

U.S. Nuclear Excess: Understanding the Costs, Risks, and Alternatives

By Kingston Reif with Alicia Sanders-Zakre

An Arms Control Association Report

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Cover Photo

The Ohio-class submarine *USS Wyoming* approaches Naval Submarine Base Kings Bay in Georgia on January 9, 2009. Photo credit: U.S. Navy

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Executive Summary

In a little-noticed comment before his controversial July 2018 summit meeting with Russian President Vladimir Putin in Helsinki, U.S. President Donald Trump characterized his government's multi-hundred billion dollar plans to replace the aging U.S. nuclear arsenal as "a very, very bad policy."¹ He seemed to express some hope that Russia and the United States, which together possess over 90 percent of the planet's nuclear warheads, could chart a different path and avert renewed military and nuclear competition.

The Helsinki meeting, however, did not produce any agreement on nuclear weapons and Trump has so far shown little interest in a different nuclear spending path. Quite the opposite, in fact. "We have far more money than anybody else by far," Trump said last October. "We'll build [the U.S. nuclear arsenal] up until" other nuclear-armed states such as Russia and China "come to their senses."²

Citing a deteriorating international security environment, the Trump administration is pursuing a significant expansion of the role and capability of the U.S. nuclear arsenal. In addition to continuing full speed ahead with its predecessor's plans to replace the nuclear triad and its associated warheads on largely a like-for-like basis, the administration is proposing to broaden the circumstances under which the United States would consider the first use of nuclear weapons, develop two new sea-based, low-yield nuclear options, and lay the groundwork to grow the size of the arsenal.

At the same time, key U.S.-Russian nuclear arms control agreements, which serve to regulate the nuclear balance and prevent unconstrained nuclear competition, are now in serious doubt. The Trump administration has announced the United States will leave the landmark 1987 Intermediate-Range Nuclear Forces (INF) Treaty in August 2019 unless Russia returns to compliance with the pact, and expressed hostility towards extending the 2010 New Strategic Arms Reduction Treaty (New START).³ New START expires in 2021 but can be extended by up to five years subject to the agreement of Washington and Moscow.

In short, the Trump administration is preparing to compete in a new nuclear arms race while simultaneously increasing the likelihood of such a contest.

The projected cost of the proposed nuclear spending spree is staggering and it is growing. The United States currently plans to spend nearly \$500 billion, after including the effects of inflation, to maintain and replace its nuclear arsenal over the next decade, according to a January 2019 Congressional Budget Office (CBO) report.⁴ This is an increase of nearly \$100 billion, or about 23 percent, above the already enormous projected cost as of the end of the Obama administration. Over the next 30 years, the price tag is likely to top \$1.5 trillion and could even approach \$2 trillion.⁵

These big nuclear bills are coming due as the Defense Department is seeking to replace large portions of its conventional forces and internal and external fiscal pressures are likely to limit the growth of—and perhaps reduce—military spending. "We're going to have enormous pressure on reducing the debt which means that defense spending—I'd like to tell you it's going to keep going up—[but] I'm not terribly optimistic," Alan Shaffer, deputy under secretary of defense for acquisition and sustainment, said in February 2019.⁶

This report outlines the ways in which the Trump administration's nuclear strategy is unnecessary, unsustainable, and unsafe. It describes three realistic options to reduce spending on nuclear weapons while still maintaining a devastating nuclear deterrent. Scores of billions of dollars could be saved or redirected to higher priorities by eliminating,

Figure A: Cost Savings from Adjusting Nuclear Weapons Spending Plans
In 2017 Dollars

	Option	Savings	What Savings Could Buy
1	Eliminate the 2018 Nuclear Posture Review Additions	\$28.8 billion	Nine Virginia class attack submarines, 90 “Penetrating Counter Air” aircraft to replace the F-15 and F-22, the sustainment of an army infantry or stryker brigade combat team for 10 years, or nearly the entire remaining acquisition cost of the Joint Air-to-Ground Missile, Long Range Precision Fires, and Arleigh Burke Class Destroyer programs
2	Deploy a More Cost-Effective 1,550-Warhead Triad	\$149.3 billion	Nearly the entire additional acquisition cost over the next 30 years to grow the Navy to 355 ships by the late 2030s
3	Deploy a 1,000-Warhead Dyad Without ICBMs	\$281.8 billion	Nearly the combined fiscal year 2019 budget requests for the Department of Veterans Affairs, Department of State, and Department of Homeland Security or nearly the entire projected cost to cleanup legacy nuclear weapons facilities and waste

delaying, or scaling back the administration’s proposals for new delivery systems, warheads, and infrastructure.

The report also recommends key steps Congress can take to enhance affordability and improve its understanding of the underlying policy assumptions and long-term budget challenges.

Over the past several years, Congress has largely supported both the Obama and Trump administration’s proposals to replace the arsenal, though not without controversy. That approach can, should, and likely will change.

The United States maintains a larger and more diverse nuclear arsenal than is required to deter and respond to a nuclear attack against itself or its allies. Despite claims that nuclear weapons “don’t actually cost that much,” the simple fact is that unless the administration and its successors find a pot of gold at the end of the rainbow, planned spending to maintain and replace the arsenal will pose a significant affordability problem, and threaten other national security priorities.⁷ Moreover, the plans

would increase the risks of miscalculation, unintended escalation, and accelerated global nuclear competition.

Key leaders in Congress are increasingly aware and concerned about the rising price tag, the Trump administration’s controversial proposals for expanded nuclear capabilities, and the risk of a total breakdown of the U.S.-Russian arms control architecture. These and other factors will bring far greater scrutiny to the U.S. nuclear recapitalization programs, their rationale, their cost, and policy alternatives. Now is the time to re-evaluate nuclear weapons spending plans before the largest investments are made.

The choice then is between the current strategy, which is excessive and unnecessary, puts the United States on course for a budgetary train wreck, and would increase nuclear risk, or a more realistic and affordable approach that still leaves the United States with a devastating nuclear force that is more than capable of deterring any nuclear threats to the United States and its allies.

Given the stakes, the choice should be obvious.

The U.S. Nuclear Recapitalization Program: Obama's Down Payment to Trump's Expansion

The United States currently possesses approximately 3,800 nuclear warheads in its military stockpile, down from a mid-1960s high of over 30,000.⁸ Of that amount, approximately 1,600 warheads are deployed on intercontinental ballistic missiles (ICBMs) and submarine-launched ballistic missiles (SLBMs) and at strategic bomber bases. An additional 150 non-strategic, or tactical, nuclear weapons are believed to be deployed at military bases in five European countries.

The United States maintains a nuclear triad, meaning it can deliver nuclear weapons by land, sea, and air. In reality, however, the Defense Department has five distinct ways to deliver a nuclear weapon. It can launch a warhead from a Minuteman III ICBM housed in an underground silo or a Trident II (D-5) SLBM carried on an Ohio-class ballistic missile submarine (SSBN). It can drop a gravity bomb directly from a long-range, nuclear-capable B-2 bomber or fire a nuclear-armed air-launched cruise missile (ALCM) from a long-range B-52 bomber. And it can drop gravity bombs from shorter-range, nuclear-capable fighter aircraft.

As of September 1, 2018, the U.S. State Department reported that the United States deploys approximately 1,398 strategic warheads on 659 long-range delivery systems (ballistic missiles and bombers) under the counting rules of New START.⁹ The treaty limits the strategic forces of the United States and Russia to no more than 1,550 deployed warheads, 700 deployed delivery systems, and 800 deployed and non-deployed launchers of missiles and bombers.

During the Cold War, the United States replaced its nuclear forces in two major waves. The first wave, which took place between 1951 and 1965, saw the Defense Department devote up to 17 percent of its

annual budget to building and maintaining nuclear weapons, according to the Trump administration's 2018 Nuclear Posture Review (NPR).¹⁰ Presidents Jimmy Carter and Ronald Reagan oversaw a second wave that lasted for over a decade and peaked at nearly 11 percent of department spending.¹¹ This wave produced the Ohio-class submarine, the AGM-86B ALCM, the B-1 bomber, the MX Peacekeeper ICBM, B-2 bomber, and the W80, B83, W87, and W88 warheads. With the exception of the Peacekeeper ICBM and the B-1 bomber, which is no longer part of the nuclear mission, all of these weapons remain in the arsenal today.

After the fall of the Soviet Union, nuclear spending dropped, as did military spending more generally.¹² But while the defense budget at large climbed back up after the September 11th terrorist attacks, nuclear weapons spending remained relatively flat.¹³ Between 2001 and 2017, it comprised no more than four percent of Pentagon spending.

Other nuclear-armed states, notably Russia and China, are upgrading their arsenals and have tested, produced, and deployed more brand-new weapons than the United States over the past decade. But this does not mean the United States has fallen behind.¹⁴ The U.S. military has refurbished and improved nearly all of its existing strategic and tactical delivery systems



Air Force Gen. Paul J. Selva, the vice chairman of the Joint Chiefs of Staff, discusses nuclear weapons policy at the Air Force Association’s Mitchell Institute breakfast series in Washington, D.C., August 10, 2018.

(DoD photo by Jim Garamone)

and many of the warheads they carry to last well beyond their planned service life. Though decades old, these forces are more capable than the originals. Gen. Paul Selva, the vice chairman of the joint chiefs of staff, noted in testimony to the House Armed Services Committee in March 2017 that while Russia and China continue to modernize their nuclear forces, “we do have a qualitative advantage.”¹⁵

But the U.S. government argues that incremental upgrades of the current arsenal are no longer feasible nor advisable and that today’s arsenal requires a third wave of major recapitalization. As former Defense Secretary Ash Carter put it in a September 2016 speech in Minot, North Dakota, “it’s not a choice between replacing these platforms or keeping [them], it’s really a choice between replacing them or losing them.”¹⁶ The Obama administration committed to a major overhaul of the arsenal in 2010, part of its effort to win Republican support in the Senate for New START.¹⁷ Not only has the Trump administration continued this effort, it has expanded upon it with proposals for new weapons and infrastructure.

The Obama Down Payment

The Obama administration’s 2010 NPR endorsed the continued maintenance of a nuclear triad. In a message to the Senate on February 2, 2011, following the Senate’s approval of New START in December 2010, President Obama stated:

“I intend to (a) modernize or replace the triad of strategic nuclear delivery systems: a heavy bomber and air- launched cruise missile, an ICBM, and a nuclear-powered ballistic missile submarine (SSBN) and SLBM; and (b) maintain the United States rocket motor industrial base.”¹⁸

The administration based its plans to rebuild the arsenal on maintaining a force structure under New START consisting of 240 deployed SLBMs,

Figure B: Final NEW START Force Structure

The Defense Department announced its plans in April 2014 for nuclear arsenal reductions under New START. New START limits each side to 1,550 accountable strategic nuclear warheads deployed on 700 long-range delivery vehicles, composed of ICBMs, SLBMs, and long-range bombers. The treaty also limits each country to 800 deployed and nondeployed missile launchers and bombers.

Strategic Delivery Vehicles	2010 Deployed Delivery Vehicles	2018 Deployed Delivery Vehicles	2018 Deployed and Nondeployed Launchers and Bombers
Minuteman III ICBMs	450	400	454
Trident II D-5 SLBMs	336	240	280
B-2A/B-52H Bombers	94	60	66
Total	880	700	800

Source: Congressional Research Service

400 deployed ICBMs, and 60 deployed long-range bombers.¹⁹ The plans aimed to replace existing strategic nuclear delivery systems with similar numbers of new or refurbished systems. Initially there wasn't a commitment to a single modernization approach, such as building a new ICBM instead of modernizing the existing Minuteman III.²⁰ But by 2016 many aspects of the plans went well beyond what was envisioned in 2010, notably programs to develop a new ICBM and interoperable ballistic missile warheads.

Obama's commitment to recapitalize the arsenal was part of a larger agenda that aimed to reduce nuclear weapons risks. Obama delivered his first major foreign policy address as president on nuclear disarmament and nonproliferation in Prague on April 5, 2009.²¹ The speech outlined his vision for strengthening global efforts to curb the spread of nuclear weapons and moving forward on practical, immediate steps "to seek the peace and security of a world without nuclear weapons." Notable achievements of this agenda included securing vulnerable nuclear materials around the world through the nuclear security summit process, taking measures (such as committing not to develop new warheads with new capabilities) to reduce the role of nuclear weapons in U.S. policy, negotiating New START (and gaining U.S. Senate

approval), and spearheading six-party talks that concluded in the July 2015 nuclear agreement with Iran.²² But other key administration priorities, such as stopping the advance of North Korea's nuclear and ballistic missile programs, achieving further reductions beyond New START, and ratifying the 1996 Comprehensive Test Ban Treaty (CTBT), were not fulfilled.

Following an interagency review, Obama determined in 2013 that the United States could further reduce the size of the deployed arsenal by up to one-third from 1,550 New START-accountable deployed strategic warheads to about 1,000 (or about 1,300 actual warheads when counting gravity bombs and ALCMs stored at bomber bases).²³ Yet Obama did not immediately reduce the size of the arsenal, despite the review's conclusion that deterrence could be achieved by even a unilateral reduction.²⁴ Instead the administration invited Russia to negotiate a further one-third reduction of each country's strategic nuclear arms. But Moscow repeatedly rebuffed the offer.

In an October 2017 report, *Approaches for Managing the Costs of U.S. Nuclear Forces, 2017 to 2046*, the CBO estimated that the Obama administration's plans to maintain and replace the arsenal over 30 years would cost \$1.2 trillion in fiscal year 2017 constant dollars.²⁵ When the effects of inflation were included, the estimated total cost approached \$1.7 trillion. The CBO projection included about \$400 billion in modernization spending that falls largely in the period between the early 2020s and late 2030s, as well as \$843 billion in relatively stable, though steadily increasing, operations and sustainment costs over the entire 30-year period for the current generation of forces and new forces once they enter service.

The estimate captured spending on the triad of nuclear delivery systems, on command and control systems at the Defense Department, and on nuclear warheads and their supporting infrastructure at the Energy Department's semiautonomous National Nuclear Security Administration (NNSA). Most of the programs to buy new systems remain in the early stages, and a few others have yet to begin.

The projection included the full cost of the long-range bomber leg of the triad, which has nuclear and non-nuclear missions, and an estimate of additional costs based on historical cost growth. It also included \$25 billion to sustain and replace tactical nuclear delivery systems and a portion of the cost of the low-yield B61 gravity bombs they carry. Annual costs were slated to peak at about \$50 billion during the late 2020s and early 2030s. During this period, nuclear weapons would consume about eight percent of total national defense spending and, during the early 2030s, 15 percent of the Defense Department's acquisition costs.²⁶

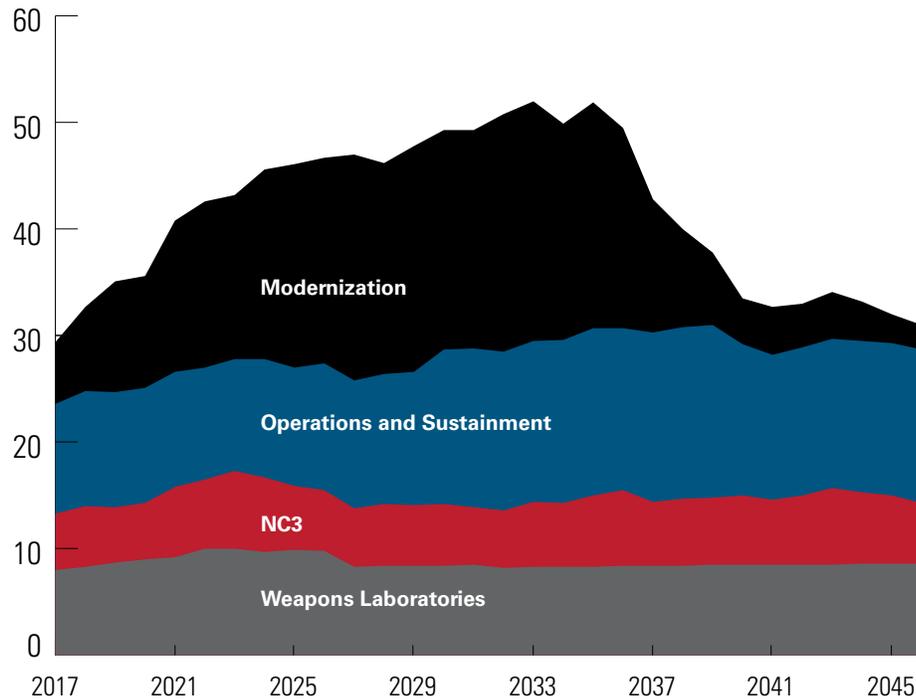


President Barack Obama delivers remarks at a Combined Forces Command Briefing at Yongsan Garrison in Seoul, Republic of Korea on April 26, 2014.

(Photo: State Department/Public Domain)

Figure C: Costs of Nuclear Forces Under the Obama Administration's Plan, 2017–2046

In Billions of 2017 Dollars



Source: Congressional Budget Office, using data from the Department of Defense and the Department of Energy
 NC3 = Nuclear command, control, communications, and early-warning systems

The estimate of \$400 billion in nuclear modernization spending might have been a best-case scenario. Because the Defense Department has not built SSBNs or (especially) ICBMs in a long time, the confidence levels in the cost estimates for the Columbia-class submarine program, which is slated to replace the Ohio-class submarine, and the Ground Based Strategic Deterrent (GBSD) program, which would replace the Minuteman III ICBM system, are relatively low.²⁷ This means that, even if the programs are managed well, they could end up costing a lot more than the estimates project. The Columbia-class and GBSD programs, as well as the plan to replace the B-2 and later the B-52 with the B-21 “Raider,” could each cost as much as \$150 billion after including the effects of inflation, easily putting them among the top 10 most expensive Pentagon acquisition programs.²⁸

The projected cost to replace the Defense Department’s command, control, communications, and early-warning systems and NNSA’s nuclear infrastructure may also be understated. The Pentagon’s command-and-control network allows operators to communicate with nuclear forces, issue commands

that control their use, and detect or rule out incoming attacks. The report projected \$184 billion in spending on command-and-control systems over 30 years. But the budget office noted that while many of these systems “need to be modernized,” the “plans to do so are generally not yet well defined. For that reason, they have not been included in CBO’s estimates of costs (except to the extent that they are included in... existing budgets).”

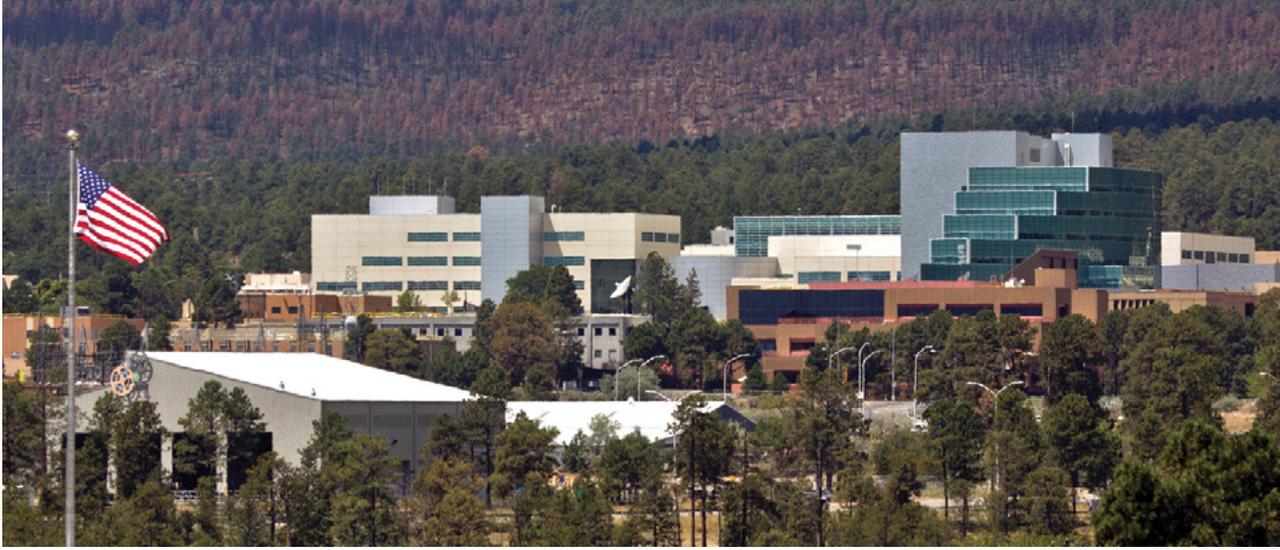
The report projected the 30-year cost to operate and replace the complex of design laboratories and production facilities that provide the engineering and scientific capabilities required to sustain warheads at \$261 billion. But as of the end of the Obama administration, plans for several NNSA priorities, such as building new plutonium production capabilities and reducing the number of aging facilities that require maintenance, had yet to be fully developed.

Congress largely supported the Obama administration’s spending plans, though not without controversy. For example, the Democrat-controlled Senate Appropriations Committee sought to scale back NNSA’s plans for the B61-12 life extension program (LEP) in 2013 and block funding for the W80-4

Figure D: The Obama-Era Nuclear Recapitalization Program

Program	Program Plan	Program Cost
<p>Columbia-class SSBN</p>	<p>Would replace the current fleet of 14 Ohio-class submarines with 12 new submarines. The first new submarine is scheduled to be purchased in 2021 and enter service in 2031. The new submarines are slated to remain in service through the 2080s. The program’s Milestone B decision occurred in January 2017. The prime contractor is General Dynamics Electric Boat.</p>	<p>The Navy estimates the acquisition cost of the program at \$128 billion in then-year dollars. However, according to the Government Accountability Office, “it is more likely than not that the” program will exceed this cost because “the Navy has budgeted the submarine to a confidence level for the program that is lower than what experts recommend.” The CBO estimates the program will cost roughly \$10 billion more in FY 2018 dollars than the Navy’s projection. Roughly \$14 billion has been appropriated for the program through FY 2019.</p>
<p>B-21 “Raider” Long-Range Strategic Bomber</p>	<p>Would initially replace the B-1 and B-2 bombers. The current plan is to procure at least 100 new bombers that would begin to enter service in the late-2020s and be capable of penetrating the most advanced adversary air defenses. The Air Force has refused to release the value of the EMD contract awarded to Northrop Grumman Corp. in October 2015 to develop the B-21 and purchase the first 21 aircraft citing classification concerns.</p>	<p>The CBO estimates the cost of the program at \$97 billion in FY 2017 dollars. The Pentagon projects the cost of each bomber at between \$564 million and \$606 million in FY 2016 dollars assuming the purchase of 100 aircraft. The Defense Department attributes 5% of the acquisition cost of the program to the nuclear mission. Over \$8 billion has been appropriated for the program through FY 2019.</p>
<p>Ground Based Strategic Deterrent (GBSD)</p>	<p>Would replace the current Minuteman III ICBM system and its supporting infrastructure. GBSD is slated for initial fielding in FY 2028. The Air Force is planning to procure 666 GBSD missiles to ensure a deployed force of 400 missiles through 2070. In August 2017 the Air Force selected Boeing Co. and Northrop Grumman Corp. to proceed with development of GBSD. The program’s Milestone B decision is slated for FY 2020.</p>	<p>An independent Pentagon cost estimate conducted in 2016 put GBSD’s price tag at between \$85 billion and \$150 billion in then-year dollars, well above the Air Force’s initial estimate of \$62 billion. Pentagon officials ultimately approved the \$85 billion figure as the initial official cost of the program. Nearly \$900 million has been appropriated for the program through FY 2019.</p>
<p>Long-Range Standoff Weapon (LRSO)</p>	<p>Would develop a replacement for the AGM-86B air launched cruise missile (ALCM). The new missile would be compatible with the B-2 and B-52 bombers, as well as the planned B-21 “Raider” and be capable of penetrating the most advanced adversary air defenses. The first missile is slated to be produced in 2026. The current plan calls for about 1,000 new missiles. In August 2017 the Air Force awarded two \$900 million contracts to Lockheed Martin Corp. and Raytheon Co. to proceed with development of LRSO. The program’s Milestone B decision is slated for FY 2022.</p>	<p>The Air Force estimates the program will cost \$10.8 billion in then-year dollars to acquire. Nearly \$1.3 billion has been appropriated for the program through FY 2019.</p>

Program	Program Plan	Program Cost
Nuclear Capability for F-35A Joint Strike Fighter	Would allow the Air Force to retain and forward deploy a dual-capable fighter aircraft, a role currently filled by the F-15E and F-16 in support of NATO commitments. The Air Force plans to provide Block 4A and Block 4B versions of the F-35A with the ability to carry the B61-12 by 2022.	The CBO estimated in 2013 that it would cost about \$350 million to finish developing the modifications to make the F-35 nuclear-capable. This does not include the costs for implementing those modifications. Roughly \$160 million has been appropriated for the program through FY 2019.
B61-12 tail kit	Would provide the B61-12 (a life extension program overseen by NNSA) with a new guided tail kit that would increase the accuracy of the weapon. The Air Force is currently planning to procure over 800 tail kits. The program also supports integration of the B61-12 on existing long-range bombers and short-range fighter aircraft.	The Air Force estimates the tail kit will cost \$1.6 billion in then-year dollars to develop. A 2013 Pentagon report put the total life-cycle cost for the program at \$3.7 billion. About \$740 million has been appropriated for the program through FY 2019.
B61-12 LEP	Would refurbish the aging B61 nuclear gravity bomb by consolidating four of the five existing versions of the bomb into a single weapon known as the B61-12. The first bomb is slated to be produced in 2020. The upgraded weapon would be equipped with a new tail-kit guidance assembly (see above) and is expected to last for 20–30 years.	NNSA estimates the cost of the LEP at \$7.6 billion in then-year dollars but the agency's independent cost estimate projects the cost at \$10 billion and thinks the programs will take longer to complete. Over \$4.5 billion has been appropriated for the program through FY 2019.
W80-4 LEP	Would refurbish the aging ALCM warhead for delivery on the LRSO (see above). The first refurbished warhead is scheduled for production in 2025.	NNSA estimates the cost of the program at between \$7.6–\$11.7 billion in then-year dollars. Roughly \$1.5 billion has been appropriated for the program through FY 2019.
W78 LEP	Would refurbish the aging W78 ICBM warhead for delivery on GBSD (see above). The Obama-era plan was to replace the warhead with an interoperable warhead for deployment on both ICBMs and SLBMs that would eventually replace the W78 and W88 warheads.	NNSA estimates the cost of the program will be between \$9.9–\$15.1 billion in then-year dollars. \$53 million has been appropriated for the program through FY 2019.



The Los Alamos National Laboratory in New Mexico, one of the nation's three national nuclear labs.

(Photo: Los Alamos National Laboratory)

ALCM warhead LEP in 2014.²⁹ The vast majority of Democrats in the House also opposed elements of the recapitalization program, notably the plans to replace the ALCM with the long-range standoff weapon (LRSO) and the ALCM warhead with the W80-4.

In 2016 during his last year in office, Obama evaluated several options to adjust the nuclear weapons spending programs in the face of concerns about the need, growing scope, and affordability of the recapitalization effort.³⁰ These included reducing the number and diversity of deployed strategic nuclear weapons consistent with Obama's determination in 2013 that the arsenal could be reduced by up to one-third below New START limits, appointing a blue ribbon presidential commission to assess and identify possible alternatives to the recapitalization plans, and delaying the planned purchase of a new fleet of 1,000 nuclear-capable air-launched cruise missiles. Yet no action was taken to adjust the plans.

The Trump Nuclear Expansion

In December 2016, President-Elect Donald Trump tweeted that the United States “must greatly strengthen and expand its nuclear capability” and later told MSNBC that he would “outmatch” and “outlast” other potential competitors in a nuclear arms race.³¹ The Trump administration's NPR, released in February 2018, comports with this objective by reaffirming the Obama administration's recapitalization plans, calling for new warheads and new missiles to counter Russia and more bomb production infrastructure at NNSA, and treating arms control and nonproliferation largely as an afterthought.

In January 2019, the CBO published the latest iteration of its biennial report estimating the 10-year costs of U.S. nuclear forces. The report, which covers the period between fiscal years 2019 and 2028, projects the cost of the Trump administration's

nuclear spending plans at \$494 billion in then-year dollars.³² This is an increase of \$94 billion, or about 23 percent, above the CBO's 2017 estimate as of the end of the Obama administration.³³ By 2028 nuclear weapons would consume about seven percent of total national defense spending.

Of the \$94 billion increase, 55 percent is due to the report capturing two additional years of recapitalization spending during the late 2020s, 39 percent is due to the additions proposed in the Trump NPR and rising costs of other programs, particularly command-and-control systems, and the last six percent is due to a higher estimate of cost growth. The CBO estimates that implementing the NPR's recommendations to build two new low-yield nuclear weapons and increase the U.S. capacity to produce plutonium pits would cost \$17 billion over the next decade, although the estimate is very uncertain.



U.S. President Donald Trump signs the \$716 billion John S. McCain National Defense Authorization Act for fiscal year 2019 at Fort Drum, New York, on August 13, 2018.

(Photo: Brendan Smialowski/AFP/Getty Images)

The Trump administration's plan to withdraw from the INF Treaty in August 2019 if Russia doesn't return to compliance and the apparent lack of interest in extending New START could further increase the price tag. In particular, the verifiable New START caps on Russian deployed nuclear forces aid U.S. military and intelligence planning by reducing the need to make worst-case assessments that might prompt additional costly nuclear force and intelligence investments. Russia already has open production lines for warheads and new strategic delivery systems and in the absence of New START could build additional weapons faster than the United States.

However, a 2012 Defense Department report concluded that the U.S. force structure under New START "has been designed to account for any possible adjustments in the Russian strategic force configurations that may be implemented in response to the New START Treaty."³⁴ The report added that Russia "would not be able to achieve a militarily significant advantage by any plausible expansion of its strategic nuclear forces, even in a cheating or breakout scenario under the New START Treaty, primarily because of the inherent survivability of the planned U.S. strategic force structure, particularly the Ohio-class ballistic missile submarines, a number of which are at sea at any given time."

New Low-Yield Weapons

The 2018 NPR calls for developing two new low-yield nuclear capabilities primarily to counter Russia's alleged willingness to use or threaten to use tactical nuclear weapons on a limited basis "in crises and at lower levels of conflict," a strategy known as "escalate to win." The "supplements," as the NPR describes them, include the near-term deployment of low-yield nuclear warheads on SLBMs and, in the longer term, development of a new nuclear-armed sea-launched cruise missile (SLCM). The United States currently possesses two types of nuclear warheads that can be detonated at a low yield: the B61 gravity bomb and the W80-1 ALCM warhead. Russia possesses a larger and more diverse arsenal of low-yield weapons than the United States and is investing to sustain and possibly expand those weapons.

According to the NPR, the development of the two additional options "is not intended to enable, nor does it enable, 'nuclear war-fighting.'" Rather, expanding U.S. tailored response options will "raise the nuclear threshold and help ensure that potential adversaries perceive no possible advantage in limited nuclear escalation, making nuclear weapons employment less likely."

The NPR states that a low-yield SLBM warhead would provide a low-cost, prompt response option that is able to penetrate adversary defenses. The review



U.S. President George H.W. Bush poses for photographers after his address to the nation, September 27, 1991, in the Oval Office of the White House. During his speech, Bush announced that the United States would unilaterally eliminate its land and sea-based short-range nuclear weapons. (Photo: Luke Frazza/AFP/Getty Images)

adds that development of a new nuclear SLCM, which would take nearly decade, would provide a non-strategic regional presence and an assured response capability. The review also claims that the weapon could provide an incentive for Russia to negotiate on its tactical nuclear weapons, which Moscow to date has been reluctant to do. The United States deployed SLCMs during the Cold War, but President George H.W. Bush removed them from attack submarines and surface ships in the early 1990s.³⁵ President Barack Obama ordered the retirement of the aging system as a result of the 2010 NPR.

The NNSA's fiscal year 2019 budget request included \$65 million for modifying a small number of 100-kiloton W76-1 SLBM warheads to reduce their explosive yield. The Defense Department requested \$22.6 million for the warhead, dubbed the W76-2. Production of the W76-2 has already begun and the initial batch of warheads are slated to be delivered to the Navy by the end of fiscal year 2019.³⁶ Fielding is scheduled to begin in fiscal year 2020. In total, development and fielding of the capability is expected to cost about \$125 million.

The Republican-controlled Congress approved the request for the capability, but not without strong opposition from Democratic lawmakers.³⁷

In addition, the Pentagon received \$1 million in fiscal year 2019 to begin an analysis of the performance requirements and costs to pursue a new SLCM. The total cost to develop the capability is uncertain given that the administration has yet to decide on which weapon system to pursue. Potential options range from restoring the Tomahawk cruise missile's nuclear capability to developing an entirely new missile, which would be the most expensive

Figure E: Trump Additions to the Obama-Era Nuclear Recapitalization Program

Program	Program Plan	Program Cost
<p>Low-yield SLBM warhead (W76-2)</p>	<p>The Trump NPR states that “DoD and NNSA will develop a low-yield SLBM warhead to ensure a prompt response option that is able to penetrate adversary defenses.” NNSA has begun production of the warhead and aims to complete production by the end of FY 2019.</p>	<p>NNSA requested \$65 million for the W76-2 in FY 2019. Congress authorized and approved this request. The Pentagon and NNSA anticipate spending a total of about \$125 million to develop and produce the warhead modification.</p>
<p>Sea-Launched Cruise Missile (SLCM)</p>	<p>According to the Trump NPR, a new SLCM “will provide a needed non-strategic regional presence, an assured response capability, and an INF-Treaty compliant response to Russia’s continuing Treaty violation.” Development is estimated to take 7–10 years.</p>	<p>The Pentagon requested and Congress approved \$1 million in FY 2019 to begin an analysis of the performance requirements and costs to pursue a new SLCM. The CBO projects a new SLCM and its associated warhead will cost \$9 billion in then-year dollars from 2019 to 2028. The cost to develop the capability is uncertain given the administration has yet to decide on what approach to pursue.</p>
<p>Retaining the B83 Until a Suitable Replacement is Found</p>	<p>The Trump NPR seeks to retain the high-yield B83-1 gravity bomb, until a suitable replacement is found. The decision reverses the Obama administration’s proposal to retire the warhead once confidence in the under-development B61-12 is achieved by the mid- to late-2020s. According to NNSA’s FY 2019 Stockpile Stewardship and Management Plan (SSMP), the agency is coordinating with the Pentagon to determine the period for sustaining the B83 and the schedule for restarting limited refurbishment programs if necessary.</p>	<p>In 2013 NNSA estimated that it would cost \$4 billion (in FY 2012 dollars) to sustain the warhead through the 2030s and an additional \$7 to \$9 billion to extend the warhead’s life beyond that.</p>
<p>Producing at least 80 Plutonium Pits Per Year By 2030</p>	<p>The Trump NPR calls for building “the enduring capability and capacity to produce plutonium pits at a rate of no fewer than 80 pits per year by 2030.” No basis is offered for this minimum capacity target, which is an increase over the requirement of 50–80 pits mandated by Congress during the Obama administration.</p>	<p>The CBO projects that expanding pit production will cost \$9 billion in then-year dollars from 2019 to 2028, although that estimate is very uncertain. According to a May 2018 internal NNSA assessment, producing plutonium pits at the Savannah River Site would cost at least \$9 billion more in fiscal year 2018 dollars than three alternative plans evaluated by the agency.</p>
<p>Advanced Nuclear Delivery Concepts R&D</p>	<p>The NPR says that the Pentagon will undertake research and development “for advanced nuclear delivery system technology and prototyping capabilities,” including “on the rapid development of nuclear delivery systems, alternative basing modes, and capabilities for defeating advanced air and missile defenses.” The language suggests the possible pursuit of R&D on mobile ICBMs and hypersonic missiles for nuclear weapons delivery.</p>	<p>In 2014 the Air Force completed an analysis of alternatives to sustain the ICBM force beyond the anticipated end of the Minuteman III’s service life in 2030. The analysis found that the hybrid option consisting of a mix of silo-based and road-mobile ICBMs would cost at least \$80 billion (in FY 2014 dollars) through 2075 than retaining only silo-based missiles.</p>
<p>Increased Emphasis on Nuclear Command, Control, and Communications</p>	<p>The Trump NPR highlights the growing number of threats to the aging U.S. nuclear, command, control, and communications systems. To address these challenges the review states the United States will pursue a series of initiatives, including strengthening protection against cyber threats and space-based threats and reforming governance of the overall NC3 system.</p>	<p>The Trump NPR lacks key specifics about the plans to place a greater emphasis on nuclear command, control, communications, and early warning systems, namely the estimated cost of these initiatives. The CBO estimates that spending on these systems would total \$77 billion in then-year dollars from 2019 and 2028, about \$19 billion more than the 2017 estimate.</p>

option.³⁸ The CBO projects a new SLCM and its associated warhead will cost \$9 billion in then-year dollars from 2019 to 2028.³⁹ The CBO assumed that the SLCM's total development costs would be 50 percent less than that of the LRSO and the associated warhead and unit production costs would be the same.

In total, the Defense Department requested \$24 billion for nuclear forces in fiscal year 2019, an increase of \$5 billion from the fiscal year 2018 request.⁴⁰ This included \$11 billion for nuclear force sustainment and operations; \$7 billion for replacement programs such as the Columbia-class ballistic missile submarine replacement, B-21 "Raider" heavy bomber, and the LRSO; and \$6 billion for nuclear command, control, and communications. In addition, the administration requested \$11 billion for the NNSA nuclear weapons account in fiscal year 2019, an increase of nearly \$800 million above the fiscal year 2018 request and \$1.8 billion above the Obama administration's final request in fiscal year 2017.

Congress increased funding above the Trump administration's fiscal year 2019 budget request for nuclear forces.⁴¹ The final defense appropriations bill provided a \$200 million increase above the budget request of \$3.7 billion for the Columbia-class submarine program. The law also funded an additional \$50 million above the budget request of \$615 million for the LRSO, and \$69 million above the request of \$345 million for GBSD. The final energy and water bill provided \$11.1 billion for nuclear weapons activities conducted by the NNSA, an increase of about \$90 million above the budget request and \$500 million more than last year's appropriation.

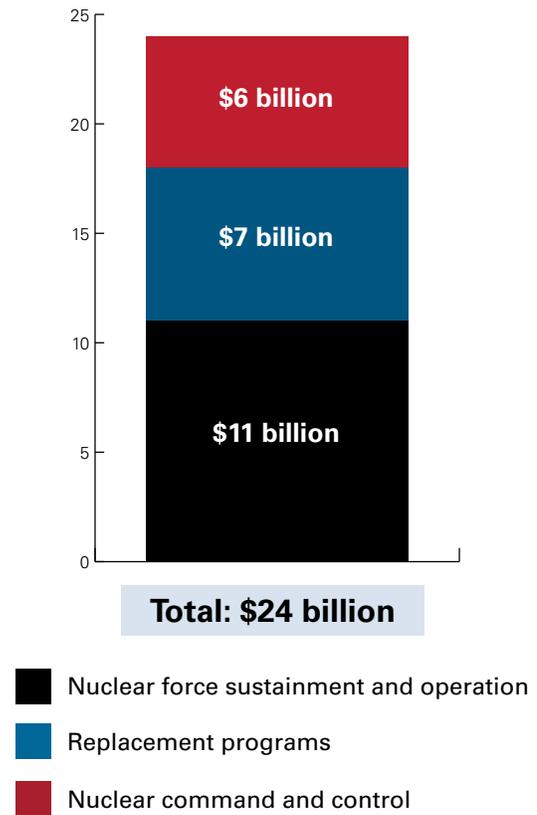
The Trump administration's fiscal year 2020 budget request would provide \$24.9 billion for nuclear forces at the Pentagon and \$12.4 billion for nuclear weapons activities at the NNSA.

Preparing for a New Arms Race

With four major warhead life extensions programs currently underway, the NNSA is already at its busiest since the Cold War era. The Trump NPR proposes a dramatic increase in the scope of the agency's weapons program.

The review calls for laying the groundwork to provide "capabilities needed to quickly produce new or additional weapons" beyond the roughly 3,800 warheads currently in the active U.S. nuclear stockpile. One measure of the scale of the plan for building "new or additional weapons" is given in the commitment to "[p]rovide the enduring capability and capacity to produce plutonium pits [nuclear warhead cores] at a rate of no fewer than 80 pits per year by 2030." No basis is offered for this minimum capacity

Figure F: FY 2019 Funding Request for Nuclear Forces



Source: Department of Defense

target, which is an increase over the requirement of 50–80 pits mandated by Congress during the Obama administration. Prior to 2013, the Los Alamos National Laboratory had the capacity to produce about 10 pits annually.

The Trump administration announced last May that it planned to re-engineer the partially constructed Mixed Oxide (MOX) fuel fabrication facility at the Savannah River Site in South Carolina to join Los Alamos National Laboratory in New Mexico in meeting the pit production target.⁴² This new approach replaces an earlier plan to expand pit production at Los Alamos, including by building one or two production "modules." NNSA officials have stated that they need both locations to meet anticipated pit requirements for the W78 replacement program and for future warhead programs.⁴³ The CBO projects that expanding pit production will cost \$9 billion in then-year dollars from 2019 to 2028, although that estimate is very uncertain.⁴⁴ According to a May 2018 internal NNSA assessment, producing plutonium pits at the Savannah River Site would



NNSA Administrator Lisa E. Gordon-Hagerty interacts with Radiological Assistance Program team members and exhibits, September 26, 2018.

(Photo: National Nuclear Security Administration)

ultimately cost at least \$9 billion more in fiscal year 2018 dollars than three alternative plans to expand plutonium-production capacity at Los Alamos.⁴⁵ It remains to be seen whether Congress will back the new approach.

The NPR also calls for options to expand the arsenal by using existing warheads, including “modifying warheads,” assessing “the potential for retired warheads and components to augment the future hedge stockpile,” and reducing “the time required to design, develop, and initially produce a warhead, from a decision to enter full-scale development.”

In addition to the two new low-yield capabilities referenced earlier, the review seeks to retain the high-yield B83-1 gravity bomb, the only remaining megaton-class warhead in the U.S. stockpile, until a suitable replacement is found. The decision reverses the Obama administration’s proposal to retire the warhead once confidence in the under-development B61-12 gravity bomb is achieved by the mid- to late-2020s.⁴⁶ Although the NPR did not provide a rationale for retaining the B83-1, Pentagon officials subsequently stated that the weapon is required to hold a variety of protected targets at risk, including in North Korea. The Defense and Energy Departments are currently evaluating a timeline and options for refurbishing the warhead. In 2013, NNSA estimated that it would cost \$4 billion in fiscal year 2012 dollars to sustain the warhead through the 2030s and an additional \$7 billion to \$9 billion to extend the warhead’s life beyond that.

Furthermore, the NPR says that the Columbia-class program “will deliver a minimum of 12 SSBNs to replace the current Ohio fleet.” This suggests the Trump administration might identify a requirement for more than 12 new boats. The review also states

that the Pentagon will undertake research and development “for advanced nuclear delivery system technology and prototyping capabilities,” including “on the rapid development of nuclear delivery systems, alternative basing modes, and capabilities for defeating advanced air and missile defenses.” This sweeping language suggests the possible pursuit of research and development on mobile ICBMs and hypersonic missiles for nuclear weapons delivery.

These preparations for a new arms race go far beyond the Obama administration’s plans, which married the development of a more responsive nuclear infrastructure to pledges for reducing the size of the stockpile of nondeployed hedge warheads and accelerating the rate of dismantlement of retired warheads (which the Republican-controlled Congress thwarted).⁴⁷ The Trump NPR does not reiterate these commitments.

The budget implications of the additional work for NNSA are staggering. In November 2018, the agency publicly released the sixth version of its annual Stockpile Stewardship and Management Plan.⁴⁸ The fiscal year 2019 iteration projects \$390 billion in spending in then-year dollars on agency efforts related to sustaining and modernizing the nuclear weapons stockpile over the next 25 years. This is a massive increase of \$70 billion, or 22 percent, over the 2018 version of the plan. Cost overruns, a far from uncommon occurrence in NNSA budgeting, could well drive these projections even higher.

The largest source of projected growth in the new stockpile plan is in the area of nuclear and non-nuclear production facility modernization, including new plutonium pit production, uranium enrichment, and lithium facilities. Whereas in 2018 the agency projected \$8.6–\$39.3 billion in spending on construction, it now estimates the cost at \$61.1–\$90.7 billion.

The plan also foresees an increase in spending relative to the 2018 version on warhead life extension programs through the beginning of the 2020s even as it abandons a controversial proposal to develop three interoperable warheads for deployment on land- and sea-based ballistic missiles as part of the so-called “3+2” strategy.

Since 2013 the NNSA had planned to jointly replace the W78 ICBM warhead and the W88 SLBM warhead with a new warhead dubbed the interoperable warhead (IW)-1. Two subsequent interoperable warheads were slated to replace the W87 and W76 warheads.

Instead, the NPR called for accelerating replacement of the W78 by one year to support deployment on the Air Force’s new ICBM by 2030 “and investigate the feasibility of fielding the nuclear explosive package in a Navy flight vehicle.” The review also did not commit to developing two additional common warheads. In

late 2018, NNSA confirmed that it no longer plans to pursue interoperable warheads.⁴⁹ Congress repeatedly questioned the wisdom of the “3+2” strategy, citing the cost and risks involved with the plan.⁵⁰ The Navy also raised concerns about the IW-1.⁵¹

But forgoing interoperable warheads does not appear to have reduced the projected cost of the W78 replacement program, now dubbed the W87-1. The stockpile plan estimates the cost of the program at \$12.5 billion in then-year dollars, an increase of \$500 million above the prior year’s estimate, and states that the warhead will consist of “all newly manufactured components” and “new technologies.” The plan projects the cost of two additional ballistic missile warhead life extension programs at \$15.8 billion and \$17.4 billion, respectively.

The fiscal year 2020 budget request foresees even higher costs for the NNSA. The weapons account would receive \$12.4 billion, an increase of \$1.3 billion above the fiscal year 2019 appropriation and \$530 million above the projection in the fiscal year 2019 request. The request includes as much as \$12 million to begin a study of the warhead for a new SLCM, \$51.5 million to sustain the B83-1 as proposed in the NPR, and \$899 million for the W80-4 that would be delivered by the LRSO. The request for the ALCM warhead is an increase of \$244 million above

the current appropriation of \$655 million and \$185 million above the projection for fiscal year 2020 in the fiscal year 2019 request.

A Greater Emphasis on Nuclear Command and Control

The NPR highlights the growing number of threats to the aging U.S. nuclear, command, control, and communications systems. To address these challenges the review states that the United States will pursue a series of initiatives, including strengthening protection against cyber threats, strengthening protection against space-based threats, and reforming governance of the overall NC3 system. But the review lacks key specifics, namely the estimated cost of these initiatives.

The CBO estimates that spending on the command-and-control systems would total \$77 billion in then-year dollars from 2019 and 2028, about \$19 billion more than the 2017 estimate.⁵² According to the budget office, the “increase is driven largely by changes to modernization programs, specifically the development and purchase of a new fleet to replace the National Airborne Operations Center (NAOC) aircraft and new concepts for early warning satellites and communications satellites used by nuclear forces.”



Building 235-F at the Savannah River Site (SRS). NNSA is seeking to build at least 50 plutonium pits per year at the site.
(Photo: Savannah River Site/Department of Energy)

Unnecessary, Unsustainable, and Unsafe Excess

According to the Trump NPR, the world is a far more dangerous place than it was at the time the Obama administration conducted its NPR in 2010. “[G]lobal threat conditions have worsened markedly since the most recent 2010 NPR, including increasingly explicit nuclear threats from potential adversaries,” states the 2018 review, citing Russia, China, North Korea, and Iran. “The United States now faces a more diverse and advanced nuclear-threat environment than ever before.”

It is true that the international security environment is less favorable than it was a decade ago. Some of the other nuclear-armed states have not been responsible actors. Technology is advancing in new and unpredictable ways. And the existing U.S. nuclear arsenal—much of which was originally built during the Cold War-era and refurbished since—is aging.

But the NPR does not provide any conclusive or compelling evidence that these challenges will be addressed or overcome by the review’s strategy. The review seeks to add new capabilities and infrastructure to an arsenal that was already excessively large and redundant, and it aims to expand the circumstances under which the United States might consider the first use of nuclear weapons. In addition, the administration is undermining key arms control and nonproliferation guardrails at a time when efforts to reduce global nuclear risks are under significant stress.⁵³

Taken together, these changes in policy are unnecessary, set the stage for an even greater and more unsustainable rate of spending on U.S. nuclear weapons, threaten to accelerate global nuclear competition, and increase the risk of nuclear conflict in the years ahead.

Unnecessary Excess

A Larger Arsenal Than Required for Deterrence

The U.S. military stockpile of approximately 3,800 nuclear warheads, though far smaller than during the

Cold War, is larger than is necessary to deter a nuclear attack on the United States or its allies from Russia’s similarly sized nuclear arsenal, or from China, which has no more than 300 total nuclear weapons.⁵⁴ This oversized arsenal is irrelevant to the most pressing security challenges the United States and its allies face in the 21st century, including cyber threats, weak and failing states, climate change, and aggressive Russian and Chinese regional behavior.

President Obama, with the support of the Pentagon, determined in 2013 that the deployed force could be reduced by up to one-third below the New START levels. Nonetheless, his administration’s nuclear recapitalization plans were based on maintaining roughly the New START levels in perpetuity. The Trump administration has yet to take a position on whether to seek an extension of New START and indicated in its NPR that it does not believe further reductions in the arsenal are prudent given the security environment.⁵⁵

But the fact remains that both the United States and Russia maintain more nuclear weapons than they need for their security. Small numerical advantages by either side would not change the fundamental deterrence equation. Indeed, the United States currently possesses more strategic delivery systems and warheads than Russia while Russia possesses more non-strategic weapons than the United States.

The September 2018 New START data exchange shows that the United States has 659 deployed ICBMs,



Russian President Vladimir Putin listens as former U.S. Secretary of State John Kerry speaks during their bilateral meeting focused on Syria and Ukraine at the Kremlin in Moscow, Russia, on March 24, 2016. (Photo: State Department/Public Domain)

SLBMs, and heavy bombers, while Russia has 517. Such a disparity provides Russia with an incentive to put multiple warheads, or MIRVs, on deployed strategic delivery systems to keep up with the United States and to invest in heavily MIRV'ed new systems, such as the under-development Sarmat (RS-28) heavy ICBM.

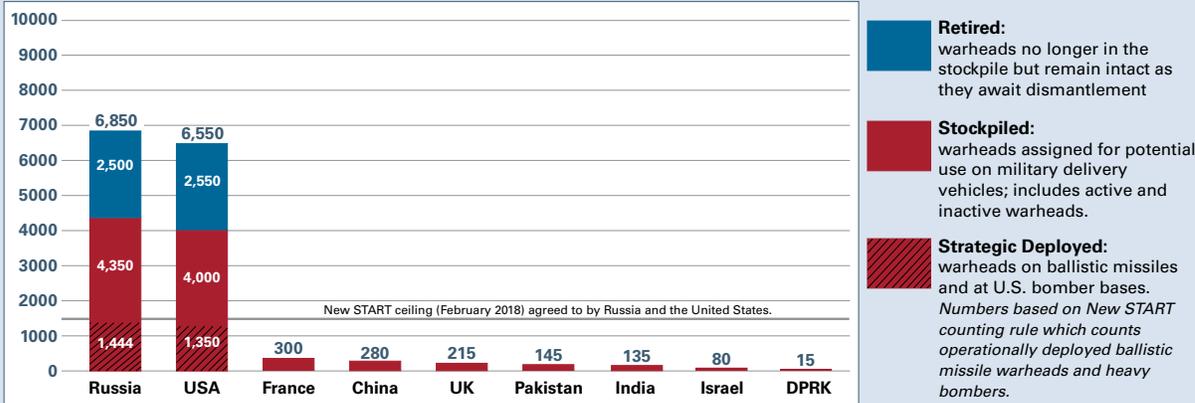
Russia is believed to maintain approximately 2,000 non-strategic warheads. It is not clear how many of these weapons are readily available for offensive use. Most are in central storage and are likely dedicated as much if not more to China than NATO.⁵⁶ The United States has a few hundred low-yield warheads for short-range delivery. Past U.S. reductions of tactical nuclear weapons have not been conditioned on Russian reciprocity.

Ideally, the United States and Russia would agree to extend New START by a period of five years, as allowed under the treaty, and begin talks on further reductions that also address obstacles that have stymied progress in the past, such as missile defense and the nuclear arsenals of other nations. A follow-on to New START could also set limits on tactical nuclear weapons and U.S. and Russian intermediate-range ballistic missiles and ground-launched cruise missiles once prohibited by the INF Treaty. But even if such talks did begin, which appears unlikely in the near term, these talks could last years.

In the meantime, Washington should not give Moscow veto power over the appropriate size and

Figure G: 2018 Estimated Global Nuclear Warhead Inventories

The world's nuclear-armed states possess a combined total of roughly 15,000 nuclear warheads; more than 90 percent belong to Russia and the United States. Approximately 9,600 warheads are in military service, with the rest awaiting dismantlement.



Sources: Hans M. Kristensen and Robert S. Norris; U.S. Department of State; Stockholm International Peace Research Institute. Updated June 20, 2018.

composition of U.S. nuclear forces. Nor should it give Moscow an easy excuse to maintain a similarly bloated arsenal aimed at the United States and its allies. A decision to reduce to 1,000 deployed strategic warheads would put the United States in a stronger position to pressure Russia to rethink some of its expensive nuclear recapitalization projects and reduce its deployed strategic nuclear warheads. Perhaps more intriguingly, a U.S. willingness to reduce its arsenal could lead China to take a less passive approach to nuclear disarmament and more openly discuss the size, composition, and operations of its nuclear forces.⁵⁷

While U.S.-Russian relations are currently strained, the decisions the United States is making now about rebuilding the nuclear arsenal are decisions that will be with it for decades to come. Decisions about force needs must consider the longer term and must weigh the opportunity costs.

A number of objections are often raised against further reducing the U.S. nuclear arsenal. One is that such cuts would reduce the U.S. ability to target adversary nuclear forces in an attempt to limit, or even preclude, the threat these forces could pose

to the United States and its allies. But the United States does not need to place such a large emphasis on “counterforce” to maintain a credible deterrent. Even if the United States wanted to limit the damage Russian or Chinese nuclear forces could cause, it could not meaningfully do so without inviting a devastating nuclear response. By targeting primarily adversary leadership and war-supporting industrial targets, the United States could still hold at risk assets valued by adversaries, reduce the number of nuclear weapons, and lessen reliance on prompt nuclear strikes.⁵⁸ In any event, a U.S. force of 1,000 deployed warheads would still provide significant counterforce capabilities.

Another objection is that further cuts would be a signal of weakness in the face of a more confrontational Russia and assertive China, both of whom are upgrading their nuclear arsenals. But this is not a reason to maintain a nuclear force in excess of U.S. security requirements. If Washington and Moscow are not deterred by 1,000 deployed nuclear weapons deployed on multiple types of delivery systems, what logic presumes 1,550 would make a difference? In the case of China, even after dropping



South Korean President Moon Jae-in meets with U.S. Vice President Mike Pence on the sidelines of the ASEAN summit in Singapore, November 15, 2018. (Photo: Republic of Korea)

to 1,000 deployed strategic warheads, the United States would still enjoy a 10–1 advantage.

Some critics also claim that further U.S. nuclear force reductions would drive allies that depend on the U.S. nuclear “umbrella” to either capitulate to U.S. adversaries or reconsider their non-nuclear-weapon status and seek their own arsenals. Such concerns merit closer inspection given the retaliatory potential of even 1,000 deployed strategic nuclear weapons, as well as the maintenance of superior U.S. conventional forces. Moreover, for a non-nuclear-weapon state, such as South Korea or Japan, to openly build a nuclear arsenal would be a dramatic renunciation of its commitment not to do so under the nuclear Nonproliferation Treaty (NPT). The political costs of such a decision would be huge and likely provide fewer benefits than continuing to rely on U.S. security commitments. Furthermore, rather than express opposition to further nuclear force reductions, many U.S. allies in Europe and Asia have not only repeatedly called on the United States and Russia to extend New START, but also to achieve even deeper reductions below the limits established by the treaty.

Reassurance has always been a function of capabilities and commitment. Allies and partners are understandably concerned about the threats a more aggressive Russia and China pose to their security. These concerns are being exacerbated by President Trump’s repeated assaults on the value of the U.S.-led alliance system and uncertainty in key allied capitals about what U.S. policy actually is on important foreign policy issues.⁵⁹ But the concerns of allies cannot be ameliorated by placing greater emphasis on nuclear threats and weapons.⁶⁰ The United States can continue to assure its allies and partners as it reduces its nuclear arsenal, maintains second-to-none conventional forces, and, most importantly, strengthens political relationships through reaffirmations of the value of alliances, stronger economic and cultural ties, and stepped-up dialogue.

The Flawed Case for New Low-Yield Weapons

The shortcomings in the Trump NPR’s rationale for the development of additional low-yield nuclear options are too numerous to count.

The claim that Russia has lowered the threshold for the first use of nuclear weapons is hotly disputed.⁶¹ While Russia appears to rely more heavily on nuclear weapons for its security than the United States due to its overall conventional inferiority and concerns about U.S. missile defenses, Russia’s official nuclear doctrine does not support the claim that it has adopted an “escalate to win” doctrine. However, even if Moscow has done so, this is likely a result of Moscow’s concerns about the conventional imbalance.



Air Force Gen. John E. Hyten, commander of U.S. Strategic Command, testifies before the Senate Armed Services Committee in Washington, D.C., March 20, 2018.

(Photo: EJ Hersom/DoD)

Regardless, adding a third and fourth low-yield warhead option to the U.S. arsenal is a solution in search of a problem. “I’m very comfortable today with [the] flexibility of our response options,” Gen. John Hyten, commander of U.S. Strategic Command, said in March 2017 as the 2018 NPR was getting underway. “Our plans now are very flexible.”⁶²

The United States already possesses hundreds of low-yield warheads, including nuclear gravity bombs stationed in Europe in support of NATO, as part of the air-leg of the triad and plans to invest over \$150 billion in then-year dollars in the coming decades to ensure these warheads can penetrate the most advanced air defenses. This investment includes the purchase of an upgraded low-yield B61 gravity bomb, a new fleet of stealthy air-launched cruise missiles armed with refurbished low-yield capable W80 warheads, a new fleet of stealthy strategic bombers (the B-21), and a new fleet of stealthy dual-capable F-35A fighter aircraft. If current and planned air-launched options cannot deter or respond to Russian limited nuclear use, why are taxpayers being asked to spend scores of billions of dollars on these systems?

Inexplicably, the NPR fails to cite an intelligence assessment demonstrating that Russia might believe the United States would be self-deterred from using the weapons in its current arsenal (including higher-yield nuclear or conventional weapons) in response to a limited Russian nuclear attack. As John Gower, a retired rear admiral from the British Royal Navy, has written, the argument that high-yield nuclear weapons lack credibility as a deterrent against limited use, though seductive, is ultimately deceptive.⁶³ “It is not necessary that an adversary must be 100 percent certain you will respond as you indicate,” he notes, “but the unacceptable nature of the damage he risks incurring means that he must be 100 percent certain you will not retaliate before he decides to break the taboo.”

Figure H: U.S. Low-Yield Nuclear Options

Current low-yield warheads: (deployed and non-deployed)

Warhead	Number in U.S. stockpile
B61 (mod 3 and 4)	300
W80-1	528
Total existing U.S. low-yield warhead stockpile	828

New low-yield warheads proposed by Trump

Warhead	Number to be built (estimated)
Low-yield Trident D5	24–48
New SLCM warhead	350
Total estimated new low-yield warheads	400

Sources: Hans M. Kristensen and Robert S. Norris, author estimate.

If Russian President Putin were to take the momentous decision to cross the nuclear threshold first—on a limited basis or otherwise—it would likely be because he perceives the survival of the Russian state to be at risk or he believes Russia has a greater stake in the conflict or crisis that precipitates such use, perhaps due to divisions among NATO allies. Contrary to the NPR, which stated that Russia might contemplate using nuclear weapons first at “lower levels of conflict,” Lt. Gen. Robert Ashley, director of the Defense Intelligence Agency, told the Senate Select Committee on Intelligence in January 2019 that a Russian decision to use nuclear weapons first would be driven by “the threshold they think the Kremlin would be at risk.”⁶⁴ Additional U.S. low-yield nuclear options are unlikely to be effective in the face of these motivations. In fact, what is more likely to convince Putin that he could get away with limited first use are statements by President Trump questioning the value of NATO and other U.S. alliances.

Other arguments made in support of the necessity of additional low-yield weapons also miss the mark. A low-yield SLBM is not necessary to promptly strike time-perishable targets. If military action has already started in the European theater and Russia uses a low-yield nuclear weapon to seek to end a conflict it believes NATO would win conventionally, it is likely that the United States would have had sufficient time to forward deploy forces, including conventional and nuclear fighters and bombers, to provide a prompt response.

The claim that a new SLCM is necessary to provide an assured theater strike option and serve as a hedge against Russian or Chinese advances in anti-submarine warfare capabilities is unconvincing. The United States is already planning to invest scores of billions of dollars in the B-21, LRSO, and F-35A to address the air defense challenge. A new SLCM would

make it more difficult for an adversary to eliminate U.S. sea-based nuclear forces in the event of a major, unforeseen breakthrough in anti-submarine warfare capabilities. But ICBMs and bombers exist in part to guard against such a scenario. Meanwhile, the Navy is unlikely to be pleased with the additional operational and financial burdens that would come with re-nuclearizing the surface or attack submarine fleet. Arming attack submarines with nuclear SLCMs would also reduce the number of conventional Tomahawk SLCMs each submarine could carry. In other words, a new SLCM would be a costly hedge on a hedge.

Ultimately, attempting to mimic Russia by developing more low-yield options would play into Moscow’s hands, since it can match NATO in the nuclear sphere. The main deterrence challenge Russia poses to the alliance is not nuclear. That means the United States should continue to invest in maintaining its overall conventional edge, buttress defenses as needed on NATO’s eastern flank where Russia has local conventional superiority, and more effectively defend against and respond to Russia’s use of disinformation, propaganda, and cyber tools to undermine western democratic institutions.

Redundancy Within the Obama-Era Recapitalization Program

The nuclear recapitalization plan that the Trump administration inherited from the Obama administration already included excessive amounts of redundancy.

For example, the Defense Department argues that replacing the current ALCM with the LRSO will extend the range of strategic bombers, ensure bombers can penetrate enemy airspace as adversaries enhance and expand their air defense capabilities, and allow individual bombers to strike more than one target with nuclear weapons at once.

But it is important to remember that the United States first fielded a nuclear ALCM in the early 1980s at a time when the country did not have stealth bombers or advanced conventional cruise missiles. This is not the case today.

The range of America's existing strategic bombers is being extended by increasingly advanced long-range conventionally-armed air-launched cruise missiles. The planned introduction of at least 100 B-21 bombers, which will be able to carry the upgraded low-yield B61-12 gravity bomb, conventionally armed cruise missiles such as the extended range Joint Air-to-Surface Standoff Missile (JASSM-ER), and electronic warfare capabilities for air defense suppression, will further enhance the range and flexibility of the bomber leg of the triad.⁶⁵ Together these improvements will make the bomber leg much more formidable than it is today.

Still, some experts worry that attempting to drop a nuclear gravity bomb over a heavily defended target is too risky and might not succeed. They argue that if the United States ever used a nuclear weapon, the most prudent and least escalatory option would be to fire a nuclear-armed cruise missile from a safer standoff distance.

If this concern is to be believed, then the United States should buy the LRSO instead of the B61-12. But over \$4.5 billion has already been sunk into the B61-12 to date, or over half of the current projected cost of the program.

Moreover, if the Air Force believes the stealth capabilities of the B-21 could be compromised soon

after it is deployed, then it is reasonable to question the service's strategy for buying the bomber in the first place. For its part, U.S. Strategic Command does not appear concerned about the long-term survivability of the B-21. As Gen. Hyten told Congress in July 2017, "It's not the survivability of the bombers, it's the ability of the bombers to access targets."⁶⁶ By this Hyten means that whereas bombers armed with the B61 can only attack one target at a time, the LRSO provides each bomber the ability to attack multiple targets at one time.

It is not surprising that military planners would want many different ways of attacking a target. But the weapons associated with the other two legs of the nuclear triad—SLBMs and ICBMs—can penetrate air defenses and strike targets anywhere on the planet with high confidence. The United States possesses more warheads for these missiles than does Russia and could upload hundreds of warheads to its deployed ballistic missiles and bombers. In addition, the Navy's sea-launched Tomahawk cruise missile is also a highly capable and continually improving conventional standoff weapon, and it has an even longer range than the JASSM-ER.⁶⁷

The sea-based leg of the triad is generally considered to be the most important leg due to the invulnerability of ballistic missile submarines underneath the ocean, the accuracy and promptness of SLBMs, and the fact that a single submarine, which currently can carry as many as 160 thermonuclear warheads, is capable of inflicting unacceptable damage on an adversary. Roughly 70 percent of U.S.



The attack submarine *USS Virginia* (SSN 774) in the Bay of Naples in Italy Jan. 7, 2010. The 2018 NPR proposes to re-arm the Navy's attack submarine or surface fleet with a nuclear SLCM. (Photo: William Pittman/U.S. Navy)



An unarmed Minuteman III intercontinental ballistic missile (ICBM) is launched during an operational test at Vandenberg Air Force Base, California, September 5, 2016. The NPR calls for replacement of all three legs of the nuclear triad, including fielding the Minuteman III replacement, the Ground-Based Strategic Deterrent, beginning in fiscal year 2028. (Photo: U.S. Strategic Command)

accountable warheads under New START are fielded on Ohio-class submarines.

ICBMs, however, do not provide unique nuclear strike capabilities not already provided by other legs of the strategic triad. For example, a 1993 report by the Government Accountability Office (GAO) found “no operationally meaningful difference in time to target” between the ICBMs and SLBMs.⁶⁸ Moreover, to use ICBMs against targets in China or North Korea, the missiles would have to overfly Russia. This targeting inflexibility problem greatly diminishes the utility of ICBMs outside a nuclear conflict with Russia, since overflying Russia to attack other states risks nuclear retaliation from Russia.

The main role of ICBMs today is to act as a target set—a “sponge”—that would require Russia to expend a large portion of its arsenal to try to eliminate them in the event of an all-out war, and as a hedge against an unforeseen problem with or vulnerability to the SLBM force. Though tensions between the United States and Russia have been on the rise over the past several years, the likelihood of a massive Russian surprise

attack against the United States remains extremely low. Regardless, it is far from clear why maintaining 400 deployed ICBMs and purchasing a new missile with new capabilities, as opposed to continuing to rely on the existing Minuteman III missiles, is necessary to perform the sponge and hedge functions.

In addition to redundancy within the triad, the Obama administration also planned to continue the forward deployment of tactical B61 nuclear bombs in Europe, despite the fact that the military mission for which these weapons were originally intended—stopping a Soviet invasion of Western Europe because of inferior U.S. and NATO conventional forces—no longer exists. The Trump NPR augments the role of these weapons, and NATO followed suit at its July 2018 summit meeting in Brussels.⁶⁹

When asked in 2010 if there is a military mission performed by U.S. tactical nuclear weapons in Europe that cannot be performed by either U.S. strategic nuclear or conventional forces, Gen. James Cartwright, then vice chairman of the Joint Chiefs of Staff, flatly said: “No.” In fact, it is highly unlikely that the weapons could be successfully used, thereby undermining their deterrent effect. According to former Air Force General Robertus C.N. Remkes,

“any attempt to use the B-61 will be challenged by the visibility of the many actions required to prepare the weapon and the crews for such an attack. The intended target nation of such an attack under the current planning scenarios will likely have many hours and even days to prepare its defenses and complicate matters for NATO target planners.”⁷⁰

Given their nearly non-existent military utility, the main rationale for keeping U.S. nuclear weapons in Europe is as a political symbol of the U.S. commitment to NATO, particularly to the newer members that border Russia.⁷¹ However, this justification is also weak. U.S. nuclear forces do provide assurance to NATO allies in Europe that the United States is prepared to respond by using these weapons in the event of a nuclear attack against the alliance. But the heavy lifting of the nuclear component of extended deterrence is done by central strategic forces based in the United States and under the oceans, not the estimated 150 forward-deployed tactical nuclear weapons stored in bunkers in five NATO countries in Europe.

Even then, nuclear weapons are just a small piece of a much larger assurance puzzle, the biggest pieces of which are rooted in other elements of U.S. power. A more rational approach would be to rely instead on the strategic nuclear forces of alliance members and

enhance information sharing and consultations about these forces.⁷² A willingness on the part of the United States to remove its nuclear weapons from Europe could incentivize Russia to share more information about its non-strategic nuclear forces and consider limitations on them.⁷³ At the very least, Russia would no longer be able to point to U.S. nuclear weapons in Europe as a reason to take no action on its non-strategic nuclear weapons.

Whether one supports or opposes the current policy, the complete withdrawal of U.S. nuclear weapons from Europe over time by political and financial default can't be ruled out. It remains to be seen whether all of the five NATO host nations will commit to spend the political capital and economic resources necessary to replace their aging dual-capable aircraft. Germany has notably yet to do so.⁷⁴

Excess NNSA Infrastructure

The Trump NPR's open-ended commitment to unleashing a nuclear weapon buildup whenever the United States wishes also lacks a compelling rationale.

For example, there is no need to rush to expand the U.S. capability to produce plutonium pits, the nuclear cores of warheads, since the NNSA can use pits from dismantled weapons if more are needed

to sustain the arsenal. Approximately 15,000 excess pits and another 5,000 in strategic reserve are already stored at the Pantex Plant near Amarillo, TX.⁷⁵ The Energy Department announced in 2006 that studies by Lawrence Livermore and Los Alamos National Laboratories show the pits of most U.S. nuclear weapons "will have minimum lifetimes of at least 85 years," which is about twice as long as previous official estimates.⁷⁶ Plutonium pits in the existing stockpile now average around 40 years old. The Senate version of the fiscal year 2019 energy and water appropriations bill directed NNSA to submit an updated estimate of the "minimum and likely lifetimes for pits in current warheads and the feasibility of reusing pits in modified nuclear weapons."⁷⁷

Furthermore, neither the NPR nor the Stockpile Stewardship and Management Plan explain why it is necessary to develop new warheads for U.S. ballistic missiles. The final version of the energy and water bill signed by President Trump in September 2018 called on the NNSA to produce a report estimating the cost of a possible less expensive alternative to the current plan to replace the W78, such as a life extension program similar to that performed on the W76 SLBM warhead.⁷⁸ The W76 life extension program, which will complete production at the end of fiscal year



The Pantex Plant, near Amarillo, Texas, is the primary facility for the final assembly, dismantlement, and maintenance of nuclear warheads in the United States. (Photo: National Nuclear Security Administration)

2019, extends the life of the most prevalent warhead in the U.S. stockpile for 30 years at a cost of roughly \$4 billion in then-year dollars.

The subsequent NNSA report, which was delivered to Congress in December 2018, determined that a simpler life extension program for the W78 would cost about the same, roughly \$8.5 to \$14.5 billion in then-year dollars, as replacing the warhead with the W87-1 and not meet military requirements.⁷⁹ But the agency did not detail how it arrived at this conclusion. The W76 life extension program refurbished far more warheads than a W78 refurbishment would and the two warheads are nearly the same age.

Nor does the NPR provide a reason for sustaining the high-yield B83-1 gravity bomb. If North Korea has built new hardened or deeply buried targets, it is far from clear why these targets cannot be held at risk by other higher-yield nuclear weapons, such as W88 warheads carried by SLBMs. Moreover, it is hard to imagine a scenario in which the benefits of detonating a megaton-class warhead on the Korean peninsula would outweigh the massive human casualty and environmental impacts.

Unsustainable Excess

As the costs and scope of the Obama administration's plans to recapitalize the arsenal began to grow during the administration's second term, numerous Pentagon and NNSA officials warned about the affordability

and execution challenge they posed. "We're looking at that big bow wave [of nuclear weapons spending] and wondering how the heck we're going to pay for it," Brian McKeon, former principal deputy undersecretary of defense for policy, said in October 2015. "[A]nd probably thanking our stars we won't be here to have to answer the question."⁸⁰

The Trump NPR's proposals to develop new nuclear capabilities and infrastructure will exacerbate the challenge. Withdrawal from the INF Treaty and the possible demise of New START with nothing to replace it could do the same. A reckoning is coming, the result of a massive disconnect between budgetary expectations and fiscal reality.⁸¹ The recapitalization project cannot be sustained without significant and sustained increases to defense spending—which are unlikely to be forthcoming—or cuts to other military priorities. And the White House, Pentagon, and NNSA are in denial about the challenge.

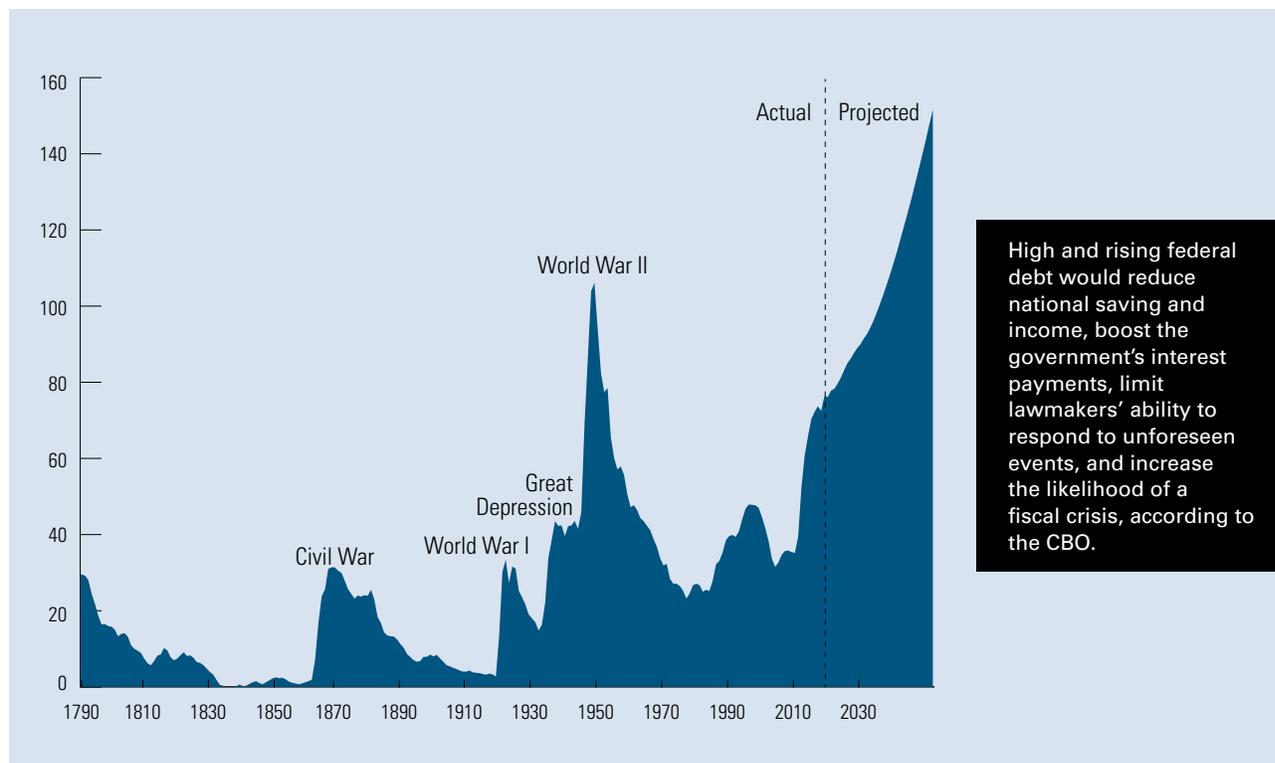
The risk of trying to recapitalize nearly the entire arsenal at roughly the same time is that less money will be spent on each individual modernization program, thereby increasing the time and cost required to complete each one. The absence of reasonable planning will also result in more suboptimal choices when hard decisions become inevitable.⁸² The current path is an irrational and costly recipe for diverting funds from other defense programs or buying fewer new nuclear delivery



U.S. Navy Rear Adm. John Kirby, former Pentagon press secretary, at a weekly Pentagon press conference, October 3, 2014.

(Photo: Department of Defense/Glenn Fawcett)

Figure I: Projected Growth of the National Debt



Source: Congressional Budget Office

systems and reducing the size of the arsenal. The longer military and political leaders continue to deny this reality, the worse off America's nuclear deterrent and armed forces will be.

The Third Wave of Nuclear Modernization: Unique Challenges

Compared to the first two waves of nuclear modernization spending, several factors are poised to make the third recapitalization effort more challenging.

Whereas the first two waves lasted roughly a decade, the third appears likely to need twice as long to complete. This is due in part to the fact that it now takes longer to buy new weapons systems than it did in the past. Today's systems are typically more complex, and the Pentagon purchasing bureaucracy is more risk-averse.⁸³

In addition, the rising cost of the nuclear mission during the third modernization wave is scheduled to overlap with large increases in projected spending to replace and augment conventional forces.⁸⁴ In addition to continuing with plans to modernize legacy conventional weapons systems, the Trump administration is also pursuing new initiatives to maintain America's dominant military position against Russia and China. The administration wants to accelerate the development of hypersonic

weapons, new types of missile defenses, and a new military department focused on space.⁸⁵ Each of the services are also calling for more force structure. The Navy wants more ships, the Air Force wants more aircraft squadrons, and the Army wants more troops.⁸⁶

While Congress approved a major increase to defense spending in fiscal year 2018 relative to the previous year, the Pentagon's own projected spending between fiscal year 2019 and 2024 merely keeps pace with inflation, which means real defense spending would flatline, not increase, in the years ahead.⁸⁷ Replacing the U.S. nuclear arsenal is not a one-, two-, or three-year project. It will require at least 15 years of sustained increased spending. The budget requirements have been steadily increasing in recent years, but the biggest bills are slated to arrive starting in the early 2020s. According to the report of the National Defense Strategy Commission published in November 2018, which assessed the Pentagon's 2018 National Defense Strategy, "available resources are...insufficient to undertake essential nuclear and conventional modernization simultaneously and rectify accumulated readiness shortfalls."⁸⁸

The Pentagon proposes to find savings by shedding weapons that do not contribute to countering Russia and China and through a process of finding efficiencies.⁸⁹ But it remains to be seen how big

the funding shifts to counter Moscow and Beijing will be—to say nothing about whether Congress will approve cuts to legacy weapons systems ill-suited to great power conflict. Past efficiency proposals have rarely been realized, been too small, or only been accomplished after an upfront investment first.⁹⁰

To make matters worse, defense spending during the Cold War was under less pressure in general than it is today. The Pentagon now has to contend with new internal budgetary challenges such as rapidly rising health care and compensation costs. According to one recent analysis, “just maintaining the size of the force will likely necessitate two to three percent growth above inflation in” the military personnel and operations and maintenance budget accounts.⁹¹

Most importantly, the overall federal fiscal outlook is grim. The latest CBO estimates project that “federal debt held by the public is projected to grow steadily, reaching 93 percent of GDP in 2029 (its highest level since just after World War II) and about 150 percent of GDP in 2049—far higher than it has ever been.”⁹² This will increase pressure to slash discretionary spending, including on defense.

“Our continued plunge into debt is unsustainable and represents a dire future threat to our economy and our national security,” cautioned Director of National Intelligence Dan Coats in March 2018.⁹³

Meanwhile, congressional caps on discretionary spending return in fiscal years 2020 and 2021.⁹⁴ Without amendment, these could force large reductions in national defense spending, relative to the total sought for those two years by the Trump administration.

Additionally, future bipartisan political support for increasing nuclear weapons spending is fragile and far from assured in the future, especially with respect to the new weapons proposed by the Trump NPR. Now in the majority in the House following the 2018 midterm elections, Democrats are likely to conduct more aggressive oversight of the administration’s nuclear policy and spending proposals. Rep. Adam Smith (D-WA), the new chairman of the House Armed Services Committee, has repeatedly made it clear that he believes the United States has more nuclear weapons than it needs for its security and can realistically afford.⁹⁵ The power of the purse in the House provides Democrats with greater leverage to push back against the Trump administration’s controversial nuclear weapons policy and spending goals.⁹⁶

Finally, support for replacing the nuclear arsenal inside the Pentagon could wane. In recent years, both uniformed and civilian defense officials have repeatedly stated that the nuclear modernization plan is the number-one priority among all other competing modernization necessities.⁹⁷ However, such support is not assured moving forward. Over the



Rep. Adam Smith (D-Wash.), chairman of the House Armed Services Committee, questions witnesses during a defense budget hearing April 12, 2018.

(Photo: Chip Somodevilla/Getty Images)

past 18 months, the Pentagon has rapidly reoriented its thinking toward long-term competition with Russia and China, thereby elevating the relevance of conventional modernization.⁹⁸

At the end of the second modernization wave, budget and political pressures, as well as changes in the strategic environment following the collapse of the Soviet Union, led to significant reductions in the number of new nuclear delivery systems that were ultimately purchased. For example, the Air Force initially sought 244 B-1 bombers but ended up buying only 100, and in 1993, the B-1 stopped participating in the nuclear mission altogether. Similarly, the planned purchase of 132 B-2 bombers was curtailed to 21. And despite plans to build 24 Ohio-class submarines, the Navy ended production after building 18 boats, four of which were subsequently converted to a conventional role.⁹⁹

Disarmament by Default

The Trump NPR acknowledges that the cost to upgrade the nuclear arsenal is “substantial,” but claims the bill is affordable because the high point of spending on nuclear weapons will be no more than 6.4 percent of Pentagon spending, a lower percentage than during the Cold War. Or as former Defense Secretary James Mattis frequently stated, “We can afford survival.” And yet these statements obfuscate the severity of the nuclear budget problem facing the U.S. government.

The NPR estimate curiously does not include any of the major costs NNSA must incur to upgrade nuclear warheads and their supporting infrastructure. Despite significant budget increases over the past two years,

the long-term viability of NNSA's plans is highly questionable. According to a GAO report issued in April 2017, the NNSA plans Trump inherited from Obama "do not align with its budget, raising affordability concerns."¹⁰⁰ Former NNSA administrator Frank Klotz said in a January 2018 interview prior to the release of the Trump NPR that the agency was already "working pretty much at full capacity."¹⁰¹ And former NNSA Deputy Administrator Madelyn Creedon has noted: "Historically, neither Congress, the Department of Defense, nor the Office of Management and Budget have shown an inclination to fully fund the NNSA program of record, let alone the new initiatives such as those outlined in the 2018 NPR report."¹⁰²

The NPR estimate also does not appear to account for the potential for significant cost growth. Unanticipated cost growth is a feature of most Pentagon acquisition programs, but because the key nuclear modernization programs are so large, variances in cost estimation can have especially significant effects.¹⁰³ Nor does the review address the additional billions of dollars that would be needed in the event of a decision to keep production lines open to build additional nuclear missiles and bombers or establish additional lines to develop ground-launched, intermediate-range cruise and ballistic missiles in a

world without any negotiated constraints on Russian strategic nuclear and intermediate-range forces.

Regardless, six percent of a budget as large as the Pentagon's is still an enormous amount of money. By comparison, the March 2013 congressionally-mandated sequester that reduced national defense spending (minus exempt military personnel accounts) was seven percent. Military leaders and lawmakers repeatedly described the sequester as devastating.¹⁰⁴

The bottom line is that the current recapitalization plans are unlikely to be executable. The Trump NPR offers no plan to pay for the rising price tag to replace the triad and upgrade conventional forces. As Gen. Robert Kehler, the former head of U.S. Strategic Command, bluntly put it in November 2017, "I am skeptical that we are capable of remaining committed to a long-term project like this without basically messing with it and screwing it up."¹⁰⁵

Indeed, a possible, if not likely, outcome is that the current plans will collapse under their own weight, forcing reductions in U.S. nuclear forces based on fiscal and political pressure rather than on strategic decisions—but not before hundreds of millions or even billions of taxpayer dollars are squandered.

Unsafe Excess

In addition to being unnecessary and unsustainable, the policies and spending plans outlined in the Trump NPR and pursued by the administration since could increase the risks of unintended escalation and miscalculation, undermine strategic stability, accelerate global nuclear competition, and threaten U.S. conventional advantages.

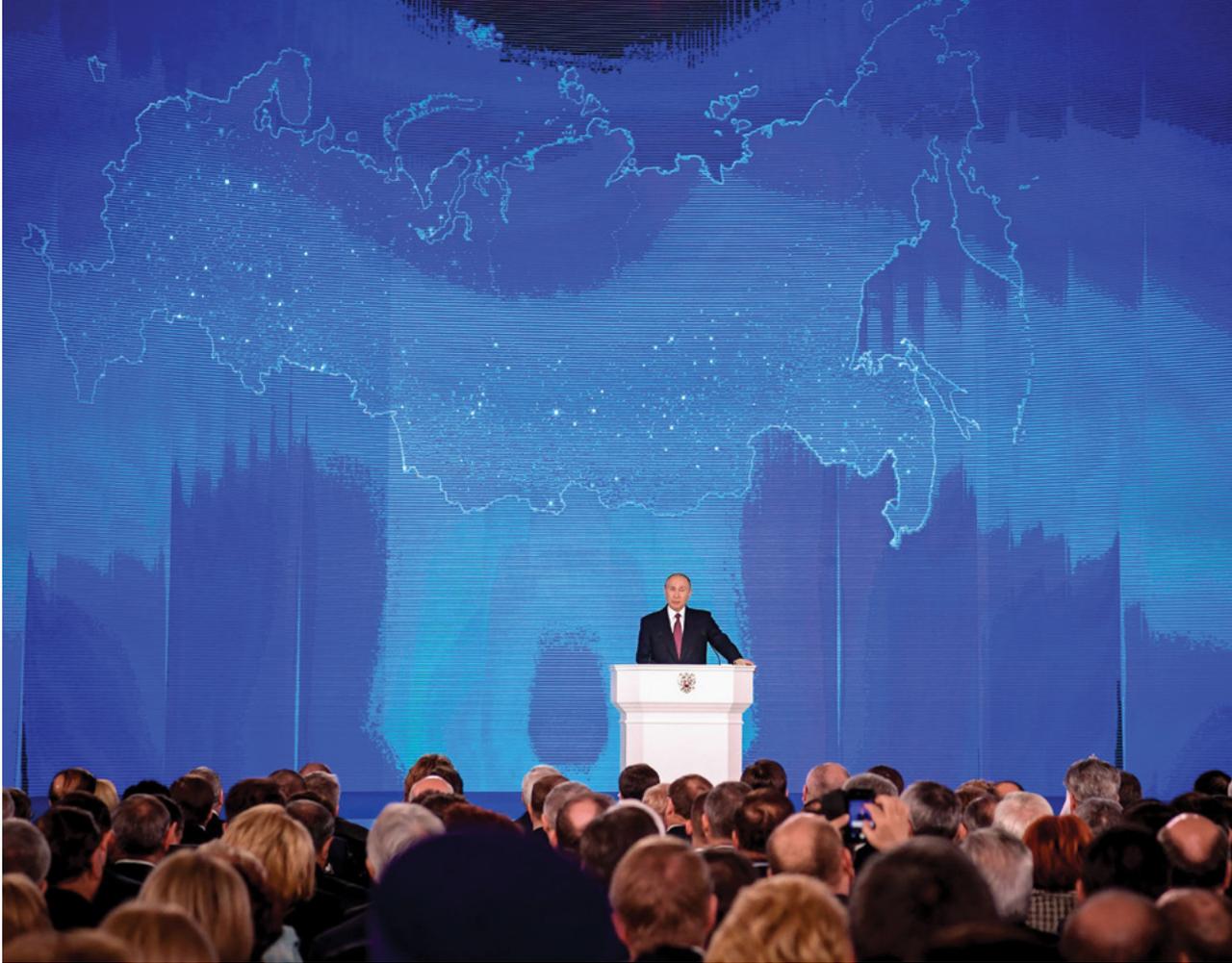
A New Technological Arms Race

Though the Cold War-era numerical nuclear arms race is over, the U.S. nuclear recapitalization program is part of what some experts have described as "a dynamic technological nuclear arms race."¹⁰⁶ Not only is this new arms race different than its Cold War predecessor, it could also be more dangerous.¹⁰⁷ Despite significant reductions in the overall number of nuclear weapons, all of the world's nine nuclear-armed states are, to varying degrees or another, devoting vast sums of money to replace, upgrade and, in some cases, expand the size and lethality of their nuclear arsenals and delivery systems. Past, present, and planned U.S. efforts to sustain and replace the existing arsenal have increased and will continue to increase the military capability of the weapons across key attributes such as stealth, accuracy, range, speed, hard-target kill, and yield flexibility.¹⁰⁸ The more capable weapons being produced as a result of this new arms race, particularly more accurate and stealthier lower-yield weapons, could lower the threshold for nuclear use in a crisis or war.



Then Secretary of Defense Jim Mattis meets with Canada's Minister of Defense Harjit Sajjan February 6, 2017, at the Pentagon in Washington, D.C.

(Photo: Brigitte N. Brantley U.S. Air Force)



Russian President Vladimir Putin delivers an annual address March 1, 2018 to the Russian Federal Assembly at Moscow's Manezh Central Exhibition Hall where he outlined Russia's development of new strategic systems, including new hypersonic weapons. (Photo: Yuri Kadobnov/AFP/Getty Images)

These developments are inconsistent with the obligations of the five declared nuclear-weapon states under the NPT's Article VI requirement to "pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament." The 2009 final report of the bipartisan Congressional Commission on the Strategic Posture of the United States observed that other "nations may not show the nuclear restraint the United States desires or support nonproliferation efforts if the nuclear weapon states take no further agreed steps to decrease their reliance on nuclear arms."¹⁰⁹

To complicate matters further, technological change and advances in conventional weapons and associated doctrines for their use pose new escalatory risks, including to the nuclear level, and threaten to erode nuclear stability.¹¹⁰ Russia and the United States, as well as China, are all seeking to apply such technologies as artificial intelligence, robotics, boost glide vehicles, and cyber, among others, to offensive military use. In addition, Washington and Moscow are expanding their missile defenses, an issue which helped to stymie reductions below New

START levels during the Obama administration, and pursuing next generation technologies to improve their defensive capabilities. Beijing is also developing a missile defense architecture. All three countries have demonstrated anti-satellite capabilities.

These advances will likely put new strains on strategic and crisis stability, by reducing decision and warning time, increasing the odds of arms racing in the development of these weapons and capabilities to counter them, and reducing the likelihood of further nuclear arms reduction agreements. Indeed, Russia has attributed its pursuit of several new and exotic strategic weapons systems, including nuclear-armed hypersonic glide vehicles, globe-circling, nuclear-powered cruise missiles, and very long-range nuclear torpedoes, to concerns about the open-ended and unconstrained development of U.S. missile defenses. Russia claims that these systems wouldn't be limited by New START because they don't use ballistic flight trajectories.

A Cold Shoulder to Arms Control

Unlike the Obama administration, the Trump administration's plan to rebuild the arsenal is not

accompanied by a proactive arms control and nonproliferation agenda aimed at reducing nuclear weapons risks.

Arms control only gets a brief mention at the end of the 2018 NPR and it is a generally dismissive mention at that. The document passively states that “the United States will remain receptive to future arms control negotiations if conditions permit” and to negotiations that “advance U.S. and allied security, are verifiable, and enforceable.” No previous nuclear arms control agreement has included enforcement measures. The review offers next to nothing in the way of proposals to address proliferation challenges, ameliorate emerging challenges to strategic stability, and pursue disarmament steps. In addition, the review expresses opposition to U.S. ratification of the CTBT even though the United States decided more than a quarter-century ago to halt nuclear explosive testing and there is no technical need to resume nuclear testing. No reason or justification for rejecting the goal of CTBT ratification is provided.

Since the release of the NPR and the arrival of arms control skeptic John Bolton as National Security Advisor, the Trump administration has withdrawn from the 2015 Joint Comprehensive Plan of Action (the Iran nuclear deal), plans to withdraw from the INF

Treaty, and, so far, failed to take Russia up on its offer to begin discussions about an extension of New START and resume a regular dialogue on strategic stability.¹¹¹

Prior to joining the Trump administration, Bolton called New START “an execrable deal” and urged Trump to abrogate the agreement.¹¹² Administration officials have stated that they have plenty of time to make a decision on whether to extend the treaty and will take several issues into account.¹¹³ These include Russia’s manufacturing of concerns about U.S. compliance with the treaty, whether Russia would agree to limit the new strategic weapons systems it is developing, and Russia’s compliance with other arms control agreements.¹¹⁴

While New START appears to be in serious jeopardy, the U.S. military and intelligence community continue to stress the national security benefits of the treaty. Without the INF Treaty and New START, there would be no legally-binding, verifiable limits on the U.S. and Russian nuclear arsenals for the first time since 1972. The collapse of the U.S.-Russian arms control architecture would mean Russian nuclear forces would be unconstrained, our insight into Russian nuclear force structure and modernization would be curtailed, and the incentives to engage in costly nuclear competition would be magnified.



U.S. Secretary of State Mike Pompeo poses for a photo with (L to R) National Security Advisor of the United States John Bolton, President Donald J. Trump, and Vice President Mike Pence before his swearing-in ceremony at the U.S. Department of State in Washington, D.C., on May 2, 2018. (Photo: State Department/Public Domain)

The Dangers of a New Low-Yield Weapons

In addition to being unnecessary, new low-yield weapons could increase the risk of nuclear conflict.

As former White House official Lynn Rusten notes, “new low-yield nuclear weapons would not ‘raise the bar’ for nuclear use; they would lower it because they increase the contingencies and planning for use and fuel the illusion that a use of nuclear weapons could remain limited and not escalate into a large-scale nuclear exchange.”¹¹⁵ The belief that a nuclear conflict could be controlled is dangerous thinking. The fog of war is thick, the fog of nuclear war would be even thicker. Large or small, nuclear weapons are extremely blunt instruments, both in terms of their destructive power and the taboo associated with the fact they have not been used in 70 years.

Placing greater emphasis on low-yield options could also have the perverse effect of convincing Russia that it could get away with limited nuclear use without putting its survival at risk. According to Creedon, who served during the Obama administration as assistant secretary of defense for global strategic affairs before joining NNSA, “Signaling that a low-yield weapon would be used to respond to low-yield weapon use might persuade Russia to lower the nuclear threshold, thus risking nuclear war-fighting.”¹¹⁶

In the case of the proposed low-yield SLBM warhead, given that U.S. strategic submarines currently carry SLBMs armed with higher-yield warheads, how would Russia know (or discriminate) that an incoming missile armed with a low-yield warhead was not actually armed with high-yield warheads? How would it know that such limited use would not be the leading edge of a massive attack, especially if the targets would not be battlefield targets but targets of high-value to the Russian leadership, as some have claimed? The answer is that Russia would not know, thereby increasing the risks of unintended escalation.

Firing a single low-yield warhead from a strategic submarine could also undermine the survivability of the most important leg of the U.S. nuclear triad, which would be at a premium in the event of a nuclear conflict. As Creedon notes:

“The sea leg of the nuclear triad is the most survivable leg in large part due to the ability of Ohio-class submarines to be invisible in the open ocean. Launching a high-value D5 missile from a ballistic missile submarine will most likely give away its location. China and Russia are expanding their ability to detect a missile launch and will be able to locate a U.S. submarine if it launches a D5 missile. Is having a low-yield warhead worth the risk of exposing the location of a ballistic missile submarine at sea?”¹¹⁷



Former Department of Energy Secretary Ernest Moniz with Madelyn Creedon former principal deputy administrator for NNSA, August 11, 2014. (Photo: DoE photographer, Ken Shipp)

The United States has never before armed ballistic missiles with a low-yield warhead. The proposal to do so in the NPR brings into play new scenarios for how the United States might use prompt-strike, long-range SLBMs, including against battlefield targets, which require further examination and analysis. It also could prompt Russia and China to deploy low-yield warheads on ballistic missiles, an outcome the United States should want to avoid.

During the George W. Bush administration bipartisan majorities in Congress killed administration proposals to develop a variable yield “robust nuclear earth penetrator” and put a conventional warhead on Trident missiles citing concerns about need, usability, and unintended escalation.¹¹⁸ These same concerns also apply to the low-yield SLBM and SLCM proposals.

What makes the Trump administration’s proposal to develop additional low-yield nuclear weapons even more concerning is that the 2018 NPR envisions a greater role for nuclear weapons against a wider range of threats. Unlike the previous administration, the Trump administration defines the “extreme circumstances” under which the United States would consider nuclear use more broadly to include “significant non-nuclear strategic attacks” against “U.S., allied or partner civilian population or infrastructure, and attacks on U.S. or allied nuclear forces, their command and control, or warning and attack assessment capabilities.” Threatening nuclear retaliation to counter new kinds of asymmetric attacks would lower the threshold for nuclear use, increase the risks of miscalculation, and make it easier for other countries to justify excessive roles for nuclear

weapons in their policies. Such threats are also unlikely to be proportional and therefore would be difficult to make credible.

Nuclear Cruise Missiles, ICBMs, and the Risks of Accidental Nuclear War

The plans to augment the role of nuclear-armed cruise missiles and replace the ICBM force raise additional stability concerns.

Proponents of the LRSO claim that it would simply sustain an existing capability—not expand that capability. In reality, the LRSO is likely to have greatly enhanced capabilities relative to its predecessor, and will be mated to the B-52, B-2 and B-21 bombers, whereas the current ALCM can only be delivered by the B-52.¹¹⁹ U.S. nuclear stealth bombers have never carried stealthy nuclear cruise missiles.

The LRSO raises serious questions about stability that have yet to be fully explored. Some sources claim that the Pentagon is envisioning potential uses for the new cruise missile that go beyond “the original mission space” of the ALCM, namely in limited nuclear war-fighting contingencies involving China.¹²⁰ Furthermore, as stressed by William Perry, President Bill Clinton’s defense secretary, and Andrew Weber, a former assistant secretary of defense, “cruise missiles are a uniquely destabilizing type of weapon” due to the fact that “they can be launched without warning and come in both nuclear and conventional variants.”¹²¹

Deploying nuclear-armed SLCMs on U.S. surface ships or attack submarines would pose similar problems. Currently the Navy only fields conventional Tomahawk SLCMs. By adding nuclear SLCMs to the mix, any use of conventional Tomahawks, especially in a conflict with another nuclear-armed state, would inherently send a nuclear signal. This would diminish the utility of the missiles and boats that carry them in a conventional conflict and increase the potential for miscalculation.

The NPR claims that the administration would consider forgoing the development of a new nuclear SLCM, which would take nearly decade to field, if Moscow “returns to compliance with its arms control obligations, reduces its non-strategic nuclear arsenal, and corrects its other destabilizing behaviors.” This requirement is so sweeping that it lacks any realistic negotiating value. Moreover, instead of compelling a change in Russian behavior for the better, a new SLCM could prompt Russia (and China) to build more intermediate-range nuclear weapons systems, including weapons on land in violation of the INF Treaty. As Rusten points out:

“Russian investments in new intermediate-range strike capabilities appear driven by perceptions of vulnerability to U.S. and

NATO prompt-strike and missile defense capabilities. Compounding Russia’s perceived vulnerabilities will prompt more countermeasures, not submission. By what logic should the United States fuel an incipient arms race by pursuing nuclear weapons systems it does not need?”¹²²

The vulnerability and risks of accidental launch associated with U.S. land-based ICBMs have long been debated. Given their vulnerability in fixed though hardened silos, the United States retains plans to launch ICBMs under attack before adversary missiles could destroy them to guard against a “disarming” first strike. This means the president might have only three to six minutes to decide how to respond after an incoming attack is detected. Though the risk of accidental launch is low, early warning systems have in the past experienced false alarms and some experts are increasingly worried that a third-party cyber-attack could trigger a false alarm.¹²³

Meanwhile, the Air Force is planning to replace the Minuteman III ICBM with a more capable and



Former Secretary of Defense William Perry speaks at the Arms Control Association’s press briefing on the growing risks posed by North Korea’s nuclear and missile capabilities, December 5, 2017.

(Photo: Allen Harris/Arms Control Association)



The Ohio-class ballistic-missile submarine *USS Tennessee* returns to its homeport at Naval Submarine Base Kings Bay, Ga., following a routine patrol mission on October 17, 2018. (Photo: U.S. Navy)

accurate missile to overcome advancing adversary defensive measures. Gen. Robin Rand, the former commander of Air Force Global Strike Command, told Congress in 2016 that:

“Improved ICBM capability and accuracy has the benefit of providing ICBM strike planners the weaponizing options of either achieving a higher probability of effect on a given target; using fewer warheads per target while still achieving the desired level of effect and thus allowing more targets covered; or provide opportunities to potentially reduce yield size while still achieving the desired level of effect.”¹²⁴

This suggests the United States is seeking to improve the counterforce warfighting capabilities of the ICBM force.

Supporters of retaining and recapitalizing the ICBM leg of the triad argue that eliminating ICBMs would drastically reduce the number of U.S. targets an adversary would need to destroy in a disarming first strike from over 500 to less than ten.¹²⁵ While the United States would still retain SSBNs at sea in the event of such an attack, ICBM advocates claim that it would be unwise to rely on the invulnerability of submarines in perpetuity given advances in possible detection technologies.

But some former government officials, military leaders, and prominent experts call for eliminating

ICBMs due to their lack of a unique mission and the risk they could trigger an accidental nuclear war. These voices include Perry and Gen. Cartwright. “As we make decisions about which weapons to buy, we should use this simple rule,” they wrote in a November 2017 op-ed advocating the elimination of ICBMs and ALCMs. “If a nuclear weapon increases the risk of accidental war and is not needed to deter an intentional attack, we should not build it.”¹²⁶

Eliminating ICBMs would also remove the targets for a large portion of Russian ICBMs. As nuclear strategist Thomas Schelling put it in 1987:

“If we unilaterally dismantled our land-based missiles, we would instantly deprive a large part of the Soviet land-based missile force for its *raison d’être*. It might look to them as if they had much less to preempt. They actually would not, because the U.S. missiles they might have preempted were redundant in the first place. ...So if we cannot dismantle their land-based missiles by negotiation, we may gain a lot by dismantling their targets instead.”¹²⁷

Other skeptics of the value of ICBMs note that even if ICBMs are retained, keeping a launch-under-attack policy is unnecessary and dangerous.¹²⁸ Given the size, accuracy, and diversity of U.S. forces, the remaining nuclear force would be more than sufficient to deliver a devastating blow to any nuclear

aggressor. The survivability of the U.S. system and sea-based leg of the triad means that U.S. leaders have time to consider how to respond to even a massive nuclear attack. No U.S. leader should be put in a situation that could lead to the use of nuclear weapons in a matter of minutes based on false information, however small the risk.

The Risks of New Warheads

NNSA's plans to develop new ballistic missile warheads has prompted concerns about compromising confidence in the reliability of the arsenal. The original plan for the IW-1 proposed using parts from two different existing warheads that have never been used together. A newly built W78 warhead, even if it is not interoperable, could introduce unwelcome doubts about reliability into an otherwise well-tested and reliable stockpile.¹²⁹

In addition, the NNSA's plans to expand the infrastructure for plutonium pit production could raise significant safety and environmental problems. Safety problems at Los Alamos forced the lab to stop production of plutonium pits from 2013 to 2016. Significant safety lapses in the plutonium operations at Savannah River also have been documented in recent internal government reports, according to a 2018 report by the Center for Public Integrity.¹³⁰

Damaging Opportunity Costs

Prioritizing an excessive nuclear improvement program could compromise investments in conventional capabilities and other critical national security programs. In this context it is useful to compare the looming spending binge on nuclear

delivery systems and their supporting infrastructure to overall Pentagon acquisition spending, as these are the areas of the budget where dollars are likely to be most directly in competition. The CBO estimated in 2017 that by the early 2030s, spending on nuclear weapons would peak at a mammoth 15 percent of the Pentagon's total acquisition costs in the early 2030s, more than triple the current share.¹³¹

At a service level, the opportunity costs are particularly stark. The Navy has repeatedly warned that the projected \$128 billion cost to develop and purchase 12 new Columbia-class ballistic missile submarines will devastate its shipbuilding budget.¹³² Similarly, the Air Force's new ICBM program will compete with other service priorities, such as the F-35 and new tanker programs.

At the NNSA, increased spending in recent years on warhead life extension programs has led to cutbacks in funding for critical stockpile surveillance work and the Stockpile Stewardship Program, which assesses and certifies the reliability of the stockpile in the absence of nuclear testing, as well as the agency's efforts to prevent nuclear terrorism and proliferation.¹³³

Every dollar Washington spends to maintain a bloated nuclear arsenal is a dollar that cannot be spent on conventional military capabilities more relevant to countering Russia and China and assuring U.S. allies. It is not in the U.S. interest to engage in a tit-for-tat race with the Russians to rebuild an excessively large nuclear force, particularly if it comes at the expense of needed conventional improvements, especially programs to maintain military readiness and a technological edge with regard to Russia and China.

Less Expensive Alternatives

The United States is planning to spend hundreds of billions of dollars over the next two decades to rebuild a nuclear arsenal much like the one it has today and to last another 50 years. The current and planned U.S. financial investment in nuclear forces is unrivaled by any other nuclear power. But the spending plans face significant budgetary, programmatic, and political challenges.

The question, then, is not whether the United States is falling behind its competitors—it is not—but whether the size and configuration of the current arsenal and the Trump recapitalization plans are necessary, sustainable, and safe. The answer is that the current course is unnecessary, unsustainable, and unsafe—and must be rethought. It is not too late to pursue a different path. Now is the time to re-evaluate nuclear weapons spending plans before the largest investments are made.

A common argument made in support of the approach proposed in the Trump NPR is that the only alternative is to allow the U.S. nuclear deterrent to waste away. But this is a false choice. The October 2017 CBO report evaluated numerous alternatives to the current sustainment and recapitalization program that, if pursued, would reduce nuclear weapons spending while still maintaining a reliable and credible nuclear deterrent. The options range from blended reductions to each or several legs of the triad to moving to a dyad. The report measured the capability of the alternatives relative to that of the current program across four metrics: the number of warheads, crisis management, limited nuclear strikes, and large-scale nuclear exchanges.

Of course, pressure on the defense budget cannot be relieved solely by reducing nuclear weapons spending. A significant portion of the overall cost of nuclear weapons is fixed. Key components of the supporting infrastructure, such as the command-and-control systems and nuclear laboratories, would remain whether the United States possessed 10 nuclear weapons or 10,000. That said, changes to the nuclear replacement program could make it easier to execute and ease some of the hard choices facing the overall

defense enterprise, while still leaving a force more than capable of deterring nuclear attacks against the United States or its alliance partners.

The following analysis describes three realistic options for reducing U.S. spending on nuclear weapons that would save at least an estimated \$29 billion to \$282 billion from fiscal year 2017 to 2046. The bulk of these savings would occur over the first 20 years of the 30-year period. Unlike the Trump NPR, the second and third options in particular would reflect a nuclear strategy that reduces reliance on nuclear weapons, emphasizes stability and survivability, de-emphasizes nuclear warfighting, reduces the risk of miscalculation, and is more affordable and executable.

The baseline for these estimates are the October 2017 CBO estimate of the Obama administration's plans to maintain and replace U.S. nuclear forces and their supporting infrastructure and our projection of the costs of the additions proposed by the Trump NPR.¹³⁴ With the exception of the first option, which is in fiscal year 2018 dollars, all estimates are in fiscal year 2017 dollars unless otherwise noted. The estimated savings from each option includes savings from research and development, procurement, and operations and sustainment unless otherwise noted.

The first option would eliminate the additions to the Obama-era recapitalization program proposed in the Trump NPR. This option would avoid an estimated \$28.8 billion in additional costs above the CBO baseline over the next 30 years

The second option would reduce costs by more cost-effectively deploying 1,550 New START-accountable strategic warheads. This option would save an estimated \$120.5 billion relative to the CBO baseline

and \$149.3 billion when combined with eliminating the Trump additions over the next 30 years.

The third option would eliminate the ICBM leg of the triad and decrease the number of New START-accountable strategic warheads to 1,000. This option would save an estimated \$253 billion relative to the CBO baseline and \$281.8 billion when combined with eliminating the Trump additions over the next 30 years. Reductions below 1,000 deployed warheads could result in even bigger savings.

Each option would involve the purchase of new fleets of ballistic missile submarines, SLBMs, and long-range penetrating bombers. All of the options would also retain at least one low-yield nuclear delivery option. None of the options would alter current plans to upgrade nuclear command, control, communications, and early-warning capabilities. Upgrading these capabilities and reducing their vulnerability to attack should be a top priority and will likely require additional funding beyond what the Pentagon has identified to date. All of the options also assume the continued maintenance of the three national nuclear laboratories: Los Alamos, Livermore, and Sandia.¹³⁵ In fact, even under the most ambitious cost-saving option, the United States would still be poised to spend roughly \$1 trillion on nuclear weapons over the next 30 years due in large part to the fixed costs of the nuclear weapons enterprise.

Option 1: Eliminate the 2018 NPR Additions (Savings: \$28.8 Billion)

This option would eliminate the additional investments proposed in the Trump NPR for the low-yield SLBM option (\$125 million in savings), the new SLCM (\$11 billion in savings), maintaining the B83-1 until a suitable replacement is found (\$13 billion in savings), and building more plutonium pits (\$4.6 billion in savings) (See Figure J). This option would not make adjustments to the Obama-era plans, which the CBO estimated will cost \$1.2 trillion between fiscal years 2017 and 2046. As noted earlier in this report, the Trump additions to the recapitalization program he inherited constitute unnecessary, unsustainable and unsafe overreach. Eliminating the Trump additions would still leave an arsenal that exceeds what is necessary for deterrence and poses a significant affordability challenge.

Savings of \$28.8 billion could purchase nine Virginia-class attack submarines (estimated by the CBO at \$3.1 billion per boat in fiscal year 2018 dollars), 90 “Penetrating Counter Air” aircraft to replace the F-15 and F-22 (estimated by the CBO at \$317 million per aircraft in fiscal year 2018 dollars), the sustainment of an army infantry or stryker brigade combat team for 10 years (estimated by the CBO at \$2.7 and \$2.8 billion per year, respectively), or

nearly the entire remaining acquisition cost of the Joint Air-to-Ground Missile (estimated by the GAO at \$4.8 billion in fiscal year 2018 dollars), Long Range Precision Fires (estimated by the GAO at \$2.9 billion in fiscal year 2018 dollars), and Arleigh Burke Class Destroyer (estimated by the GAO at \$23.4 billion in fiscal year 2018 dollars) programs.¹³⁶

Estimating the amount of money that could be saved under this option is difficult given that in most cases the plans for these additions have yet to be clearly defined and official cost estimates do not yet exist.

For this report we follow the CBO in assuming that the Navy would build a SLCM similar in design to the LRSM to reduce development costs and maximize the missile’s ability to penetrate adversary air defenses.¹³⁷ Another option would be to leverage the Navy’s planned replacement for the Tomahawk with the Next-Generation Land Attack Weapon. But this effort is in its infancy, having recently completed an analysis of alternatives.¹³⁸

The CBO assumes a SLCM and its associated warhead would cost 50 percent less to develop than the LRSM and W80-4, respectively, and the same as the LRSM and W80-4 to produce. Assuming the purchase of 350 missiles, which is the same as the number of nuclear Tomahawks that were built during the 1980s, we estimate the cost to develop and procure the SLCM and its associated warhead at roughly \$11 billion. Additional funds, likely several billion dollars, would also be required through 2046 to recertify ships or attack submarines to carry SLCMs and to operate and sustain the missiles.

Estimating the additional cost of the Trump administration’s plans to expand pit production is difficult given the lack of published projections of the cost of the Obama administration’s plans to produce 50-80 pits annually. For this report we base our estimate on NNSA’s April 2018 engineering assessment of plutonium pit production and assume the agency would pursue the least expensive option to produce 80 pits annually.¹³⁹ According to the assessment, producing 50 additional pits per year at the Savannah River Site would cost \$13.4 billion more between 2030 and 2080 to operate than the least expensive option to produce the same number of pits at Los Alamos. Pursuing the less expensive option would thus save about \$4.6 billion through fiscal year 2046. However, this estimate could be significantly understated. The CBO projects that reverting to the Obama administration’s plan to produce 50-80 pits annually would save \$9 billion in then-year dollars between fiscal years 2019 and 2028.¹⁴⁰

For the B83-1 we assume that NNSA would retain the warhead and proceed to extend its life. In 2013 the agency estimated that it would cost \$4 billion in fiscal year 2012 dollars to perform an alteration

of the warhead beginning in fiscal year 2019 and \$7 billion to \$9 billion to conduct a more comprehensive life extension program beginning in fiscal year 2035. We estimate that sticking with the Obama administration’s original plan to retire the warhead after confidence in the B61-12 is achieved would thus save about \$13 billion through fiscal year 2046.

Trump’s intention to leave the INF Treaty and his uncertain commitment to New START could further increase the long-term price of the administration’s nuclear weapons spending plans, though by how much is difficult to project. The Defense Department requested, and Congress approved, \$48 million in fiscal year 2019 to explore concepts and options for conventional, ground-launched, intermediate-range missile systems in response to Russia’s violation of the treaty. The Pentagon is planning to test a land-based cruise and ballistic missile system by the end of 2019. Although the current effort is focused on a conventional missile, the administration or its successor could ultimately opt to develop a nuclear-capable version.

Prior to the negotiation of the INF Treaty in 1987, the United States deployed several hundred nuclear-armed intermediate-range Pershing II ballistic missiles and ground-launched cruise missiles in Europe, the latter of which were an adaptation of the Tomahawk. The Pentagon spent \$2.6 billion (in fiscal year 1987 dollars) to develop and procure 247 Pershing II missiles and associated launchers and \$3.5 billion to develop and procure 442 ground-launched cruise missiles through fiscal year 1987, according to the GAO.¹⁴¹ However, the cost today to develop a new ballistic missile system would be higher given that several decades have passed since the development of the Pershing II. In addition, the range of the new missile would likely need to be much greater than the 1,800-kilometer range of the Pershing II to have any utility against China in the Pacific.

Figure J: (Option 1) Eliminate the 2018 NPR Additions (Savings \$28.8 billion)

Eliminate SLBM	\$125 million
Eliminate SLCM	\$11 billion
Retire B83-1	\$13 billion
Scale back pit production	\$4.6 billion
Total savings	\$28.8 billion

The budget implications of withdrawing from or failing to extend New START are difficult to judge. It is plausible that the U.S. military could call for additional nuclear deployments amid greater uncertainty about Russian nuclear force posture and planning. In the near term this might include redeploying the 48 SLBMs and 50 ICBMs that were removed under the treaty. The Pentagon could also add additional warheads to SLBMs and, with greater difficulty, to ICBMs. In the longer term, the Pentagon could propose to accelerate and build more new bombers, submarines and ICBMs. The CBO estimated that building 16 instead of the current plan of 12 Columbia-class submarines and building enough new GBSD missiles to support a deployed force of 450 ICBMs instead of the current plan of 400 would cost an additional \$33 billion in fiscal year 2017 dollars through fiscal year 2046.

Option 2: Deploy a 1,550-Warhead Triad (Savings: \$149.3 Billion)

This option would more cost-effectively deploy 1,550 New START-accountable warheads by reducing the size of the triad to 10 SSBNs and 300 ICBMs (\$40 billion in savings), delaying the GBSD program in favor of extending the life of the Minuteman III and reducing the number of ICBMs (\$17.5 billion in savings), eliminating the LRSO (\$30 billion in savings), no longer deploying B61 gravity bombs in Europe (\$17 billion in savings), pursuing simpler warhead life extension programs (\$10 billion in savings), and developing a capability to produce 30 plutonium pits per year (\$6 billion in savings) (See Figure K). This option would save \$120.5 billion relative to the CBO baseline and \$149.3 billion when combined with eliminating the Trump additions. Additional savings could be achieved by reducing the triad to eight SSBNs and 150 ICBMs and delaying the B-21 program or purchasing fewer B-21s.

Savings of \$149.3 billion would cover nearly the entire additional acquisition cost over the next 30 years relative to current plans to grow the Navy to 355 ships by the late 2030s (estimated by the CBO at \$161 billion).¹⁴²

Under this option the United States in 2030 would deploy roughly 1,550 New START accountable warheads on 520 strategic delivery systems consisting of 200 SLBMs, 300 ICBMs, and at least 20 nuclear-capable bombers. To achieve this level of warheads with a smaller number of delivery systems, the Navy would deploy an average of six warheads on each SLBM instead of the current loading of four-to-five warheads. By 2046 the United States would deploy about 1,450 warheads on 160 SLBMs, 300 ICBMs, and 100 nuclear-capable bombers. Each SLBM would carry six-to-seven warheads. By 2046 the current fleet of Ohio-class submarines armed with 20 operational

SLBM tubes under New START will be replaced by the Columbia-class boats armed with 16 SLBM tubes. In addition, the current fleet of about 40 nuclear-capable B-52 bombers would be removed from the nuclear mission due to the elimination of ALCMs and replaced by a fleet of at least 100 B-21 bombers, some or all of which will be nuclear-capable. The Air Force plans to begin retiring the B-2 bomber in the late 2030s.¹⁴³

Reducing the triad to eight SSBNs and 150 ICBMs and the number of deployed warheads to 1,000 would save an additional \$45 billion through fiscal year 2046, according to the CBO.

Reducing the Number of Submarines

The Navy is planning to purchase 12 new Columbia-class submarines to meet current military requirements but shifting to 10 strategic submarines would still provide a devastating sea-based nuclear deterrent. The CBO projects that purchasing two fewer new boats would save \$17 billion through fiscal year 2046. The majority of the savings from reducing to 10 submarines would come during the early 2030s when the last two Columbia-class submarines are scheduled to be purchased. These savings would lessen the burden on the Navy's shipbuilding budget as it seeks to expand the fleet to roughly 350 ships.

The Navy is seeking 12 new boats rather than 14 because the new submarine will not need a four-year mid-life refueling, but only a two-year overhaul.¹⁴⁴ The Navy originally planned to start deploying the replacement boats in 2029, but in 2012 the Pentagon announced a two-year delay to the program, pushing back the fielding of the first new submarine to 2031. As a result, the Navy will field only 10 ballistic missile submarines in the 2030s. Under New START the Navy plans to deploy about 1,000 warheads on 240 SLBMs.

Current military requirements call for 10 strategic submarines to be operational at all times to ensure that five submarines are "on station" within range of their targets so SLBMs can be launched promptly, as quickly as within 15 minutes of an order to do so. For the Navy to operate five submarines on station, it would need 12 submarines in total: five in the Atlantic, with two on station and the rest in transit or in port (such as for maintenance), and seven in the Pacific with three on station and the rest in rotation. Initially, only 10 submarines are needed to meet these goals.¹⁴⁵

The need for 12 submarines, then, has as much to do with where the warheads are deployed and how promptly they could reach their targets as it does with the number of warheads. A fleet of 10 Columbia-class submarines can carry nearly 1,300 warheads, but it cannot support five submarines that are deployed close enough to their targets in Russia and China, ready for quick launch. In addition, reducing the number of submarines to 10 and increasing the

number of warheads per SLBM would reduce, though not eliminate, the Navy's flexibility to deploy SLBMs with one or two warheads and to upload nondeployed warheads in the event of a need to significantly increase the deployed arsenal. Reducing to eight boats would further reduce that flexibility. Increasing the number of warheads per SLBM could also reduce the range of the missile.

However, relaxing the requirements for prompt launch, especially against counterforce targets, would allow fewer than five submarines to be on station, thereby eliminating the need for 12 new submarines. So too would reducing the required number of deployed warheads. With a smaller arsenal, the United States also would not need such a large upload capability. Carrying extra spaces on SLBMs for warheads is an expensive hedge.

Refurbishing the Minuteman III and Reducing Their Number

The ICBM leg of the triad is the least valuable leg of the triad and plans to sustain it should reflect this reality. Due to a limited range of flight trajectories, the Minuteman III is essentially unusable outside of a nuclear conflict with Russia. The Trident D-5 SLBM is mobile, highly accurate, and capable of prompt launch. In addition, continuing to maintain ICBMs in a "launch under attack" mode is unnecessary and risky. The primary mission of the land-based leg of the triad is to deter an adversary nuclear first strike attack and serve as a backstop to an unforeseen and unlikely future vulnerability in the SLBM force. But these functions can continue to be performed at lower numbers of ICBMs and by deferring the development of a new ICBM.

The CBO projects that \$17.5 billion could be saved over the next 30 years by delaying development of a new ICBM by 20 years and instead extending the life of the Minuteman III by buying new engines and new guidance systems for the missiles. Crucially, however, this approach would save \$37 billion through fiscal year 2036 when the vast majority of nuclear recapitalization spending is scheduled to take place. The Air Force has to contend with the high cost of several other priorities during this period in addition to GBSB, including the F-35, B-21, and new tanker programs.

The U.S. Air Force currently deploys about 400 single warhead Minuteman III ICBMs located at F.E. Warren Air Force Base, Wyoming; Malmstrom Air Force Base, Montana; and Minot Air Force Base, North Dakota. Under New START, the Air Force maintains 50 extra missile silos in a "warm" reserve status. The Minuteman III was designed in the 1960s and entered service throughout the 1960s and 1970s. Today's Minuteman weapon system is the product of almost 40 years of continuous enhancement. The Pentagon

spent over \$7 billion in the early 2000s to keep the ICBMs safe, secure and reliable through 2030.¹⁴⁶ This modernization program has resulted in an essentially “new” missile, expanded targeting options, and improved accuracy and survivability.¹⁴⁷

To reduce the number of ICBMs from 400 to 300, the Air Force would have several options. It could remove 100 missiles from the deployed force and distribute the reductions across the three bases while leaving the silos in a warm status. It could also eliminate a wing of 50 silos from two of the three bases. Yet another option would be to eliminate an entire base of 150 silos, which would save roughly \$200 million per year.¹⁴⁸

The Defense Department is planning to replace the Minuteman III missile, its supporting launch control facilities, and command-and-control infrastructure. The plan is to purchase 666 new missiles, 400 of which would be operationally deployed through 2070.¹⁴⁹ The remaining missiles would be used for test flights and as spares. The Pentagon is seeking to make significant capability upgrades as part of the recapitalization program, known as the GBSD. According to the 2018 NPR, the life of the Minuteman III “cannot be extended further” and the missiles “will have increasing difficulty penetrating future adversary defenses.”

The Air Force initially estimated the cost of the GBSD program at \$62 billion in then-year dollars. But the Pentagon in August 2016 set the estimated acquisition cost of the program at \$85 billion and the total life-cycle cost at \$238 billion in then-year dollars. The \$85 billion estimate is at the lower end of an independent Pentagon cost estimate that put the acquisition price tag as high as \$150 billion.¹⁵⁰ Many ICBM proponents argue that they are the cheapest leg of the triad to maintain and modernize, but the independent estimate of approximately \$150 billion exceeds the projected cost of \$128 billion for the Columbia-class submarine program.

The Air Force in 2014 conducted an analysis of alternatives to sustain the ICBM leg of the triad which showed that the price to build a new missile system would be roughly the same as the cost to maintain the Minuteman III.¹⁵¹ However, the service arrived at this conclusion by comparing the total lifecycle cost of each option through 2075. This meant that the Minuteman III life extension option included the costs of both refurbishing the existing missiles and the costs of building a new fleet of replacement missiles. The analysis of alternatives also assumed a need to deploy 450 missiles.

In contrast, the CBO evaluated the cost of the two options over a shorter period of time. In addition, a 2014 report by the RAND Corporation on the future of the ICBM force found that “any new ICBM

alternative will very likely cost almost two times—and perhaps even three times—more than incremental modernization of the current Minuteman III system.”¹⁵² The report said continuing to maintain the Minuteman III through life-extension programs and “gradual upgrades is a relatively inexpensive way to retain current ICBM capabilities.”

The RAND study identified two challenges to this approach. First, the number of Minuteman III missile bodies is declining due to test launches. Based on the current testing pace of roughly 4–5 tests per year, maintaining a force of 400 missiles, as is the plan under New START, would deplete the test inventory by 2035. Second, the report said incremental modernization would be “viable” only if the capability the Minuteman III provides “is not substantially changed.”

But reducing the number of ICBMs to 300 and forgoing capability upgrades, which are unnecessary for the ICBM force to continue to serve its sponge function, would mitigate these challenges. Life-extended Minuteman III missiles can get blown up in their silos by incoming Russian ICBMs less expensively than new GBSD missiles. Moreover, the claim that the Minuteman III may not be able to overcome expected advances in adversary air and missile defenses over the next two decades merits further scrutiny given the repertoire of countermeasures the missile is already believed to contain to overcome such defenses.

Some analysts argue that refurbishment is not viable due to the aging-out of the Minuteman III’s component parts.¹⁵³ Extending the life of the Minuteman III could entail some technical risk. However, neither RAND nor the 2014 analysis of alternatives determined that doing so is infeasible.

Additional savings could potentially be found from keeping Minuteman III missiles past their anticipated expiration in the early 2030s, which would delay, if not obviate, the need to refurbish the missiles. For example, Todd Harrison, the director of the Aerospace Security Project at the Center for Strategic and International Studies, wrote in a 2017 report that keeping the missiles three years longer than planned, would increase the probability of failure at launch from 1.3 to 3.8 percent.¹⁵⁴ But as Harrison notes:

“If the primary purpose of the ICBM force is to deter an attack by acting as a missile sponge, then quantity is arguably more important than reliability. At extremely high levels of unreliability, an adversary could begin to disregard the missiles altogether. At the range of failure rates discussed here (up to 3.8 percent), though, that adversary would still need to target all of the ICBMs to neutralize them.”

The Defense Department continues to use even older Minuteman II rocket motors for military space launches, which suggests the department has high confidence in the boosters. Which begs the question: If older Minuteman II motors are still functioning reliably, could the newer Minuteman III boosters reliably last longer than currently planned?¹⁵⁵

The Air Force has yet to demonstrate that sustaining the Minuteman III beyond the missiles' expected retirement in the 2030 timeframe is not a viable or more cost-effective nearer-term option. Former undersecretary of defense for policy Michèle Flournoy stated in 2017 that "the Defense Department should more seriously consider further extending the life of the existing Minuteman III ICBMs as a cheaper near-term alternative to the current plan to build an entirely new ICBM system."¹⁵⁶ Pursuing this approach would carry significant option value as it would defer a decision on whether to build an entirely new system.

Additional Savings from this Option

Eliminating the LRSO and no longer deploying B61 gravity bombs in Europe would save \$47 billion through fiscal year 2046. As noted above, these weapons are militarily unnecessary and in the case of the LRSO pose underappreciated risks to stability. Under this option removing tactical nuclear weapons from Europe would not alter the scope of the B61-12 life extension program but would result in foregoing plans to make the F-35 nuclear-capable.

Jettisoning the LRSO and F-35 nuclear capability would leave B61-12s delivered by the B-2 and later the B-21 as the lone low-yield option in the U.S. nuclear arsenal. Given the enormous investment that is being made in the B-21, there should be no doubt about the bomber's ability to penetrate even the most advanced adversary air defenses for the foreseeable future. If a second low-yield option is required, then fielding the low-yield SLBM as proposed by the Trump NPR would be a far more cost-effective option, though the risks to stability and the survivability of SSBNs highlighted earlier in this report would still remain.

Building a capability to develop 30 plutonium pits per year instead of 80 and ditching plans to build interoperable warheads would save \$14.5 billion through 2046. The estimated \$6 billion in fiscal year 2018 dollars in savings from building only 30 plutonium pits, which is based on forgoing the least expensive option studied by NNSA to build an additional 50 pits, is likely an underestimate given that the cost to build the necessary infrastructure to produce the extra pits is at the low end of NNSA's projected cost range for the option.

As described earlier, the United States does not need to build at least 80 pits per year. Achieving

the capability to build even 30 by 2030 would be an enormous achievement given that the Energy Department has not produced pits at such a quantity since the 1980s and had to cease major plutonium operations at Los Alamos' Plutonium Facility-4 from 2013-2017 due nuclear criticality safety concerns. Once NNSA demonstrates a capability to manufacture 30 pits per year, it can re-evaluate the need for additional pits based on the anticipated aging of existing pits, the size of the total warhead stockpile, and the international security environment.

The need for increased pit production could also be reduced by pursuing less ambitious warhead life extension programs. The model for future life extensions should instead be the Navy's simpler, \$4 billion in then-year dollars W76 SLBM warhead life extension program.¹⁵⁷ In addition, instead of rebuilding the W78 warhead, it should be retired. A smaller ICBM force means there is no need to keep two different ICBM warheads. The W87 is newer and has modern safety features. Enough W87 warheads have been produced (more than 500) to arm the entire ICBM fleet. The estimated savings of \$10 billion in this option from forgoing the development of interoperable warheads assumes a simpler life extension program for the W78 warhead, not its retirement.

Delaying the B-21 bomber program or purchasing fewer B-21s would result in additional savings. According to the CBO, deferring development of the B-21 would save \$34.5 billion through fiscal year 2046. The CBO projects the cost of each B-21 at \$690 billion. Reducing the planned buy from 100 to 70

Figure K: (Option 2) Deploy a 1,550-Warhead Triad (Savings: \$149.3 billion)

Reduce triad to 10 SSBNs and 300 ICBMs	\$40 billion
Delay GBSD program	\$17.5 billion
Eliminate LRSO	\$30 billion
Don't deploy B61 gravity bombs in Europe	\$17 billion
Pursuing simpler warhead LEPs	\$10 billion
Reduce to 30 pits/year production capacity	\$6 billion
Eliminate Trump additions	\$28.8 billion
Total savings	\$149.3 billion

Additional savings of \$34.5 billion through FY2046 if B-21 bomber program delayed or \$20.7 billion if B-21 bomber purchase reduced from 100 to 70

bombers could thus save \$20.7 billion, though the actual savings might be less than that amount due to the loss of economies of scale.

The primary mission of the B-21 is to allow the Air Force to continue to provide a conventional long-range penetrating bomber. The B-21 would not be certified to carry nuclear weapons until two years after it is first deployed. According to the Pentagon, only about five percent of the bombers' acquisition cost would go directly to making the bombers capable of carrying nuclear weapons.¹⁵⁸ However, if the bomber did not have a nuclear mission, the overall program could be less expensive. For example, the bombers might not need to use pilots, but could be operated remotely.

Even with a 10-year delay, a new bomber would still be ready by about the time current bombers are reaching the end of their service life and the delay would allow the new bomber to incorporate technological advances made during that time. "Taking advantage of future technological developments can be particularly valuable for weapon systems that are expected to be in use for several decades," the CBO states.¹⁵⁹ In addition, by moving B-21 funding into the future, the Air Force would free up resources for other priorities, such as buying KC-46A tankers and F-35A fighters. Buying fewer bombers would also save money for the "Penetrating Counter Air" aircraft the Air Force is seeking to replace the F-22 and part of the F-15 fleet beginning in 2030.¹⁶⁰

The B-2, the last U.S. bomber built, provides a cautionary tale. In the 1980s, plans called for 132 B-2s, and then 75, but the dissolution of the Soviet Union led to growing congressional opposition. In 1992, President George H.W. Bush announced that production would be limited to 20 aircraft. Twenty-one B-2s were ultimately built, at a cost of more than \$2 billion each, far above initial estimates. Its predecessor, the B-1, also was never built in the numbers envisioned.¹⁶¹

However, delaying fielding of the B-21 until the late 2030s would limit the Air Force's inventory of stealthy bombers able to fly in defended airspace to the 20 B-2s in today's bomber force. While this disadvantage would be less pronounced if the B-21 only had a nuclear mission, the main purpose of the bomber is conventional. Delaying the bomber might also weaken the rationale for forgoing the LRSO in favor of the B61-12.

Option 3: Deploy a 1,000-Warhead Dyad Without ICBMs (Savings: \$281.8 billion)

This option would reduce the number of deployed strategic warheads to 1,000 New START-accountable warheads by eliminating the ICBM leg of the triad and reducing the number of SSBNs to eight (\$200 billion in savings), eliminating the LRSO (\$30 billion

in savings), no longer deploying B61 gravity bombs in Europe (\$17 billion in savings), and developing a capability to produce 30 plutonium pits per year (\$6 billion in savings) (See Figure L). This option would save \$253 billion relative to the CBO baseline and \$281.8 billion when combined with eliminating the Trump additions. Additional savings could be found by delaying the B-21 program or purchasing fewer B-21s.

Savings of \$281.8 billion would nearly equal the combined price of the fiscal year 2019 budget request for the Department of Veterans Affairs (\$199 billion), Department of State (\$37.8 billion), and Department of Homeland Security (\$47.5 billion). Such savings could also cover nearly the entire projected cost to cleanup legacy nuclear weapons facilities and waste (estimated by the Energy Department at \$377 billion in then-year dollars).¹⁶²

Under this option the United States would by 2030 deploy roughly 1,000 New START accountable warheads on 180 strategic delivery systems consisting of 160 SLBMs and at least 20 nuclear-capable bombers. By 2046 the United States would deploy the same number of warheads on 128 SLBMs and 100 nuclear-capable bombers.

The main difference between Option 2 and Option 3 is that this option would eliminate the ICBM leg of the triad and its associated warheads and supporting infrastructure and retain eight submarines instead of 10. In order to deploy 1,000 warheads under this option, each SLBM would carry an average of six warheads.

The case for eliminating ICBMs is that they are a redundant backup to SLBMs and because they are

Figure L: (Option 3) Deploy a 1,000-Warhead Dyad Without ICBMs (Savings: \$281.8 billion)

Eliminate the ICBM leg and reduce to 8 SSBNs	\$200 billion
Eliminate the LRSO	\$30 billion
Don't deploy the B61 gravity bomb in Europe	\$17 billion
Reduce to 30 pits/year production capacity	\$6 billion
Eliminate Trump additions	\$28.8 billion
Total savings	\$281.8 billion

Additional savings of \$34.5 billion through FY2046 if B-21 bomber program delayed or additional savings of \$20.7 billion if B-21 bomber purchase reduced from 100 to 70

primed for “launch-under-attack,” could increase the potential of an accidental nuclear war. Discarding ICBMs would also remove the rationale for those Russian nuclear weapons targeted at the missiles. Phasing-out the ICBM force would save \$149 billion through fiscal year 2046, according to the CBO.

Eliminating the missiles would drastically reduce the number of aim-points an adversary would have to strike to destroy delivery systems and warheads based on U.S. soil. But as the CBO notes, so long as submarines “remained undetectable, the United States would still have several hundred warheads on SLBMs available for a retaliatory strike.”

For the foreseeable future there does not appear to be any threat to submarines that would allow an adversary to prevent massive retaliation by the United States. As James Miller, a former undersecretary of defense for policy, and Richard Fontaine, the executive director of the Center for a New American Security, write “The United States is proceeding with its Columbia-class replacement SSBN [ballistic missile submarine], which will continue to serve as the backbone of the U.S. strategic deterrent, indicating that the United States does not regard threats to its strategic missile submarines in the coming generation as unmanageable.”¹⁶³ They note that “it is likely that the measure-countermeasure interaction between offensive strike capabilities...and defensive and survival capabilities...will continue both in undersea

warfare and for time-critical targeting of mobile missiles without a fundamental shift in the basic strategic reality of the nuclear era.”

Even if an unforeseen breakthrough in anti-submarine warfare were to emerge, retaining ICBMs might not provide a reliable hedge given their vulnerability. This has led some to suggest the development of a mobile basing mode to enhance the survivability of ICBMs. In fact, the Trump NPR suggests the Pentagon might consider a mobile basing mode. But such an approach would be far more expensive than even the already pricey GBSB program, which will retain silo-basing, and would likely be politically infeasible in any event.¹⁶⁴

Under this option the United States would still retain bombers, which could be put on alert during a crisis or major conflict, as a hedge against submarine vulnerability. If a future U.S. president believes that an additional hedge against strategic submarine vulnerability is required, there would be the option of developing and fielding a nuclear-armed SLCM on attack submarines. This would be more cost-effective than retaining ICBMs or even building more Columbia-class boats. But development of a SLCM would not need to begin for some time given current confidence in the invulnerability of ballistic missile submarines. A SLCM would increase the number of nuclear-capable submarines by a factor of five, though as noted earlier the capability would not come without risks.¹⁶⁵

Recommended Action Items for Congress

While the third wave of nuclear modernization poses significant challenges, it need not prevent the United States from continuing to field a powerful and credible nuclear force sufficient to deter nuclear attack against the United States and its allies. As noted in the previous section, scores of billions of dollars could be freed up by eliminating the Trump administration’s proposals for new warheads and infrastructure, scaling back or delaying new delivery systems, and taking a more disciplined approach to rebuilding warheads and their supporting infrastructure. The United States can more cost-effectively maintain a triad and the number of nuclear warheads it plans to deploy under New START. Further reducing the size of the arsenal and eliminating the ICBM leg of the triad would allow for even greater savings.

As the new 116th Congress scrutinizes the Trump administration’s nuclear weapons spending plans and considers adjustments to them, there are numerous steps lawmakers should take to enhance affordability and improve their understanding of the underlying policy assumptions and long-term budget challenges.

Hold in-depth hearings on U.S. nuclear weapons policy and spending. In light of the growing price tag to sustain and recapitalize the U.S. nuclear arsenal, the Trump administration’s controversial proposals to expand U.S. nuclear capabilities, the risk of the collapse of the U.S.-Russian arms control architecture, and concerns about the emergence of a new arms race, Congress—specifically the Armed Services, Appropriations, and Intelligence committees—should hold a series of hearings in 2019 and 2020 to examine U.S. nuclear strategy and spending with government officials and non-governmental experts.

Areas of focus should include:

- nuclear targeting doctrine and requirements, including the requirement for prompt launch;

- reduction of the risk of nuclear miscalculation and accidental nuclear use;
- the budget and programmatic challenges facing the nuclear recapitalization effort;
- the rationale and costs of sustaining the ICBM force;
- the threats to nuclear command, control, and communications capabilities and the Pentagon’s plans to upgrade those capabilities;
- the benefits of extending New START and the costs of failing to do so;
- the status of the Pentagon’s implementation of the Trump NPR;
- the impact of the development of increasingly advanced cyber, space, missile defense, long-range conventional strike, and autonomous systems on strategic stability; and
- Russian nuclear doctrine and strategy.

Request a National Intelligence Estimate on the sufficiency and credibility of the U.S. nuclear arsenal. The Trump NPR makes a number of unsupported assumptions about the credibility of

U.S. nuclear forces. For example, the review claims that additional low-yield capabilities “will enhance deterrence by denying potential adversaries any mistaken confidence that limited nuclear employment can provide a useful advantage over the United States and its allies.” But the basis for the presumption of “mistaken confidence” is unclear. According to House Armed Services Committee Chairman Rep. Smith, the conclusion that Russia or China might believe the United States would be self-deterred from using the current weapons in its arsenal is “just speculation. I have not seen any in-depth study on that question.”¹⁶⁶

Congress should request the Director of National Intelligence to oversee the production of a national intelligence estimate that assesses the views of U.S. adversaries, in particular Russia, on the adequacy of the current U.S. nuclear arsenal. The estimate, which should include an unclassified summary, should address the following issues:

- whether the Russian leadership believes existing U.S. air-delivered low-yield weapons lack credibility as a response to limited Russian nuclear use;
- whether the Russian leadership believes the United States would be self-deterred from using higher-yield weapons in response to a limited nuclear strike;
- the conditions under which Russia would resort to using nuclear weapons on a limited basis against the United States or a U.S. ally;
- the number and diversity of nuclear weapons that is sufficient to deter the Russian leadership from initiating a nuclear attack on the United States, its allies, or partners; and
- the reasons for Russia’s expansion and modernization of its non-strategic nuclear forces.

Require the Defense Department and Director of National Intelligence to prepare a report on the costs of failing to extend New START. The current plans to replace the nuclear arsenal have been crafted to fit within the New START limits. If New START expires in February 2021 with nothing to replace it, U.S. and Russian nuclear forces would be unconstrained. In addition, the Pentagon and intelligence community would have less visibility into Russia’s nuclear capabilities, their force structure, and their modernization plans. To date the Trump administration has shunned talks with Russia on extending the treaty. Congress should ask the Defense Department to provide its unclassified assessment of how the absence of New START would affect U.S. military planning and spending. It should also ask the

department and the Director of National Intelligence to estimate the cost of attempting to make up for the loss of the intelligence information provided by New START’s data exchanges and onsite inspection rights and the impact of the treaty’s expiration on Russian nuclear force plans and the nuclear forces plans of other nuclear-armed states. The report from the director should include an unclassified summary.

To send a message to the administration about the importance of sustaining New START, Congress could also consider a prohibition on funding to increase the number of nuclear weapons above the limits set by the treaty, so long as Russia continues to comply with the agreement. Such an approach would guard against a breakout by either side and help to maintain strategic stability in the event the treaty disappears.¹⁶⁷

Require the Defense and Energy departments to prepare a report on options for reducing the scale and scope of their nuclear recapitalization effort. The affordability and execution challenges facing the effort are real and growing and can no longer be ignored. Pressure on the defense budget cannot be relieved solely by reducing nuclear weapons spending but adjusting the plans could yield significant savings.

Congress should require the Pentagon and NNSA to estimate, in an unclassified report, the cost savings from and assess the feasibility and programmatic implications of delaying, reducing the scope of, and eliminating major delivery system replacement programs, warhead life extension programs, and warhead production facility recapitalization programs. In doing so, they should assess options to reduce costs that maintain a deployed strategic nuclear arsenal of 1,550 New START accountable warheads, reduce the size of the arsenal by one-third below the New START limits, and reduce the size of the arsenal by two-thirds below the New START limits.

Require unclassified annual updates from the Defense and Energy Departments on the projected long-term costs of nuclear weapons. Section 1043 of the fiscal year 2012 national defense authorization act requires the Pentagon and NNSA to provide an annual estimate of the cost of nuclear weapons over a period of 10 years. In addition, the fiscal year 2013 authorization bill required the CBO to provide Congress with a 10-year estimate of the cost of the arsenal. Congress subsequently required the CBO to update the projected 10-year cost once every two years.

While a 10-year estimate is useful, it only captures a portion of the period during the mid-2020s and mid-2030s when nuclear weapons sustainment and recapitalization costs are slated to peak. In order to be in the best position to exercise effective oversight, steward taxpayer dollars, and weigh tradeoffs,

Congress should ask for more information about projected costs over a longer period of time.

Long-term budget projections are of course uncertain. But there is precedent for such estimates. For example, the Navy publishes a 30-year shipbuilding plan and NNSA publishes a 25-year nuclear stockpile plan, both of which include budget estimates. As the CBO notes, longer-range projections are useful because they can help Congress and the Pentagon “in setting appropriate budgets” and “also identify key future issues—when too many programs might need procurement appropriations at the same time, for example...and give decisionmakers enough time to address them.”¹⁶⁸

Require the Defense Department to report on the projected cost of its major nuclear and non-nuclear acquisition programs during the period from 2020 and 2040 and require the GAO to evaluate this analysis and assess the affordability of the effort.

The Pentagon’s portfolio of 86 major acquisition programs is projected to cost \$1.66 trillion. Congress needs a better understanding of the scale of the mismatch between currently projected defense spending and the long list of defense projects the Pentagon and Congress would like to carry out, including nuclear recapitalization, force structure expansion, conventional modernization, research and development on new technologies, and continued investment in readiness and compensation growth. In addition to mandating an unclassified 20-year cost estimate and associated GAO affordability assessment, Congress should ask the Pentagon to explain how it proposes to fund the 2018 National Defense Strategy under different levels of projected defense spending, including scenarios in which planned “efficiencies” from reform do not materialize or defense spending drops back down to the Budget Control Act levels.

Mandate a report by a federally funded research center or an independent commission on the future of the ICBM force.

Given the controversial utility of ICBMs, the staggering high-side cost risk of the GBSB program, and the limitations on how the 2014 analysis of alternatives to sustain the ICBM force was conducted, Congress should ask an independent entity to conduct its own analysis of alternatives. In particular, the analysis should not assume a requirement to deploy 400 ICBMs in perpetuity. The analysis should include an assessment of the technical feasibility of refreshing the Minuteman III rocket motors and guidance system, the impact of extending the life of the Minuteman III on sustaining the current Minuteman III test rate, the ability of the Minuteman III to achieve its mission in the expected future air defense environment, an assessment of whether

existing Minuteman III rocket motors could last without being replaced and if so for how long, and an estimate of the cost sustaining the Minuteman III relative to the cost of building a new missile system. The analysis should also assess alternatives to maintaining ICBMs in a “launch under attack” posture.

Require the Defense Department to divulge the value of the contract to develop the B-21 “Raider” awarded to Northrop Grumman in October 2015 and the estimated cost to acquire the bomber.

Citing the need to protect national security, the Air Force has kept secret the value of its 2015 contract award to Northrop Grumman to build the B-21 as well as the estimated total program acquisition and sustainment costs. Declassifying the cost of bomber will not undermine U.S. security.¹⁶⁹ But it would help to ensure more effective oversight of one of the Pentagon’s largest and most important programs. According to the late Sen. John McCain (R-Ariz.), releasing the value of the contract award would not reveal anything about the B-21’s capabilities that could not be gleaned from the information that has already been released.¹⁷⁰

The Pentagon has already released substantial information to help solidify political support for the program, but not the essential budget details that would hold the department’s feet to the fire on program outcomes.¹⁷¹ The case for greater public disclosure of B-21 costs is strengthened by the fact that Northrop Grumman’s winning contract bid was lower than the Pentagon’s estimate, raising concerns that it was unrealistic.¹⁷² Moreover, the Defense Department has a long history of underestimating how much its major aircraft acquisition programs will cost.¹⁷³ Fear of a “sticker shock” backlash or embarrassing cost overruns are not legitimate reasons to keep taxpayers in the dark about the price tag of one of the Pentagon’s largest and most important programs.

Avoid gimmicks like the special fund Congress has legislated to pay for the Columbia-class program.

Navy officials have repeatedly warned that the service’s projected long-term budget is not large enough to accommodate the Columbia-class program and meet its needs for conventional ships. In an attempt to address the Navy’s concerns, Congress in the fiscal year 2015 defense authorization bill created the National Sea-Based Deterrence Fund, a separate budget account outside the Navy’s regular shipbuilding account that would provide a mechanism for the Navy to buy the new boats without reducing funding for its other shipbuilding programs. Congress subsequently expanded the purview of the fund and provided the Navy with special acquisition authorities, such as the ability to buy components for multiple boats in

a single bulk purchase, which supporters say could reduce the cost of the new submarines.

But the fund is a gimmick. The extra monies will have to be found somewhere in the Pentagon's budget with or without the fund, which would be counterproductive because it would force the Army and Air Force help foot the bill for the new submarines.¹⁷⁴ Congress can also authorize more-efficient acquisition practices in the absence of a separate account. In addition, the fund sets a bad precedent that the other services might try to replicate to fund their highest priority programs. Navigating the disconnect between the scope of the nuclear recapitalization effort and expected defense spending requires making hard choices among different Navy and other Pentagon programs.

Highlight the link between arms control and replacing the arsenal. The costs and risks of the Trump administration's nuclear weapons spending plans are compounded by its abdication of the longstanding U.S. leadership role in crafting and sustaining a safety net of nuclear arms control, nonproliferation, and restraint agreements.

Congress should support both extending New START and adjusting the spending because doing so makes sense for U.S. security. But lawmakers should make it clear to the administration that there will be consequences for not upholding the arms control end of the 2010 "bargain" that helped to ensure Senate approval of New START and to keep the fragile bipartisan support for recapitalizing the nuclear arsenal.¹⁷⁵ As Senate Foreign Relations Committee ranking member Robert Menendez (D-NJ) noted last September, "bipartisan support for nuclear modernization is tied to maintaining an arms control process that controls and seeks to reduce Russian nuclear forces...We're not interested in writing blank checks for a nuclear arms race with Russia."¹⁷⁶ Congress should demand that in return for funding a reasonable and affordable nuclear weapons sustainment program, the Trump administration must pledge to, at a minimum, pursue a comprehensive strategy to mitigate the consequences of withdrawing from the INF Treaty and prevent the renewal of a missile race in Europe, support an extension of New START, and commit to a regular dialogue on strategic stability with Russia and China.

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Arms Control Association

The Arms Control Association (ACA), founded in 1971, is a national nonpartisan membership organization dedicated to promoting public understanding of and support for effective arms control policies. Through its public education and media programs and its magazine, *Arms Control Today* (ACT), ACA provides policy-makers, the press and the interested public with authoritative information, analysis and commentary on arms control proposals, negotiations and agreements, and related national security issues. In addition to the regular press briefings ACA holds on major arms control developments, the Association's staff provides commentary and analysis on a broad spectrum of issues for journalists and scholars both in the United States and abroad.

The projected cost of the proposed U.S. nuclear spending spree is staggering and it is growing. The United States currently plans to spend nearly \$500 billion, after including the effects of inflation, to maintain and replace its nuclear arsenal over the next decade. Over the next 30 years, the price tag is likely to top \$1.5 trillion and could even approach \$2 trillion. This report describes the ways in which this level of spending is unnecessary, unsustainable, and unsafe. It outlines three realistic options to reduce spending on nuclear weapons while still maintaining a devastating nuclear deterrent. The report also recommends key steps Congress can take to enhance affordability and improve its understanding of the underlying policy assumptions and long-term budget challenges.

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