The Enduring Value of America's ICBMs

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ICBM Test Launch, USAF photo by Michael Peterson

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In July 2009, President Barack Obama and Russian President Dmitry Medvedev announced that the United States and Russia would negotiate a new arms agreement that would replace the 1991 Strategic Arms Reduction Treaty (START) and the 2002 Moscow treaty. Later that year, to inform those negotiations and the subsequent Senate ratification process, members of the Senate ICBM Coalition published a white paper that highlighted the strategic importance of intercontinental ballistic missiles (ICBMs) and made recommendations for the ICBM force under the agreement that became known as New START.

The Department of Defense adopted several of the coalition's recommendations when it established its New START force structure. For example, DoD will continue to disburse its ICBMs across three bases each of which host three missile squadrons. In addition, as recommended in the coalition's 2009 report, each ICBM now carries a single warhead, affirming the coalition's judgment that single warhead deployments increase strategic stability.

We, the current members of the ICBM Coalition, believe that the ICBM force is entering another critical transition period. The next administration likely will conduct its own review of U.S. nuclear force structure and posture, and it will do so against the backdrop of evolving strategic threats against the United States. At the same time, the Air Force is developing a follow-on system for the Minuteman III known as the Ground Based Strategic Deterrent

(GBSD). The successful development of this weapon system will be a major consideration for the next Secretary of Defense and for future congresses.

In light of these developments, we present the following report on the enduring value of ICBMs as part of our nation's strategic nuclear deterrent. Our analysis builds on and updates the work done by the ICBM Coalition in 2009 and leverages our many years of experience with the ICBM mission. While we represent strong local interests in the ICBM mission, we also possess, by virtue of our close relationship to the ICBM force, years of accumulated experience on strategic matters. We therefore offer several recommendations at the end of this report to inform the new administration and our congressional colleagues during this period of transition for the nation's ICBM force. As with the 2009 report, we believe these recommendations contribute to the preservation of global peace and stability and therefore are in the best interests of the United States as well as the states and communities we represent.

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Table of Contents

Executive Summary

- **ICBMs have several key attributes that strengthen U.S. deterrence.**
  - ICBMs provide a large and persistent deterrent force.
  - The wide dispersal of ICBM silos presents an essentially impossible targeting problem to potential adversaries.
  - ICBMs give the President a timely response option.
  - The ICBM force cannot be destroyed with a limited nuclear attack.

- **U.S. security would suffer without ICBMs. Eliminating the ICBM force would:**
  - Allow U.S. adversaries to concentrate defensive efforts on U.S. bombers and submarines.
  - Allow U.S. adversaries to consider if a limited strike could neutralize the U.S. deterrent.
  - Force the United States to posture remaining forces to deter attacks on the homeland, potentially detracting from efforts to reassure allies under the U.S. nuclear umbrella.
  - Make the U.S. vulnerable to both technical failure in other parts of the U.S. deterrent as well as unexpected technical advancements by potential adversaries.

- **The ICBM leg of the triad is critical to deterring 21st century threats.**
  - The ICBM force ensures Russia cannot achieve nuclear superiority over the United States, despite Russia's modernization program and aggressive strategic posture.
  - ICBMs help ensure the U.S. can deter direct threats from a rising China and simultaneously provide reassurance to East Asian allies.
  - ICBMs ensure the triad has the flexibility to deter small nuclear powers from attacking the U.S. while simultaneously reassuring regional allies and hedging against the emergence of future nuclear challengers.

- **The Minuteman III must be replaced to ensure the land-based portion of the triad remains both effective and credible.**
  - The current Minuteman III is aging to obsolescence.
  - The U.S. will need a new ICBM to provide increased range, greater accuracy and an enhanced ability to defeat missile defenses.
  - The Ground Based Strategic Deterrent (GBSD) program is affordable both in absolute terms and relative to the cost of modernizing other legs of the triad.

- **RECOMMENDATIONS: The new administration and Congress should:**
  - Affirm that nuclear deterrence is the nation's highest priority defense mission and support the modernization of the nuclear triad.
  - Keep the Ground Based Strategic Deterrent program on schedule and provide funding to ensure it results in a replacement for the Minuteman III before 2030.
  - Support the continued deployment of 400 single warhead missiles in 450 missile silos, with the capacity to upload additional warheads if necessary in the future.
  - Ensure Air Force personnel have the tools needed to effectively operate and maintain the ICBM force, including better pay, equipment and facilities and a new helicopter to provide security in the missile fields.

Introduction: Today's ICBM Force

The United States has deployed intercontinental ballistic missiles (ICBMs) for six decades. The Minuteman ICBM was the first to use solid-fuel technology, a significant safety enhancement over liquid fuel and something that enables timely launches to occur after an order to strike has been issued. The first Minuteman deployed on October 24, 1962, at the height of the Cuban Missile Crisis, and the strategic leverage it provided President Kennedy led him to later refer to it as his "ace in the hole." The currently-deployed Minuteman III entered service in 1970.

The ICBM force evolved over the course of the Cold War and continues to evolve today. By 2018, when New START is fully implemented, the U.S. ICBM force will consist of 400 Minuteman III missiles deployed across 450 operational missile silos. Those missiles and silos are evenly distributed across three Air Force missile wings, each of which is further subdivided into three squadrons. Each squadron manages silos spread over dozens of miles, allowing the total force to present a highly dispersed target set to any adversary. Each missile has a single warhead but maintains the hedge capacity to carry additional warheads should developments in global security require their deployment.[1]

FE Warren AFB, USAF photo by RJ Oriez

Despite the efforts of some nuclear disarmament advocates to undercut the rationale for a land-based strategic deterrent, this ICBM force continues to provide incalculable benefits to the United States. This report will demonstrate that the ICBM force is a critical component of U.S. deterrence and that as strategic threats proliferate, modernizing the capabilities of the U.S. ICBM force will be increasingly important. The report begins with an assessment of the role ICBMs play within the U.S. triad of nuclear delivery systems. It then highlights the increasing value of ICBMs in the face of post-Cold War strategic threats to the United States and its allies. It then assesses the need to modernize the ICBM force before offering a series of recommendations for the next administration and Congress.

Supporting the Triad

No one set out to build a triad of nuclear delivery systems when the Cold War began. The United States developed nuclear bombers, land-based missiles, and submarine-launched missiles as it strove to ensure its nuclear deterrent remained effective as adversary capabilities increased. The capabilities of each of these systems, however, combined to create a deterrent that is more effective than the sum of its parts.

The interlocking attributes of the three legs of the triad form a robust deterrent capability. The bomber force provides flexibility: aircraft can be redeployed where needed and can be used to signal U.S. resolve as a crisis develops. The submarine force offers a high level of survivability and stealth, ensuring that no enemy first strike could eliminate the U.S. capability to deliver a nuclear response. The land-based ICBMs provide a large, persistent and widely-dispersed deterrent, giving the President a timely response option and ensuring that even a large nuclear power could not launch an effective attack against hundreds of individual ICBM silos.[2] ICBMs, as two noted analysts wrote recently "are the only leg of the triad that requires that an adversary launches a large-scale nuclear attack on the United States to destroy them…. The strategic effect of requiring a massive attack on the American homeland is that it dramatically raises the bar for any adversary to contemplate such an attack. This is a good thing."[3] Indeed, the guarantee of a devastating U.S. response would make any decision to launch a large-scale attack irrational.

The triad remains critical to deterrence in the post-Cold War security environment. The Nuclear Posture Reviews conducted at the beginning of the administrations of George W. Bush and Barack Obama explicitly cited the triad as important for deterrence in the foreseeable future.[4] In fact, the Congressional Commission on the Strategic Posture of the United States found that the resilience and flexibility that the triad provides through its land, sea, and air legs prove "valuable as the number of operational deployed strategic nuclear weapons has declined."[5] Thanks to its complementary set of characteristics and capabilities, the triad provides deterrent effects that a dyad or monad could not achieve.

U.S. security would suffer without ICBMs. Eliminating the ICBM force as some analysts have called for, would make it easier for U.S. adversaries to concentrate their defenses on U.S. bomber and submarine forces. And because these forces deploy from just five U.S. bases, they would be subject to degradation from a very small first strike from an adversary. Without ICBMs, therefore, U.S. adversaries might consider whether a limited strike could neutralize the U.S. deterrent. Without ICBMs, the United States would have to posture its forces to deter attacks on the U.S. homeland, potentially detracting from efforts to reassure allies under the U.S. nuclear umbrella. This would hurt strategic stability and potentially undermine U.S. efforts to dissuade its allies from pursuing their own indigenous nuclear capabilities.

The land-based deterrent also provides a hedge against unforeseen technological developments. First, ICBMs could mitigate technical failures in the air and sea-based legs of the U.S. triad. For example, the failure of a component of the D5 submarine launched ballistic missile (SLBM) could make the sea-based deterrent temporarily unreliable. ICBMs would help maintain deterrence until the problem could be resolved. Second, ICBMs ensure a strong deterrent in the face of advancements in adversary capabilities. For example, developments in undersea surveillance technology might allow an adversary to track U.S. ballistic missile submarines. As far as we know, no U.S. adversary has such capabilities today, but such technology could emerge at any point during the next few decades.[6]

The triad has a remarkable historical track record of deterring nuclear threats to the United States and its allies, and as the 2010 Nuclear Posture Review (NPR) concluded, the triad remains the best way to "maintain strategic stability at reasonable cost, while hedging against

potential technical problems or vulnerabilities."[7] The United States cannot expect to retain the benefits of the triad without a robust land-based deterrent capability. And as described in the next section, the increasing complexity of 21st century strategic threats makes the ICBM force as important as ever.

Deterrence for 21st Century Threats

The end of the Cold War allowed the United States and Russia to reduce their nuclear arsenals well below their peak levels of the 1970s and 1980s. Despite facing a far smaller aggregate number of warheads, however, the U.S. now must deter a much broader array of nuclear challenges. Secretary of Defense Ashton Carter called today's security environment "dramatically different" from previous generations, thanks in large part to the new weapons and delivery systems developed by countries like Russia, China and North Korea.[8] Far from being rendered obsolete by the end of the Cold War, ICBMs play a critical role in deterring these 21st century threats.

Russia

Russia deploys fewer strategic delivery systems than the United States does, but it deploys far more warheads on the delivery systems it deploys. Despite its New START commitment to reach parity with the U.S., Russia is increasing, not decreasing, its total warhead deployment.[9] Russia also maintains almost a 10-to-1 advantage over the U.S. in non-strategic nuclear weapons. In addition to its current capabilities, Russia is engaged in an extensive nuclear modernization program. Looking across Russia's full nuclear enterprise, General Joseph Dunford, Chairman of the Joint Chiefs of Staff believes Russia's nuclear capabilities represent "a potential existential threat to the United States,"[10] and characterizes Russia as "the greatest threat to our national security."[11]

The U.S. ICBM force included in the New START force structure presents Russia with a complex and perhaps impossible targeting problem. By retaining 450 ICBM silos and 48 launch control centers, the U.S. forces Russian planners to commit much of their strategic force to dealing with the land-based portion of the U.S. deterrent. Simple math further magnifies the problem. Since an attacker likely would assign more than one warhead to each target, Russian planners would use at least 800 of the 1,550 strategic warheads permitted under New START to strike the 400 warheads in the U.S. ICBM force. Even then, they would have little confidence that the U.S. ICBM force could be eliminated.

Beyond the numbers, the U.S. must also account for Russian strategic intent. Though the Cold War threat of a massive Russian nuclear strike has receded, there are several reasons why the much reduced U.S. nuclear force permitted under New START – and the ICBM forces in particular – remain vital. First, U.S. nuclear forces that are strong enough to make a large scale Russian attack unthinkable are an indication that deterrence is working. The U.S. strategic deterrent, which is now sustained with just ten percent of the warheads deployed at the height of the Cold War, must remain strong enough to make a nuclear attack not only implausible but

indeed unthinkable for Russian planners. The large number of targets presented by the ICBM force, as described above, ensures Russia will incur costs far higher than any expected benefits from a nuclear strike.

Second, Russian officials increasingly point to a doctrine of "escalate to deescalate" in which they would introduce tactical nuclear weapons into conventional conflicts. According to their theory, nuclear escalation would convince the U.S. to withdraw any conventional opposition it would otherwise pose to Russian military operations, such as those aimed at reestablishing Russian power and dominion in Central Europe. The Department of Defense is preparing "a range of options" to respond to this kind of "limited nuclear use."[12] Those options will be developed on the deterrent foundation the ICBM force provides. ICBMs force Russia to recognize that nuclear escalation leads them only to disaster by ensuring Russia cannot escalate beyond a U.S. capability to respond. Ultimately, then, ICBMs provide a strong deterrent to nuclear escalation in the first place.

Third, forecasting Russian strategic intent decades into the future would be a fools' errand. Putin's current willingness to launch a large scale strike on the United States may be slight, although open discussion of tactical nuclear use suggests anything is possible. But whatever Putin thinks, no one can credibly estimate the strategic intent of Putin's successors. Russia, thanks to its nuclear modernization program, will have a powerful strategic force for decades to come. Future Russian leaders may be less hostile than Putin. Or they may not. Eliminating or failing to modernize the U.S. ICBM force therefore would be like betting the future security of the United States on the prospect that Russia will pose ever less of a nuclear challenge in the future. That is a bet the United States should not make. A strong ICBM force functions both as an insurance policy for an uncertain future and a strong disincentive for Russia to attempt to achieve nuclear superiority over the United States.

China

China's forces are much smaller than Russia's – estimated around 250 strategic warheads.[13] Nevertheless, China poses several nuclear challenges to the United States. The first is China's potential to pose a large-scale nuclear threat to the United States. Today, thanks to the large number of targets presented by U.S. ICBMs, the U.S. can deter a Chinese strategic strike even while it credibly deters the much larger Russian nuclear force. As a large country with a preexisting nuclear program and a sizable military budget, however, China could build new warheads and delivery systems, perhaps rapidly, if it wanted to do so. The full deployment of 400 U.S. ICBMs along with the other legs of the triad should hedge against an aggressive Chinese nuclear buildup. But if China decided to expand its nuclear forces, the U.S. would need the dispersion and responsiveness of the ICBM force to preserve deterrence while it re-examined the adequacy of forces permitted under New START.

The U.S. also must be concerned about qualitative improvements in Chinese forces. China is increasing the survivability of its entire strategic force, including the development of new road-mobile ICBMs that could carry multiple independently targeted reentry vehicles (MIRVs). China also is deploying nuclear ballistic missile submarines for the first time and may

choose to develop a long-range strategic bomber that would give China its own nuclear triad. Further, China seeks to overcome U.S. ballistic missile defenses, including maneuverable reentry vehicles, decoys, and jamming technologies.[14] These advancements mean that the United States cannot assume its Cold War-era forces, including the ICBM force, will deter China in the future.

Chinese strategic intent poses an additional challenge for the United States. In recent years, China has become increasingly assertive in East Asia and the Western Pacific, posing particular challenges for U.S. allies including Japan and South Korea. The U.S. must prepare for the possibility that as Chinese interests expand and its capabilities increase, China will become more likely to coercively employ both conventional and nuclear forces. This means the U.S. must leverage the interlocking capabilities of the triad, including the large-scale deterrent provided through the ICBM force, to ensure the U.S. can both deter China and reassure U.S. regional allies, even as we assist our allies in modernizing their conventional forces and defenses.

North Korea and Smaller Nuclear Powers

North Korea's nuclear weapons program represents the most significant and critical near-term threat to stability in East Asia. North Korea's ability to leverage a small but growing nuclear capacity – perhaps two dozen warheads today and the capacity to increase its arsenal to between 50 and 100 warheads in the next few years[15] – may also serve as a template for other aspiring nuclear powers. The U.S. must be able to deter North Korea's challenge today and prepare for the possibility of similar challenges from small nuclear powers in the future.

ICBMs underwrite the U.S. ability to deter North Korea and similar nuclear aspirants for at least two important reasons. One, thanks to the inherent flexibility of the triad, the U.S. can use its bomber force primarily to reassure allies and address regional contingencies without compromising the ability to deter direct strategic threats to the U.S. homeland. For example, the U.S. often responds to North Korean nuclear provocations with flights of B-2 or B-52 nuclear-capable bombers to the Korean peninsula. Without a robust land-based deterrent, U.S. nuclear planners might have to favor deterring attacks on the United States over missions to provide nuclear assurance to U.S. allies. Moreover, U.S. bombers provide important conventional capabilities, and ICBMs could be critical to deterring North Korean aggression if the bomber force must be committed to conventional missions.

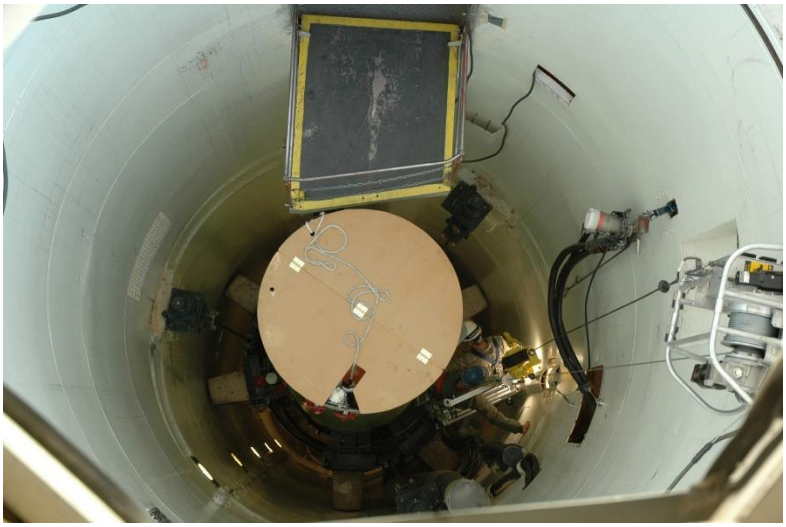
Two, the emergence of each new nuclear power forces the United States to reconfigure its deterrent. The U.S. built its Cold War deterrent around a single nuclear challenger, so changes in each superpower's force structure or posture had direct, corresponding effects on the other. Today, for example, if Japan or South Korea decided to develop their own nuclear weapons to counter North Korea, China might respond by expanding its own capabilities. In turn, India might view a Chinese build up as a threat, and enhance its deterrent, with obvious effects on its relationship with Pakistan. The U.S. might need to emphasize different parts of its triad to maintain deterrence at any level of such cascade of nuclear moves and countermoves.

The bottom line is that the credibility of any future U.S. deterrent will depend greatly on its flexibility. Different capabilities supplied from different legs of the triad will take on varying levels of relevance with respect to any specific nuclear threat. All legs of the triad will support each other to ensure the U.S. has a credible deterrent capability to deal with a multifaceted post-Cold War security environment.

The Need for a New ICBM

The U.S. originally deployed the Minuteman III in 1970 with an expected service life of ten years. Minuteman III remains in service today thanks to several rounds of life extension programs, the latest of which will sustain the missile system through 2030. What happens after 2030 depends on the answers to two important questions the next administration and Congress must answer.[16]

First, what capabilities should the U.S. ICBM force have? After 2030 the capabilities of the existing ICBM force will decline as the Minuteman III ages to obsolescence. Several Minuteman III components, particularly the ground infrastructure, rocket engines and guidance systems must be replaced. Air Force stockpiles of critical components for these systems, however, are dwindling, and the lack of replacement parts eventually will force the Air Force to curtail future missile tests and deploy an ever smaller number of missiles.[17] Such extensive refurbishment, moreover, would call the system's overall reliability into question. In other words, the Minuteman III force must be replaced, even if the U.S. required nothing more than sustaining its existing capabilities.



Silo at Malmstrom AFB, USAF photo by Dillon White

But the U.S. will need more than what the Minuteman III can provide. U.S. adversaries will make future technological advances that will render the Minuteman III less effective and less credible. Specifically, the Minuteman III eventually will lack the range, payload and speed to penetrate well defended targets. General Robin Rand, commander of the Air Force's Global Strike Command recently testified to Congress that Minuteman III is becoming "more and more obsolete" each year and will have a difficult time penetrating enemy defenses after 2030.[18] While the specific capabilities of a replacement system are yet to be determined and likely would be kept secret once they are identified, it would be reasonable to expect that Minuteman III replacement system to provide increased range, greater accuracy and an enhanced ability to defeat missile defenses, along with upgraded ground control systems and facilities.

The combination of an unsustainable existing Minuteman III and the need for enhanced long-term capabilities strongly supports an effort to develop a new ICBM for the post-2030 period. Such an effort, of course, must be evaluated in terms of cost. The second key question for the next administration and Congress is whether the benefits of a new ICBM are worth the price. The answer is yes, both in terms of the absolute cost of the system and the cost relative to the nuclear budget and the budget for the Department of Defense overall.

Cost estimates for the Air Force's Ground Based Strategic Deterrent (GBSD) program to replace the Minuteman III vary, largely because it has been so long since the Air Force built a new ICBM. In 2015, the Air Force estimated that the GBSD program would cost $62 billion from Fiscal Year 2015 through Fiscal Year 2044.[19] The Pentagon's Cost Assessment and Program Estimate (CAPE) office, using different cost assumptions, estimated at least $85 billion in GBSD costs over that same timeframe.[20] Even the higher CAPE figure, however, would result in average program costs only slightly less than $3 billion per year. While that is not a small figure by any means, it is consistent with the price of other significant weapons systems developed across the Department of Defense each year.[21]

GBSD costs look even more affordable when compared to plans to modernize other legs of the triad. In January 2015, the Congressional Budget Office (CBO) estimated the cost over the following ten years, from Fiscal Year 2015 to Fiscal Year 2024, to modernize all components of the triad. CBO concluded that a new ballistic missile submarine would cost $83 billion in that ten year window. Another $40 billion would go to the new bomber. CBO forecasted $26 billion for the new ICBM over this ten year period, making the land-based leg of the triad easily the most affordable leg to modernize.[22]

Regardless of which triad components are the most affordable relative to each other, the defense budget still must pay for a wide range of priorities across the full spectrum of conflict and within all branches of the Armed Forces. Some analysts suggest a constrained defense budget cannot accommodate the simultaneous modernization of all three legs of the triad while meeting other DoD obligations. This, however, is really a question of how much the U.S. will invest in defense generally and nuclear deterrence in particular. As Defense Secretary Ashton Carter said, "America's nuclear deterrence is the bedrock of our security and the highest priority mission of the Department of Defense."[23] In that light, nuclear modernization is a bargain. In Fiscal Year 2015, the budget for the nuclear enterprise, including operation and maintenance of existing systems and warheads, as well as programs to modernize or prepare to modernize various parts of the enterprise, totaled $17 billion.[24] The total appropriation for the Department of Defense in FY15 was $547.7 billion. In other words, the nuclear enterprise, generally considered to be the foundational element of U.S. national defense, cost just three percent of total defense expenditures.

This figure will rise in coming years as the Department pays for programs to modernize the triad. Yet, the Center for Strategic and Budgetary Assessments (CSBA) concluded that the total cost of U.S. nuclear forces is unlikely to exceed five percent of the annual defense budget in any year through at least 2039. CSBA estimated nuclear forces would average a little more than four percent of the defense budget in the 2020s before declining to around three percent by

2039.[25] And the specific cost of modernizing the ICBM force would be a fraction of those figures.

The case for pursuing the GBSD program is therefore strong. Minuteman III has provided tremendous value to the nation for more than four decades, but it cannot function indefinitely. A modern, replacement ICBM system—including missiles and ground systems and associated infrastructure —would correct Minuteman III's shortfalls and provide improved capabilities necessary to preserve the credibility of the land-based deterrent against coming threats. All of this can be achieved at costs that are affordable, whether viewed in absolute terms or relative to the other legs of the triad or the broader defense budget. Nuclear deterrence is the nation's highest priority defense mission, and GBSD provides cost effective nuclear deterrence for the 21st century.

Recommendations and Conclusion

The United States faces a wide array of strategic challenges and must maintain a strong nuclear deterrent for the foreseeable future. The best way to sustain a powerful deterrent is with a capable triad of nuclear capable bombers, submarine launched ballistic missiles, and land based ICBMs. The ICBM leg of the nation's nuclear triad plays a critical role in deterring 21st century threats but must be modernized to ensure it is both effective and credible for the next several decades. We therefore offer the following recommendations for the next administration and the incoming 115th Congress.

Recommendation #1: Reaffirm paramount priority of nuclear deterrence and the value of the triad

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The next administration should clearly and unequivocally affirm that nuclear deterrence is the nation's highest priority defense mission and reaffirm the nation's continuing requirement for a nuclear triad. The next Congress should prioritize funding for modernizing all three legs of the triad and the nuclear command and control system. Both the administration and Congress should reject calls to move to a dyad or monad nuclear force structure. The Senate should further consider commitments to nuclear deterrence and the triad when it gives advice and consent on relevant presidential nominations.

Recommendation #2: Support GBSD and ensure it stays on schedule

The next administration should keep GBSD on schedule, including the awarding of contracts for technology maturation and risk reduction scheduled for no later than September 2017. The next administration should also include robust funding for GBSD in its Fiscal Year 2018 budget submission to Congress, and Congress should fully fund that request in the FY18 authorization and appropriations process. The administration and Congress should reject any proposal to delay GBSD or extend the life of Minuteman III beyond the currently-planned 2030 timeframe. Congress should also closely scrutinize ICBM modernization efforts and ensure the GBSD program remains on budget and on schedule to replace the Minuteman III before the end of the next decade. This includes working closely with the industry and oversight groups to institute best practices and maximize cost-efficiency in the program.

Recommendation #3: Maintain existing ICBM force structure

The Department of Defense should continue to deploy 400 single warhead missiles in 450 missile silos. The Department should also retain the capability to upload additional warheads on current and future ICBMs. Congress should support this force structure with relevant authorizations and appropriations and reject any effort to reduce ICBM capacity below the existing level.

Recommendation #4: Provide Air Force personnel with the tools needed to effectively operate and maintain the ICBM force

In 2014, the Air Force launched a Force Improvement Program designed to support the personnel who perform the ICBM mission, including increases in pay, better equipment and refurbished facilities.[26] Congress should closely review these investments and ensure that Air Force personnel are receiving the tools they need to perform their tasks and missions. The Air Force also is in the early stages of a program to replace the Vietnam-era helicopters currently used to provide security in the missile fields surrounding the three ICBM bases. Congress and the next administration should continue the helicopter replacement program and ensure that the Air Force can provide the required level of security for the nation's ICBMs until it fields a new airframe.

Notes

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[12] Robert Scher, Statement to the House Armed Services Committee Subcommittee on Strategic Forces, 2 Mar 2016; http://docs.house.gov/meetings/AS/AS29/20160302/104619/HHRG-114-AS29-Wstate-ScherR-20160302.pdf

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[21] For example, the Defense Department Comptroller's report on weapon system costs for Fiscal Year 2017, which showed 7 major weapons programs that received more than $2 billion in funding in Fiscal Year 2016. See "Program Acquisition Cost By Weapon System, U.S. Department of Defense Fiscal Year 2017 Budget Request," Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, Washington, DC: February 2016.

[22] "Projected Costs of U.S. Nuclear Forces, 2015 to 2024," Congressional Budget Office, Washington, DC: January 2015, p. 4. Available at: https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/49870-NuclearForces.pdf

[23] Ashton Carter, "Remarks on 'Sustaining Nuclear Deterrence,'" 26 Sept 2016. Available at: http://www.defense.gov/News/Speeches/Speech-View/Article/956630/remarks-on-sustaining-nuclear-deterrence

[24] Todd Harrison and Evan Braden Montgomery, "The Cost of U.S. Nuclear Forces: From BCA to Bow Wave and Beyond," Center for Strategic and Budgetary Assessments, 2015, p. 28.

[25] Ibid, pp. 31-32.

[26] Department of Defense Press Briefing by Secretary Hagel on Reforms to the Nuclear Enterprise in the Pentagon Briefing Room, 14 Nov 2014. Available at: http://www.defense.gov/News/Transcripts/Transcript-View/Article/606962/department-of-defense-press-briefing-by-secretary-hagel-on-reforms-to-the-nucle