike by the possibility of triggering an unintended crisis with a second nuclear power.

The SSBN Modernization Debate

While there is little disagreement over the inherent virtues of SSBNs in meeting key U.S. security objectives, there is no consensus on the number of platforms needed to maintain a credible and effective undersea deterrent. For example, proponents of additional nuclear reductions have advocated cutting the size of the current SSBN fleet to only ten, eight, or as

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[14] Graham Spinardi, "Why the U.S. Navy Went for Hard-Target Counterforce in Trident II (And Why it Didn't Get Their Sooner)," *International Security*, Vol. 15, No. 2 (Autumn 1990), pp. 177-182.

[15] Hans M. Kristensen, "Administration Increases Submarine Nuclear Warhead Production Plan," *Federation of American Scientists*, August 20, 2007, available at http://blogs.fas.org/security/2007/08/us_tripples_submarine_warhead/.

few as six submarines.[16] Likewise, there is a significant debate in some circles over the planned SSBN recapitalization program, with some observers criticizing the intended scope of the effort and others rejecting the need for any modernization at all. This issue has become more urgent as the SSBN fleet has grown older, and more controversial as defense budget reductions have brought added scrutiny to high-profile procurement programs.

Specifically, Ohio-class ballistic missile submarines are now approaching the latter stages of their expected service lives, which have already been extended from 30 years to 42 years. The first boat is due to retire in 2027, with additional boats exiting the fleet at a rate of one per year until the final Ohio-class SSBN is retired in 2040. To replace the current fleet, the Navy intends to build a new class of SSBNs, the as-yet unnamed Ohio-Replacement. Rather than building 14 new SSBNs, however, current plans call for procuring only 12 new platforms. Because the nuclear propulsion plant at the heart of the Ohio-Replacement will not need to be refueled during a boat's mid-life overhaul, a process that can take several years or more, the new fleet is expected to have a higher rate of availability than Ohio-class SSBNs. As a result, 12 Ohio-Replacement SSBNs should provide the Navy with 10 available boats at all times (barring unforeseen factors that might negatively impact operational availability), enabling it to maintain the same continuous presence at sea that it has today (reportedly four or five boats on some type of alert status, with two or three patrolling in the Pacific Ocean and two patrolling in the Atlantic Ocean).[17]

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Nevertheless, the anticipated price tag of the Ohio-Replacement program is considerable. In an effort to reduce costs, the Navy has made several modifications to the original design: decreasing the number of planned missile tubes from 20 to 16, forgoing a larger diameter missile tube, and incorporating various components from its Virginia-class attack submarines (SSNs). According to the Congressional Budget Office (CBO), however, the entire program will still cost an estimated $97-$102 billion over the next several decades, including $10-$15 billion in research and development (R&D) and another $87 billion to procure all twelve boats. Alternatively, the Government Accountability Office (GAO) has assessed that the overall program cost will be slightly lower, or approximately $93 billion for R&D and procurement.[18]

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[16] See, respectively, Global Zero U.S. Nuclear Policy Commission Report, *Modernizing U.S. Nuclear Strategy, Force Structure and Posture* (2012), p. 7; Michael O'Hanlon, *A Moderate Plan for Additional Defense Budget Cuts*, p. 21; and Benjamin H. Friedman and Christopher Preble, "Budgetary Savings from Military Restraint," *Policy Analysis* No. 667, September 23, 2010, p. 8.

[17] Ronald O'Rourke, "Navy Ohio Replacement (SSBN[X]) Missile Submarine Program: Background and Issues for Congress," *Congressional Research Service*, March 14, 2013, pp. 2-3, 10; Amy Woolf, "Modernizing the Triad on a Tight Budget," *Arms Control Today*, January/February 2012; and Elaine Grossman, "U.S. Navy to Grapple with Dip in Deployed Subs for More than a Decade," *Global Security Newswire*, March 30, 2012.

[18] CBO, *An Analysis of the Navy's Fiscal Year 2014 Shipbuilding Plan* (Washington, DC: October 2013), p. 24; and GAO, *Defense Acquisitions: Assessment of Selected Weapons Programs* (Washington, DC: March 2013), p. 145.

Not surprisingly, then, many of the same critics that recommend shrinking the existing SSBN fleet also advocate abandoning, delaying, or cutting back the Ohio-Replacement program. For example, the Global Zero organization has called for postponing the acquisition of new ballistic missile submarines.[19] Because of the scheduled retirement of Ohio-class SSBNs and the Obama administration's decision to defer procurement of the first Ohio-Replacement by two years, a further delay would be tantamount to reducing the overall size of the SSBN fleet, which will already shrink from 14 boats to as few as 10 throughout the 2030s.[20] Likewise, respected defense analyst Michael O'Hanlon has argued that new SSBNs are unnecessary given prospective threats and current budget shortfalls.[21] A critical issue, then, is whether the United States needs new SSBNs and, if so, how many it should acquire.

Given the central role of the SSBN fleet for nuclear deterrence and the looming retirement of Ohio-class boats, there is little choice except to begin constructing new ballistic missiles submarines in the near future.

The Sources of Survivability

Given the central role of the SSBN fleet for nuclear deterrence (a point that even skeptics of a replacement program accept) and the looming retirement of Ohio-class boats (which will soon be the oldest submarines ever operated by the United States), there is little choice except to begin constructing new ballistic missiles submarines in the near future. Although there are possible substitutes for the Ohio-Replacement program, each one has significant financial and operational drawbacks.

Two alternatives that have been considered by the Navy and debated in the press are building modified Virginia-class SSNs and restarting production of Ohio-class SSBNs. Although both options might be less expensive to design and build, at least individually, the cost savings in either case might not be as great as some proponents assume. For instance, a modified SSN capable of launching SLBMs would have to be procured in greater numbers than new ballistic submarines in order to maintain the same level of presence at sea, because these boats would have to undergo an extended mid-life overhaul and refueling process. Alternatively, building new Ohio-class SSBNs would necessitate reopening a production line that has been shuttered since the 1990s, which would introduce significant start-up costs and limit the use of more recent and cost-effective manufacturing processes.

In addition, neither alternative is likely to produce a boat as survivable as a newly designed ballistic missile submarine—a particular concern given that the next generation of SSBNs is expected to remain in service into the 2080s.[22] Notably, because attack submarines have a much smaller length and diameter than ballistic missile submarines, an SSN armed with

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[19] Global Zero US. Nuclear Policy Commission Report, *Modernizing U.S. Nuclear Strategy, Force Structure and Posture*, pp. 12-13.

[20] Ronald O'Rourke, "Navy Ohio Replacement (SSBN[X]) Missile Submarine Program," pp. 10-11. This reduction is considered acceptable by the Navy, because during these years all 10 of the SSBNs in service will be operational (i.e., none of them will be in the midst of a mid-life overhaul).

[21] Michael O'Hanlon, *A Moderate Plan for Additional Defense Budget Cuts*, p. 21.

[22] Ronald O'Rourke, "Navy SSBN(X) Ballistic Missile Submarine Program: Background and Issues for Congress," *Congressional Research Service*, June 10, 2010, pp. 18-22; Elaine M. Grossman, "Pentagon Said Likely to Back New Design for Ballistic Missile Submarine," *Global Security Newswire*, December 21, 2010; and Rear Adm. Barry Bruner, "Next-Generation Ohio Class," *Navy Live*, September 24, 2012, available at http://navylive.dodlive.mil/2012/09/24/ next-generation-ohio-class/.

SLBMs would need a large insert in its hull (which would decrease the speed and increase the signature of the platform) or a new, smaller, and shorter-range ballistic missile (which could require SSBNs to conduct their patrols in closer proximity to potential targets).[23] Alternatively, while Ohio-class submarines would not require an extensive structural redesign or entirely new armaments, rebuilding a platform that was designed several decades ago would limit the signature reduction technologies that could be incorporated—perhaps most importantly the electric drive system that is expected to make the Ohio-Replacement far quieter than its predecessor.

What about decreasing the number of Ohio-Replacements that the Navy plans to purchase? This option would obviously reduce procurements costs, which are expected to average between $5 and $7 billion per boat.[24] Yet these savings would not be achieved for decades, because of the need to field new SSBNs as Ohio-class boats begin exiting the fleet in the late 2020s. The price per unit would almost certainly increase as well if fewer platforms were acquired due to lost economies of scale. More importantly, though, procuring fewer Ohio-Replacements could also increase the vulnerability of the undersea deterrent.

The high degree of survivability that characterizes the SSBN fleet not only stems from the opaque undersea environment and advanced acoustic signature reduction technologies; it is also a product of how many boats are operationally deployed and where those boats conduct deterrent patrols.

The high degree of survivability that characterizes the SSBN fleet not only stems from the opaque undersea environment and advanced acoustic signature reduction technologies; it is also a product of how many boats are operationally deployed and where those boats conduct deterrent patrols. All else being equal, the more SSBNs that are on patrol at any given time, the greater the likelihood that some boats would survive an attack by a determined and capable adversary—an unlikely scenario today, but perhaps not at some point over the next seven decades. Equally important, because SSBNs operate in the Atlantic and Pacific, any opponent attempting to threaten the undersea leg of the triad would confront a daunting "two ocean problem." Not only would it have to invest in large numbers of ASW assets, but it would also have to disperse those assets across the globe. This enhances the survivability of U.S. SSBNs, dissuades potential rivals from developing sufficient ASW capabilities to threaten them, and imposes substantial costs on any adversary that might attempt to do so. By procuring fewer Ohio-Replacements, however, the United States might eventually find itself patrolling a more geographically limited area, enabling a future opponent to concentrate its ASW forces.

At present, the SSBN fleet is divided between two naval bases: Bangor, Washington and Kings Bay, Georgia.[25] With a smaller fleet, however, the Navy could face significant pressure to consolidate all of its SSBNs at one base (in all likelihood Bangor given the growing strategic importance of the Western Pacific), which would leave them bound to a

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[23] The need to design and build a new missile from scratch would also increase the costs associated with a modified Virginia-class SSBN.

[24] CBO, *An Analysis of the Navy's Fiscal Year 2014 Shipbuilding Plan,* pp. 23-24. The first Ohio-Replacement is estimated to cost $12-$13 billion, however, due to additional non-recurring costs.

[25] While the majority of SSBNs were previously home ported on the east coast, that balance has since changed due to the growing strategic importance of the Western Pacific region. At present only six SSBNs are home ported at Kings Bay, while eight are home ported at Bangor. O'Rourke, "Navy Ohio Replacement (SSBN[X]) Missile Submarine Program," p. 3.

single ocean.[26] While the Pacific is an enormous operating area, this would still reduce the difficulty that a prospective adversary (or combination of adversaries) would confront if it sought to threaten the undersea leg of the triad.

Critics often fail to appreciate the lack of suitable alternatives to a new ballistic missile submarine and, just as importantly, the inherent long-term risks of reducing the size of the fleet.

Conclusion

There is a broad consensus among analysts and policymakers that the SSBN fleet is and will remain the most important element of the United States' strategic nuclear deterrent.[27] Not only are bombers at their bases and ICBMs in their silos more vulnerable, but the former cannot retaliate immediately in the event of an attack, while the latter offer comparatively limited targeting options given their high yield warheads and launch trajectories that would carry them over Russian territory to strike most potential targets in East Asia and the Middle East. Nevertheless, the need to modernize the existing but aging SSBN fleet has generated significant controversy, largely because of the Ohio-Replacement program's cost. Yet critics often fail to appreciate the lack of suitable alternatives to a new ballistic missile submarine and, just as importantly, the inherent long-term risks of reducing the size of the fleet.

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[26] Ibid. p. 29.

[27] For example, see Global Zero U.S. Nuclear Policy Commission Report, *Modernizing U.S. Nuclear Strategy, Force Structure and Posture*; Jeff Richardson, "Shifting from a Nuclear Triad to a Nuclear Dyad," *Bulletin of the Atomic Scientists*, Vol. 65, No. 5 (September/October 2009); Dana Johnson, Christopher J. Bowie, and Robert P. Haffa, *Triad, Dyad, or Monad*? *Shaping the U.S. Nuclear Force for the Future,* Mitchell Paper 5 (Mitchell Institute for Airpower Studies: Mitchell Institute Press, December 2009); and Kurt Guthe, "Deterrence, the Triad, and Dyads," in Barry R. Schneider and Patrick D. Ellis, eds., *Tailored Deterrence: Influencing States and Groups of Concern* (Maxwell AFB: USAF Counterproliferation Center, 2011), p. 318.

CHAPTER 2: BOMBER FORCES

The second component of the nuclear triad is the bomber leg, which includes a standoff nuclear strike capability (B-52H aircraft that can release air-launched cruise missiles (ALCMs) from beyond the range of enemy air defenses) and a penetrating capability (B-2 aircraft that can release gravity bombs directly over enemy targets). At present, the U.S. Air Force maintains a fleet of 76 nuclear-capable B-52Hs, 44 of which are combat-coded (meaning they are available for nuclear strike operations rather than being designated for non-combat functions such as training missions), along with 18 nuclear-capable B-2s, 16 of which are combat-coded.[28] To meet its obligations under the New START Treaty, the Obama administration plans to keep up to 60 nuclear-capable bombers, including all 18 nuclear-capable B-2s. As a result, a number of B-52Hs will be converted for conventional strike use only.[29]

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[28] Woolf, "U.S. Strategic Nuclear Forces: Background, Development, and Issues"; and Kristensen and Norris, "U.S. Nuclear Forces, 2013." Although the B-1B bomber was initially designed as a nuclear-strike platform, it has since been converted to a conventional-strike role. While the B-52 can deliver gravity bombs, it cannot reliably penetrate modern air defense systems to deliver them, and therefore would only be used in a nuclear role as a delivery platform for cruise missiles.

[29] Gates, "Remarks to the Senate Armed Services Committee on New START"; and Department of Defense, *Nuclear Posture Review Report* (April 2010), p. 24. How many B-52s will retain their nuclear strike mission is unclear because the administration's planned force structure—up to 60 nuclear-capable bombers, up to 420 ICBMs, and 240 SLBM launchers—exceeds the ceiling of 700 deployed strategic delivery systems established in the New START Treaty. This suggests that 20 additional deployed ICBMs or bombers (or some combination of the two) will have to be removed from the active inventory by 2018.

The Changing Roles of the Bomber Fleet

During the early years of the Cold War strategic bombers were the only nuclear delivery platform available to the United States. As land-based and submarine-launched ballistic missiles became operational and the bomber lost its unique status, the oldest leg of the triad gradually became valued for a diverse set of characteristics other than its ability to deliver large numbers of nuclear weapons. To varying degrees, many of these attributes are still relevant today.

First, bombers are much more visible than either ICBMs or SSBNs, and can therefore be used to send signals during peacetime, during a crisis, or in the midst of a conflict. Bombers can be put on alert, deployed from their bases in the continental United States to locations overseas, or used to conduct high profile non-combat missions. In early 2013, for example, Washington dispatched a pair of B-2 bombers on a training mission to the Korean peninsula in response to North Korea's nuclear threats against South Korea and the United States, a move that was intended to serve as a demonstration of American resolve to defend a treaty ally.[30] Second, bombers can have an important cost-imposing function by compelling opponents to invest in expensive but relatively non-threatening air defense systems to protect their territory, particularly if they must defend against both penetrating and standoff weapons. Third, bombers can avoid sensitive or dangerous flight paths by adapting the routes they take to their targets.

Fourth, bombers grant policymakers a level of control that other delivery systems do not. One of the greatest dangers during a crisis involving nuclear-armed nations is the possibility that mistakes could occur, signals could be misinterpreted, and events could quickly spiral out of control with horrendous consequences. A reliance on ballistic missile delivery systems does little to ameliorate these concerns and can even exacerbate them; not only does their extremely short time of flight provide little warning in the event of an attack, but they cannot be recalled or diverted after being launched. By contrast, the comparatively slow speed of aircraft means that decision times are not radically compressed during a crisis, while the use of manned delivery platforms provides the opportunity to abort a nuclear attack after it is ordered but before a weapon is actually released.

The bomber fleet offers a high degree of targeting flexibility given its ability to deliver a more diverse array of munitions than either SLBMs or ICBMs.

Finally, the bomber fleet offers a high degree of targeting flexibility given its ability to deliver a more diverse array of munitions than either SLBMs or ICBMs. For instance, the B83 gravity bomb has a maximum yield of 1.2 megatons, making it the largest remaining weapon in the U.S. nuclear arsenal. The variable yield B61-7 gravity bomb can detonate with a force as small as 10 kilotons or as large as 360 kilotons, while the newer B61-11 is an earth-penetrating weapon with a yield of several hundred kilotons. Finally, the W80-1 warhead on the ALCM has an adjustable yield ranging from five kilotons to 150 kilotons.[31]

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[30] Thom Shanker and Choe Sang-Hun, "U.S. Runs Practice Sortie in South Korea," *New York Times*, March 28, 2013.

[31] Robert S. Norris and Hans M. Kristensen, "U.S. Nuclear Warheads, 1945-2009," *Bulletin of the Atomic Scientists* (July/August 2009). Current plans call for the B83 and the B61-11 warheads to be retired following the life extension of the remaining B61 variants, a program that is discussed below. "Statement of the Honorable Madelyn R. Creedon, Assistant Secretary of Defense for Global Strategic Affairs, Before the House Armed Services Committee Strategic Forces Subcommittee," October 29,

Collectively, these weapons allow the United States to hold at risk large area targets such as cities and discrete targets such as military forces, and therefore to execute a massive retaliation or conduct far more limited nuclear strikes.

Although the bomber leg was retained to preserve the triad, it has repeatedly been scaled back since the end of the Cold War.

The Bomber Modernization Debate

The importance of nuclear bombers has fluctuated considerably over time. Despite accounting for the bulk of U.S. strategic nuclear delivery systems during the first half of the Cold War, bombers were eventually supplanted by ICBMs and SLBMs, which provided a more secure, prompt, reliable, and efficient way to deliver nuclear weapons—particularly after the United States developed the technology to arm individual missiles with multiple, independently targetable reentry vehicles (MIRVs). Although the bomber leg was retained to preserve the triad, it has repeatedly been scaled back since the end of the Cold War. Over the past two decades the Department of Defense opted to procure only 21 B-2 bombers rather than 132 as originally planned; it stripped the B-1B fleet of its nuclear mission; it retired the nuclear-armed Advanced Cruise Missile; and it cut the inventory of older and less stealthy ALCMs in half. Individually, these decisions have resulted in a much smaller bomber force. Collectively, they have led some analysts to characterize the U.S. nuclear arsenal as "a de facto dyad."[32]

There are, however, plans in place to modernize both the penetrating and standoff components of the bomber leg.

- First, the Air Force plans to procure 80-100 new long-range strike bombers (LRS-B), a penetrating aircraft that will supplement and eventually replace the B-2. According to public reports, these platforms are expected to cost $550 million each and will begin entering the force around 2025.[33]

- Second, the United States is modernizing all but the newest B61 nuclear gravity bombs in its arsenal, including the "strategic" variant carried by B-2 (the B61-7) as well as the "tactical" variants that can be delivered by dual-capable fighter aircraft (the B61-3, B61-4, and B61-10). All four versions will be consolidated into a single modification (the B61-12), creating a common pool of gravity bombs that can be carried by nuclear-capable fighters and bombers alike. The first B61-12s are expected to enter into service in 2020, and the refurbished weapons will remain in service for 30 years.[34]

2013, p. 2, available at http://docs.house.gov/meetings/AS/AS29/20131029/101355/HHRG-113-AS29-Wstate-CreedonM-20131029.pdf.

[32] Johnson, Bowie, and Haffa, *Triad, Dyad, or Monad*? *Shaping the U.S. Nuclear Force for the Future*, p. 19.

[33] Kristensen and Norris, "U.S. Nuclear Forces, 2013," p. 83.

[34] GAO, *Nuclear Weapons: DOD and NNSA Need to Better Manage Scope of Future Refurbishments and Risks to Maintaining U.S. Commitments to NATO* (May 2011); and "Statement of the Honorable Madelyn R. Creedon," p. 4. The B61-11, an earth-penetrating weapon that is newest variant of the B61, is not included in this modernization program.

- Third, the life of the ALCM is being extended until 2030, at which point it will be replaced by the long-range standoff (LRSO) cruise missile, a program that is in the early stages of research and development, is scheduled to begin production in the mid-2020s, and is estimated to cost at least $1.3 billion.[35]

Despite their unique attributes, air-breathing nuclear forces have arguably made only a modest contribution to strategic nuclear deterrence since the end of the Cold War. It is hardly surprising, therefore, that these modernization efforts have been heavily criticized in some quarters as overpriced and anachronistic. With a $55 billion price tag for the LRS-B program and $10 billion needed for the B61 life extension, plans to maintain and upgrade the penetrating component of the bomber leg are likely to receive the most intense scrutiny as defense budgets go down. Are they worthwhile? Answering that question requires putting these investments in a broader strategic context and considering the specific roles that these forces are likely to play in the future—not only for nuclear deterrence but for conventional deterrence as well.

The bomber leg of the triad (especially the penetrating component of the bomber leg) will have the dual roles of providing conventional military options in highly contested environments and limited nuclear options against hostile nuclear powers.

Conventional Power-Projection and Limited Nuclear Options

Looking ahead, two developments in particular could impact the United States' ability to deter aggressive nations, preserve crisis stability in key regions, and project military power abroad in defense of its interests and allies: the proliferation of both conventional precision-strike systems and nuclear weapons. As these distinct but potentially overlapping trends play out over time, the capability to operate from range, penetrate defended airspace, and deliver variable-yield nuclear weapons is likely to become increasingly important. Specifically, the bomber leg of the triad (especially the penetrating component of the bomber leg) will have the dual roles of providing conventional military options in highly contested environments and limited nuclear options against hostile nuclear powers.

Consider the LRS-B. Like the B-52 and the B-2, any new bomber will operate primarily as a conventional strike platform despite having a nuclear mission. In fact, it is likely to play a major role in conventional deterrence, crisis stability, and power-projection as guided weapons proliferate—especially extended-range weapons that could threaten the United States' ability to conduct expeditionary military operations. Armed with accurate ballistic and cruise missiles, a future adversary could launch attacks against forward operating locations, impeding flight operations and reducing sortie rates for land-based tactical aircraft. Equipped with advanced air defenses, an opponent could also force non-stealthy surveillance, strike, and refueling aircraft to operate far outside of its airspace. Under these conditions, long-range, low-observable systems might be some of the only platforms capable of reliably conducting combat operations, particularly in the early stages of a conflict.

With sufficient range and stealth, an aircraft like the LRS-B could operate independently of vulnerable theater air bases and inside of defended airspace to hold at risk a variety of targets, including mobile targets that can relocate while standoff weapons are in flight and hardened or deeply buried targets that can only be destroyed by munitions too large to be carried by cruise missiles. Of course, the United States already has a penetrating long-range

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[35] Elaine M. Grossman, "Pentagon Eyes More Than $800 Million for New Nuclear Cruise Missile, *Global Security Newswire*, March 9, 2010.

strike aircraft in the B-2, which is expected to remain in service until 2050.[36] Nevertheless, there are only a handful of B-2s in the force, and these platforms may not be able to survive against increasingly sophisticated air defenses in the decades ahead. As one senior Air Force official recently explained, the ability of the B2 to operate in contested environments "will be challenged by next generation air defenses and the proliferation of these advanced systems."[37]

Even so, must the LRS-B have a nuclear mission as well? As one critic has argued, "the rationale for a nuclear version seems to boil down to little more than we need them because we've always had them."[38] With a compelling need for a long-range conventional strike platform, perhaps the better question is: why not build a dual-capable aircraft? Even if a new bomber does not go through the testing process required for nuclear certification at the outset,[39] the additional expense of incorporating the hardware needed to deliver nuclear weapons is relatively modest (approximately three percent of total procurement costs), whereas the cost of making a bomber nuclear-capable retroactively is almost certainly prohibitive.[40]

What about the nuclear weapons that existing and future penetrating bombers will carry, in particular the B61 gravity bomb? Does the United States need to modernize these munitions if its long-range strike aircraft will principally be employed in a conventional combat role? In fact, the importance of bombers for nuclear deterrence could increase due to the growing disconnect between the types of nuclear threats the United States is likely to confront and the type of nuclear arsenal it will continue to field.

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[36] General C.R. Kehler, Commander, United States Strategic Command, "Statement before the House Committee on Armed Services," March 5, 2013, available at http://www.stratcom.mil/files/2013-03-05-posture.pdf, p13.

[37] Lieutenant General James M. Kowalski, Commander, Air Force Global Strike Command, "Status of Air Force Nuclear and Strategic Systems," Presentation to the Senate Armed Services Committee Strategic Forces Subcommittee, United States Senate, p.8 available at http://www.airforcemag.com/testimony/Documents/2013/April%202013/041713kowalski.pdf.

[38] Tom Nichols, "Time To Change America's Atomic Arsenal," *The Diplomat*, March 14, 2013, available at http://thediplomat.com/2013/03/14/time-to-change-americas-atomic-arsenal/.

[39] Current plans call for the next-generation bomber to be "nuclear capable" at initial operational capability (IOC), and "nuclear certified" two years after IOC. Major General Garrett Harencak, "Presentation to the Senate Armed Services Committee Subcommittee on Strategic Forces, United States Senate," April 17, 2013, p. 3, available at http://www.armed-services.senate.gov/statemnt/2013/04%20April/Harencak_04-17-13.pdf.

[40] Mark A. Gunzinger with Christopher Dougherty, *Sustaining America's Advantage in Long-Range Strike* (Washington, DC: Center for Strategic and Budgetary Assessments, 2010), pp. 76-78; and Undersecretary of Defense for Policy Jim Miller, "Nuclear Deterrence: New Guidance and Constant Commitment," Transcript, Reserve Officers Association, National Defense Industrial Association, and Air Force Association Capitol Hill Breakfast Forum, July 17, 2013, available at http://secure.afa.org/HBS/transcripts/2013/July%2017%20-%20Miller2.pdf.

During the Cold War, nuclear strategy, planning, and procurement were all shaped by the need to deter an attack by the Soviet Union. Today, the prospect of a massive assault by a great power armed with thousands of nuclear weapons has thankfully receded. Instead, a much more likely threat is that a minor nuclear power armed with a relatively small arsenal might conduct a limited nuclear strike against frontline U.S. allies or forward-deployed U.S. forces. For example, if the United States were in a conflict with a nuclear-armed rogue nation, the latter might be willing to escalate a conventional war in the hope of forestalling defeat (and, by forgoing attacks on the U.S. homeland, avoiding a devastating reprisal). As Keir Lieber and Daryl Press have argued, though, a nuclear arsenal that was built to address the Soviet threat—comprised largely of warheads designed to pack the most explosive power into the smallest package—might not provide a viable deterrent in this scenario.[41]

Because high-yield weapons would inflict enormous civilian casualties and collateral damage, they would be disproportionate and potentially ineffective. As a result, the threat to use them might not be credible. By contrast, lower-yield weapons could be used for comparatively discriminate counterforce strikes—a more proportional form of retaliation that is likely to be a more credible deterrent to limited nuclear use. Unfortunately, the smallest warhead carried by either ICBMs or SLBMs is the 100-kiloton W76, which could be employed in a counterforce role but does not provide the low-yield capability that might be most appropriate for a strike against a hostile regional power's nuclear weapons or infrastructure. In fact, the only weapons in the U.S. arsenal that do provide that capability are those delivered by aircraft. With no plans to build new nuclear warheads, air-delivered gravity bombs and cruise missiles will remain the only low-yield weapons available to the United States.

Armed with a stealthy LRSO, the B-52 could retain its standoff role until its retirement in 2040, while the B-2 could be converted to a standoff strike platform if it cannot reliably deliver gravity bombs.

Importantly, while the B61 life-extension program will reduce the stockpile of nuclear gravity bombs available to the United States, it will also preserve and potentially enhance the capability of penetrating bombers to conduct limited nuclear strikes. As a result of this effort, B61-12s will employ the explosive package currently used by the tactical B61-4—which has the lowest yield of all four variants being modernized. To compensate for having a lower yield than the strategic B61-7—that is, to hold the same classes of targets at risk with a less powerful weapon—the B61-12 is also being modified to increase its accuracy.[42]

In contrast to the development of the LRS-B and the life extension of the B61, the LRSO program is perhaps the least important modernization effort associated with the bomber wing of the triad, although it is by far the least expensive as well. Nevertheless, it does have an important role that should be considered if pressure to cut the program mounts. Without the LRSO, the standoff component of the bomber leg will eventually be eliminated through obsolescence because the ALCM will be retired 10 years before the B-52 (and could be

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[41] Keir A. Lieber and Daryl G. Press, "The Nukes We Need: Preserving the American Deterrent," *Foreign Affairs*, Vol. 88, No. 6 (November/December 2009); and Keir A. Lieber and Daryl G. Press, "The New Era of Nuclear Weapons, Deterrence, and Conflict," *Strategic Studies Quarterly*, Vol. 7, No. 1 (Spring 2013).

[42] Public reports suggest that the B61-4 can produce yields of 0.3, 1.5, 10, and 50 kilotons. Hans M. Kristensen, "The B61 Life-Extension Program: Increasing NATO Nuclear Capability and Precision Low-Yield Strikes," *Federation of American Scientists*, Issue Brief (June 2011).

withdrawn from service even earlier if it is judged too vulnerable to interception). While standoff weapons can be useful insofar as they impose costs on potential adversaries, in this case the LRSO should also be viewed as a hedge against disruptions in other modernization programs. Specifically, if procurement of the LRS-B were delayed for financial or technical reasons, and if the survivability of the B-2 declines as conventional precision-strike systems proliferate, then by 2030 (or earlier) the United States would not have any air-breathing nuclear forces that could be employed reliably against an opponent with advanced, integrated air defenses. Armed with a stealthy LRSO, the B-52 could retain its standoff role until its retirement in 2040, while the B-2 could be converted to a standoff strike platform if it cannot reliably deliver gravity bombs.[43] Ultimately, this would ensure that the United States retains the ability to credibly threaten limited nuclear options against hostile actors in contested operational environments.

The combination of a new bomber along with lower-yield but more accurate weapons could provide the most effective and credible deterrent to aggression.

Conclusion

Despite its declining role over the past several decades, the bomber fleet (and especially the penetrating component of the bomber fleet) is poised to become far more important. Not only will penetrating strike platforms play an increasingly central role as the United States attempts to deter well-armed adversaries, but the lower-yield weapons carried aboard nuclear-capable aircraft also remain the most suitable capability for deterring limited nuclear use by hostile regional powers. Looking ahead a decade or more, however, the proliferation of conventional precision-guided weapons and the proliferation of nuclear weapons might go hand-in-hand in some cases. That is, the United States could face adversaries with increasingly sophisticated conventional capabilities that keep its legacy forces at bay, along with modest nuclear arsenals that threaten its frontline allies. In these cases, the combination of a new bomber along with lower-yield but more accurate weapons could provide the most effective and credible deterrent to aggression.

[43] Elbridge Colby and Thomas Moore, "Maintaining the Triad," *Armed Forces Journal* (December 2010). Given the sophistication and density of opposing air defenses, over the next two decades there will likely be scenarios where the B-2 cannot reliably penetrate defended airspace, where it can still do so, and where it can penetrate partially (extending the range of standoff weapons, which would in turn allow it to hold at risk a broader set of targets).

CHAPTER 3: LAND-BASED BALLISTIC MISSILE FORCES

The ICBM leg of the nuclear triad includes 450 silo-based Minuteman III missiles, which are stationed at several Air Force bases throughout the central United States. Each missile is armed with up to three independently targetable W78 warheads (which have a yield of 335 kilotons) or one W-87 warhead (which has a yield of 300 kilotons, and was originally deployed on the newer but now retired MX Peacekeeper ICBM). Although there are approximately 500 warheads currently loaded on 450 ICBMs, the 2010 Nuclear Posture Review determined that all Minuteman IIIs would be "de-MIRVed" to enhance strategic stability. In comparison to MIRVed ICBMs, missiles carrying a single warhead are a less tempting target for an adversary contemplating a first strike and are less useful as a first-strike weapon against an opponent's nuclear forces. Nevertheless, the United States will retain the capability to "upload" missiles with additional warheads from the inactive stockpile, which is maintained as a hedge against adverse technical or geopolitical developments.[44] To meet the limitations on deployed launchers outlined in the New START Treaty, however, the Obama administration does plan to reduce the size of the ICBM force slightly, keeping no more than 420 missiles.[45]

Cold War Weapons in a Post-Cold War World

For much of the Cold War ICBMs represented the largest component of the U.S. strategic nuclear arsenal in terms of launcher numbers. Along with undersea forces, therefore, they formed the backbone of the U.S. strategic nuclear deterrent. Nevertheless, the relative importance of the ICBM leg of the triad has diminished in recent years, and its utility for meeting future security challenges is up for debate.

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[44] Woolf, "U.S. Strategic Nuclear Forces: Background, Development, and Issues;" Kristensen and Norris, "U.S. Nuclear Forces, 2013"; and Department of Defense, *Nuclear Posture Review Report* (Washington, DC: April 2010), p. 23.

[45] Gates, "Remarks to the Senate Armed Services Committee on New START."

Traditionally, ICBMs have been valued for several reasons. First, with approximately 99 percent of missiles on constant alert and redundant command-and-control systems in place, ICBMs provide the capability to execute an immediate and massive retaliatory strike in the wake of an attack or on warning of an attack. Second, because ICBMs, like bombers, are stationed in the continental United States, any effort to disable or destroy this leg of the triad would require launching an assault on the U.S. homeland, further increasing the certainty of a nuclear reprisal. Finally, because ICBMs are based in individual silos, an attack against them would likely require a large number of warheads—at least one and perhaps two per silo to neutralize as many targets as possible. An adversary would therefore have to expend a significant number of its nuclear weapons in any first strike.

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Each of these factors helped to bolster deterrence during the Cold War. Nevertheless, the ICBM force currently suffers from two major limitations. First, although the Minuteman III had an important counterforce role when the United States confronted a continental-size rival with a large number of missile silos and other hardened targets, the high yields of the W78 and W87 warheads are better suited for countervalue targeting than limited strikes against opposing military forces, particularly now that the most likely U.S. adversaries are minor powers with small nuclear arsenals. As described above, should the United States need to preempt or retaliate for a limited nuclear strike by a rogue nation, countervalue targeting would be highly disproportionate and might not even be effective in preventing initial or follow-on nuclear attacks. Second, missiles launched from the central United States must overfly Russia to strike most other potential targets in East Asia and the Middle East, raising the possibility that Moscow could mistake a nuclear strike against another nation as an attack on its territory—a possibility that might restrain U.S. policymakers from using ICBMs except in the most extreme circumstances.[46]

The ICBM Modernization Debate

The ICBM force is in the midst of several life-extension programs, including efforts to upgrade or replace the Minuteman III's guidance system, targeting software, propellant, and propulsion components. The result of these programs, according to one analyst, is "basically new missiles except for the shell."[47] According to the Commander of U.S. Strategic Command, the Minuteman III can remain in service until 2030 "and potentially beyond with

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[46] In addition, one of the chief virtues of the ICBM leg, its prompt response capability, is often overstated. According to a major assessment of the nuclear triad conducted by the General Accounting Office (now the Government Accountability Office) at the end of the Cold War, the assumption that the command-and-control infrastructure of land-based ICBMs was far more robust than the systems used to communicate with submarines at sea was faulty because SSBNs on patrol were in near-constant contact with the National Command Authority and could launch their missiles almost immediately if ordered to do so. United States General Accounting Office, Statement of Eleanor Chelimsky Before the Committee on Government Affairs, United States Senate, "The U.S. Nuclear Triad: GAO's Evaluation of the Strategic Modernization Program," June 10, 1993, available at http://archive.gao.gov/d43t14/149423.pdf.

[47] ICBM Program Analyst, quoted in Carla Pampe, "Life Extension Programs Modernize ICBMs," Air Force Global Strike Command Public Affairs, October 25, 2012, available at http://www.af.mil/news/story.asp?id=123323606.

additional modernization investment."[48] Given the limitations outlined above, however, there have been a number of proposals to dramatically scale back or even eliminate this leg of the nuclear triad.[49] In fact, as sequestration first loomed in late 2011, then-Secretary of Defense Leon Panetta raised the possibility that major defense budget cuts could lead to a reduction in the size of the SSBN fleet, a delay in the development of the next-generation bomber, and the elimination of all three ICBM wings.[50] In the context of its questionable strategic relevance and growing budgetary pressures, the Air Force will soon begin an "analysis of alternatives" to explore future options for the ICBM leg of the triad, to include replacing the Minuteman III or continuing to extend its life beyond 2030.[51]

Preserving Strategic Stability

Even if the relative value of ICBMs for near-term security challenges has waned, their importance for meeting emerging long-term challenges should not be dismissed. In particular, the role of ICBMs as a "missile sink"—that is, a force-in-being that maximizes the number of aim points an adversary would have to target in a first strike on U.S. nuclear forces—still has value. As the Commander of the Air Force's Global Strike Command has argued, "450 dispersed and hardened missile silos provide the foundation for strategic stability with other major nuclear powers by presenting any potential adversary with a near insurmountable obstacle should they consider an attack on the U.S." [52] Ultimately, no opponent can seriously degrade the U.S. ICBM force without expending a disproportionate share of its own nuclear arsenal given the number of targets it would have to strike (and the number of times it would have to strike them).

Ultimately, no opponent can seriously degrade the U.S. ICBM force without expending a disproportionate share of its own nuclear arsenal given the number of targets it would have to strike (and the number of times it would have to strike them).

In an era characterized more by threats from minor powers than great power security competitions, the possibility of a massive nuclear strike to disarm the United States might seem outlandish. But it is not unprecedented. During the height of the Cold War, for example, a confluence of factors led to growing fears of a Soviet first strike on the U.S. nuclear arsenal. In particular, these fears stemmed from the heightened vulnerability of American ICBMs, which was the result of several developments: the Soviet development of ICBMs with sufficient throw weight to carry a large number of extremely high-yield warheads; the advent of MIRV technology, which allowed the Soviets to increase the number discrete targets they could hold at risk with a single ICBM; and efforts by Moscow to further enhance the lethality of its missile forces through improvements in accuracy.

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[48] General Kehler, "Statement before the House Committee on Armed Services," p. 13.

[49] For example, see Global Zero U.S. Nuclear Policy Commission Report, *Modernizing U.S. Nuclear Strategy, Force Structure and Posture*, p. 7; and Pincus, "Cutting the U.S. Nuclear Arsenal Can Help Cut the Deficit."

[50] "Panetta: Budget Sequester Could Force Elimination of ICBMs," *Global Security Newswire*, November 15, 2011.

[51] Jason Sherman, "Air Force Readies Contracts to Shape Minuteman II Modernization Plans," *Inside Defense*, March 12, 2013.

[52] Lieutenant General Kowalski, "Presentation to the Senate Armed Services Committee Strategic Forces Subcommittee," p. 3.

Together, these developments generated concerns that the Soviet Union might gain the ability (or erroneously conclude it had the ability) to inflict a major blow against the U.S. nuclear arsenal and still have sufficient weapons left to absorb an American retaliation and launch a counter-reprisal.[53] As one contemporary government report summarized the issue:

> In recent years…concern has grown that one element of the U.S. strategic TRIAD, land-based ICBMs, may become vulnerable to a disarming first strike by an increasingly capable Soviet force. Using a fraction of their ICBM force, the postulated Soviet attack would destroy large portions of U.S. missiles in their hardened silos. Simultaneous attacks on U.S. Strategic Air Command (SAC) bases and submarine ports would destroy bombers not on alert and missile-carrying nuclear submarines (SSBNs) not at sea. At the same time, the existence of a large Soviet reserve force capable of destroying U.S. cities would deter a U.S. counterstrike against Soviet cities and thus leave U.S. leaders with few attractive retaliatory options.[54]

Under these conditions, the chief fear was that the Soviets might be tempted to strike first during a crisis because the United States would have little choice but to concede in the aftermath of the initial attack.

Although U.S. ICBMs were indeed becoming more vulnerable in the late 1970s and 1980s, this scenario exaggerated the likelihood and effectiveness of a Soviet first-strike. Among other factors, it rested on worst-case assumptions about Soviet capabilities, especially missile accuracy, and it generally ignored the fact that a large portion of U.S. nuclear warheads were assigned to the submarine and bomber legs of the triad (by comparison, the Soviet triad was heavily weighted toward land-based ICBMs).[55] Nevertheless, a similar situation could arise in the future if the United States were to radically scale back or abandon the ICBM leg of the triad. That is, moving toward a strategic dyad of ballistic missile submarines and bombers could create a destabilizing situation where a nuclear peer competitor could use a small portion of its own arsenal to eliminate a greater percentage of U.S. weapons.

Absent the large, hardened target set presented by ICBM silos, an attacker could theoretically strike only five sites and disable or destroy a significant portion of the U.S. strategic nuclear arsenal.

Absent the large, hardened target set presented by ICBM silos, an attacker could theoretically strike only five sites (the three Air Force bases that host B-52s and B-2s along with the Navy's two submarine bases) and disable or destroy a significant portion of the U.S. strategic nuclear arsenal.[56] Because bombers are no longer kept on alert, and because nuclear gravity bombs and cruise missiles are stored separately from their delivery systems, this entire leg of the triad could be wiped out in a nuclear attack. Moreover, attacks on submarine bases would likely destroy SSBNs in long-term overhaul as well as any boats undergoing routine maintenance. In this scenario, then, the United States would only be left with those SSBNs

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[53] The best-known version of this argument is Paul Nitze, "Deterring our Deterrent," *Foreign Policy*, No. 25 (Winter 1976/77).

[54] Robert R. Soule, *Background Paper: Counterforce Issues for the U.S. Strategic Nuclear Forces* (Washington, DC: Congressional Budget Office, January 1978), available at http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/67xx/doc6714/78-cbo-012.pdf, p. 1.

[55] General Accounting Office, *The U.S. Nuclear Triad* (Washington, DC: June 10, 1993), p. 6.

[56] Johnson, Bowie and Haffa, *Triad, Dyad, or Monad*? *Shaping the U.S. Nuclear Force for the Future,* p. 23; and Guthe, "Deterrence, the Triad, and Dyads," p. 337.

on station and on alert, as well as any other ballistic missile submarines that might be at sea on training missions or transiting to or from their designated patrol areas.

Of course, a force of perhaps six to eight SSBNs (four or five on alert and two or three at sea but not in a position to fire their missiles immediately) would still represent a potent nuclear arsenal. Depending on the total number of boats, how many missiles they each carried, and how many warheads were loaded onto each missile, the United States might be left with approximately 700 to 1300 warheads at sea (presuming the New Start ceiling of 1,550 warheads remained in place).

In the event of an attack on the remainder of the U.S. nuclear arsenal, however, the United States would still confront the same dilemmas that it grappled with during the Cold War: Are the weapons that survive a first-strike sufficient to conduct a counterforce retaliation that would significantly limit the damage that could be inflicted by a follow-on attack? If not, would policymakers be willing to retaliate at all, knowing that an attacker would be able to absorb a second-strike and still launch a massive counter-retaliation against U.S. cities? Unlike the Cold War era, Washington would also have to maintain a significant reserve force to deter other potential adversaries (including perhaps one or more nations with sizeable nuclear arsenals), further inhibiting its willingness and undermining its capability to respond to an attack. Because the United States does not currently face a hostile nuclear peer competitor, it can be easy to ignore these issues. Looking out several decades or more, however, the possibility of a resurgent and aggressive Russia or an increasingly assertive China that builds toward nuclear parity cannot be dismissed.

Eliminating ICBM wings or allowing this leg of the triad to atrophy into obsolescence could create a source of instability over the long-term.

Ultimately, eliminating ICBM wings or allowing this leg of the triad to atrophy into obsolescence could create a source of instability over the long-term. The prospect that a first strike could be "successful," however small, could have extraordinarily dangerous consequences. It might, for example, encourage an adversary to initiate or escalate a crisis in the belief that it has a bargaining advantage. Alternatively, it could lead the United States to implement countermeasures that make an adversary's nuclear arsenal increasingly susceptible to a first strike—a concern during the latter stages of the Cold War, when the United States compensated for ICBM vulnerability with new land-based and sea-launched ballistic missiles that had greater accuracy and payload capacity, in addition to placing greater emphasis on counterforce targeting in its nuclear doctrine. In the end, either outcome could raise the likelihood of a future crisis that triggers a catastrophic nuclear conflict.

Conclusion

Despite its limitations, the ICBM leg remains an important hedge against future uncertainty and plays an important role in preserving strategic stability. Because it is the least expensive component of the triad to maintain, there is little financial incentive to drastically scale back or eliminate the Minuteman III force, at least for the time being. Current ICBMs will eventually need to be recapitalized, however, and developing an entirely new missile will be a significant expense. Perhaps the most sensible option, then, is to continue extending the life of the Minuteman III, if doing so is indeed technically feasible. Although this might contribute to decreased reliability over time given the age of the missile, reliability will not be as useful a metric as it was in the past if the chief function of the ICBM leg is to deter a nuclear attack by absorbing a first strike rather than launching a prompt and massive retaliation. The Department of Defense should, therefore, take steps to keep the Minuteman III in service until at least 2040, ten years beyond its current expected service life, at which

point the D5 SLBM will also need to be replaced. With both missiles exiting the force at the same time, it may be possible for the Air Force and Navy to collaborate on a common successor—or at the very least search for the greatest degree of overlap possible in their individual efforts to build new ballistic missiles—to reduce the costs of preserving both capabilities.

CONCLUSION

Programs that cost the most and would therefore yield the greatest savings if they were eliminated or scaled back are arguably the most important for maintaining an effective deterrent, while programs that may have less near-term strategic relevance would yield minimal savings if they were cut.

In the end, there are compelling reasons for the United States to forgo deep reductions in the size of its nuclear arsenal, avoid significant cuts in its nuclear force structure, and move ahead with planned nuclear modernization programs. By shrinking the arsenal and divesting force structure, Washington could find it increasingly difficult to simultaneously dissuade other nations from building nuclear weapons, preserve strategic stability with a nuclear peer, and deter nuclear use by hostile regional powers. Moreover, abandoning modernization efforts would be tantamount to major nuclear cuts given the age of existing warheads and delivery systems, the long timelines associated with developing new capabilities, and the fact that the United States no longer has the infrastructure or personnel in place to quickly begin producing nuclear weapons if necessary—a situation that will only grow worse over time.

The current U.S. nuclear arsenal is a legacy of the Cold War. Nevertheless, each leg of the triad still has a useful role to play as the United States prepares for existing and emerging threats. The SSBN fleet, for example, will continue to underpin strategic nuclear deterrence by providing a highly survivable retaliatory capability, presuming that the size of the fleet does not continue to shrink and that future boats remain difficult to detect by a capable and determined adversary. By contrast, the bomber force is likely to provide the most effective deterrent against limited nuclear attacks by rogue nations on U.S. forces or frontline allies, so long as penetrating platforms and standoff munitions do not become excessively vulnerable to advanced air defenses and can still deliver relatively low-yield warheads against counterforce targets. For their part, although ICBMs may not be as critical for deterrence as they once were, cutting missile wings or eliminating this leg of the triad could create strategic instability in the event of a future crisis with a nuclear peer.

Finally, strategic considerations are not immune to budgetary constraints, and the U.S. defense budget is indeed shrinking. Despite pressure to conserve resources in a period of fiscal austerity, there is an inherent dilemma that proponents of nuclear reductions often overlook: programs that cost the most and would therefore yield the greatest savings if they were eliminated or scaled back (such as replacing Ohio-class SSBNs and fielding the LRS-B) are arguably the most important for maintaining an effective deterrent, while programs that may have less near-term strategic relevance (such as maintaining the Minuteman III ICBM force or developing the LRSO) would yield comparatively limited savings if they were cut.

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