



Deep Cuts Working Paper
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U.S. NUCLEAR FORCE STRUCTURE AND DEEP REDUCTIONS

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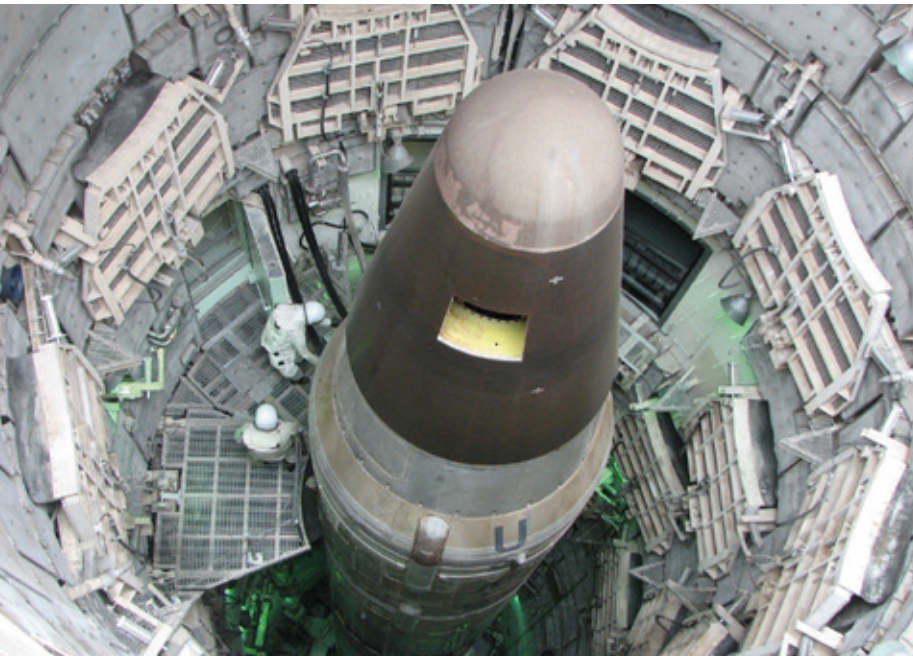


Introduction

The United States and Russia have made major reductions in their long-range nuclear forces since the end of the Cold War. These reductions should be welcome, but are less than one might expect and hope for, given that the Cold War is over. The recent New START treaty calls for a modest additional reduction for the nuclear superpowers, but leaves the two arsenals with essentially the same Cold War structure on a smaller scale. Truly significant further reductions in numbers and nuclear dangers will require a new attitude toward the role of nuclear weapons.

Truly significant further reductions in numbers and nuclear dangers will require a new attitude toward the role of nuclear weapons.

The following discussion focuses on U.S. forces: first their current status, then the doctrine and policy that guide their potential use, plans for the next generation of weapons, and finally, some personal observations about what is required to move toward even greater reductions in nuclear forces.



Titan 2 intercontinental ballistic missile (Titan Missile Museum, Arizona). The Titan 2 was the largest intercontinental ballistic missile ever built by the U.S. Copyright: Kingdafy.

Current U.S. Force Structure

The U.S. maintains the same three independent nuclear delivery platforms, the so-called triad, that were developed during the Cold War: land-based missiles, submarine-based missiles, and manned bombers. During the Cold War, successive administrations justified the three different delivery systems by claiming they complicated any Soviet attempt at a disarming surprise first strike. Today, the administration justifies the triad, in part, as a way to assure survivability and, in part, as redundancy to ensure against some unforeseen technical failure.

All current U.S. nuclear warheads and nuclear delivery systems are left over from the Cold War and were designed in the context of the nuclear standoff with the Soviet Union. Individual weapons are not, however, nearly as old as this might imply. While the U.S. is not now introducing what it defines as “new” warheads, it does have vigorous “life extension” programs for existing nuclear warheads and delivery systems.

As part of “life extension”, some design changes have been introduced into nuclear warheads to, for example, to improve safety or to use more modern materials.¹ In some cases, life extension for warheads involves replacement of older parts either with remanufactured original parts or with improved, redesigned parts that serve the same function. In other cases, life extension involves almost complete rebuilding of the weapon including, in the future, even the nuclear components. Existing nuclear warheads could be maintained in this way for decades into the future.²

The only remaining U.S. intercontinental ballistic missile (ICBM), the Minuteman III, was first deployed in 1970, but has been completely rebuilt³ and is expected to remain deployed until at least 2030.⁴ The sole U.S. submarine-launched ballistic missile (SLBM), the D-5 or Trident, was first deployed only in 1990, but even so is being upgraded and is expected to remain serviceable until at least 2042.⁵

The D-5 missile is carried by the Ohio class nuclear submarine. The oldest of these ships will reach its planned end of service in 2027 with approximately one ship per year reaching its end of service after that. Past experience with other major weapon systems is that they often operate long past their estimated service lives. Nuclear submarines are different because, in addition to normal accumulated stress on the hull, replacing the nuclear reactor fuel is an extremely complex and expensive process called an “engineered refueling overhaul.” So a decision must be made to extend the service life by twenty years or not at all and current plans are to not refuel the Ohio submarines.⁶

ICBMs are launched from hardened, underground reinforced concrete silos that are practically immortal. While the Air Force is exploring alternative future basing systems for the ICBM, there is no concern about the lifetime of current launchers.

All existing U.S. missiles are capable of carrying multiple, independently-targetable reentry vehicles (MIRVs). The U.S., for reasons of stability and due to operational constraints (ICBMs, for example, are organized in “flights” of 150 missiles) prefers to have warheads spread among as many missiles as possible. To get down to lower numbers of warheads, the U.S. has, therefore, not reduced the number of missiles as much as it might have, but has reduced the number of warheads per missile. For example the Minuteman III originally carried three warheads. That number will be reduced to one warhead per missile under New START. The D-5 SLBM has been tested with up to eight MIRVs and that is being reduced to an average of between four and five per missile.

The Minuteman III is armed with a mixture of W78 and W87 warheads. The W87 originally sat atop the MX or Peacekeeper ten-MIRV missile, but when those missiles were retired, some of their warheads were redeployed on Minuteman. Warhead yields remain classified, but both warheads have typically been cited

as having yields of about 300 kilotons TNT (kT) equivalent. The D-5 is armed with a mixture of W76 and W88 warheads. The W76 is claimed to have a 100 kT yield and estimates of the W88 yield are as high as 475 kT.

Earlier arms control agreements counted every launcher as holding a missile carrying its maximum tested warhead payload, regardless of actual loading. If a D-5 had been tested with eight warheads, then every launcher that could carry a D-5 counted as eight warheads. Under START I, for example, the U.S. needed to reduce its accountable warhead loading, so it removed two warheads each from the three warhead load of the 150 Minuteman missiles at Warren Air Force Base and, in addition, destroyed the MIRV carrier, or “bus,” making the missiles incapable of carrying more than one warhead. The U.S. then allowed Soviet inspectors to confirm this and those missiles counted as one warhead each under the treaty. One of the important innovations of the New START agreement is on-site inspection to confirm *actual* deployed warhead numbers. With on-site inspection counting actual warheads, the U.S. can simply offload warheads and there is no need to disable MIRV *capability*. Under New START, the D-5 will carry an average of four to five warheads and be counted as such, but those warheads will be mounted on the original eight-MIRV bus and those missiles could be rapidly reloaded with warheads if the strategic environment were to worsen. Except for the Warren missiles, the Minuteman III missiles could also be uploaded.⁷ The U.S. currently maintains non-deployed warheads as a hedge to allow for increasing the loading if the future security environment warrants.⁸ Russia sees this capability as a breakout threat.

The smaller U.S. arsenal largely maintains Cold War alert levels. Land-based intercontinental ballistic missiles (ICBMs) are routinely kept ready to launch on several minutes’ notice. At any given time, the majority of U.S. ballistic missile submarines (SSBNs) are at sea, deployed in both the Atlantic and Pacific Oceans. U.S. SLBMs

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The F-35B is the variant of the Joint Strike Fighter designed for use by U.S. Marine Corps.
Copyright: U.S. Navy photo courtesy Lockheed Martin/Andy Wolfe/Released.

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can also be kept ready to fly within several minutes of receiving launch authorization and normally patrol within range of their targets.⁹ Communication with submarines is not as certain as with land-based systems, but submarines have redundant communication channels and a near constant shore-to-ship link can be assumed to exist when needed.¹⁰ ICBMs are kept at high alert, in part, to allow a launch-under-attack tactic,¹¹ that is, ensure the use of the ICBMs by launching when attacking Russian missiles are still in flight, before they arrive. This tactic cannot explain the SLBM alert levels.

By agreement with Russia, on a day-to-day basis, U.S. missiles are aimed not at Russian targets but at open ocean areas.¹² While this is perhaps a useful additional safety measure in case of accidental missile launch and a welcome symbolic gesture, it says nothing about actual intended targets. One Minute-man upgrade was the Rapid Execution and Combat Targeting (REACT) system that allows retargeting of the missile guidance systems in just a few minutes, using target lists stored in central computers.¹³ Submarines have a comparable capability called the SLBM Strategic Retargeting System (SRS).

Retargeting would not be visible to Russian surveillance.

The U.S. bomber force is the only part of the triad that is not routinely kept at high nuclear alert. The U.S. has two nuclear-capable long-range bombers, the B-52 and the B-2. The 76 nuclear capable B-52Hs are quite old but can carry long-range cruise missiles so do not have to penetrate enemy airspace (there are additional B-52s that are not nuclear-capable). The B-2 is a capable bomber but the Air Force has only 20 of the machines.¹⁴ The third long-range bomber, the B-1 Lancer, was never a well-regarded aircraft and was converted to a purely conventional role after the end of the Cold War.¹⁵

Bombers seem to be less significant to both the U.S. or Russia than are missiles. Under New START, a nuclear-capable bomber counts as only one warhead although each can carry at least a dozen bombs or cruise missiles.¹⁶ From their normal status, it would take hours to days to fit bombers with nuclear weapons. Of course, in a crisis, they could be put on ready-to-launch alert for extended periods. This change of status should be visible to Russian surveillance. From North American bases, bombers could take up to half a day to reach interior Russian targets.

Under the New START agreement, Russia and the U.S. are limited to 700 deployed missiles and bombers and a total of 1,550 warheads, keeping in mind that a bomber counts as only one warhead. Both sides have flexibility in how they meet this limit. The U.S. may make some small changes in final numbers but Secretary Gates reported to the Senate, in testimony supporting the treaty, that the U.S. would keep 12 submarines and four of the 24 tubes of each submarine would be blocked, leaving 20 tubes per ship, for a total of 240 D-5 missiles. The 450 Minuteman missiles would be reduced to 420, each with a single warhead. The U.S. currently has 18 nuclear-capable B-2 bombers and 76 B-52Hs but all except 42 of the B-52s would have

their nuclear launch capability removed, leaving a total of 60 nuclear-capable bombers.¹⁷ The D-5 missiles would then be loaded with between four and five warheads each to bring the overall warhead total to 1,550.

The U.S. has deployed a missile defense system, although many outside analysts claim it has little to no effectiveness.¹⁸ The long-range system, intended to defend against North Korean missiles and a hypothetical future Iranian capability, is called the Ground-based Mid-course Defense. Russia and China are explicitly excluded as potential targets of the system.¹⁹ It currently consists of 30 interceptors, split between 26 at Fort Greely in central Alaska and four at Vandenberg Air Force Base in southern California.²⁰ The U.S. also has intermediate range missile interceptors based on Aegis cruisers and destroyers.²¹ These currently have no capability against Russian long-range missiles, although Russia is concerned about future developments of this system.

U.S. Nuclear Policy and Doctrine

Future directions for U.S. nuclear forces depend on current U.S. nuclear policy. The Obama administration's policy includes reducing both the roles and number of nuclear weapons, indeed, even holding out the possibility of an eventual global elimination of nuclear weapons. But U.S. nuclear policy has multiple, sometimes conflicting, goals. The difficulty of further reductions will depend on a combination of (1) the goals that nuclear weapons are meant to accomplish, (2) the missions assigned to nuclear weapons to accomplish those goals, and (3) the physical characteristics of the weapons.

President Obama has put forth a vision for sharply reducing, even eventually eliminating, nuclear weapons and, regardless of the number of nuclear weapons, dramatically reducing their roles and salience. President Obama has presented his views on several occasions but most famously in a speech in Hradcany

Square in Prague on 5 April 2009²² and another by the Brandenburg Gate in Berlin on 19 June 2013.²³ Earlier public statements, from an essay he published while a college student²⁴ to a speech given at DePaul University on 2 October 2007²⁵ when he was a U.S. Senator, demonstrate that Mr. Obama was thinking of a nuclear-free world long before becoming president.

The official U.S. nuclear policy documents are, however, far more cautious than the president's speeches. The definitive unclassified U.S. nuclear policy document is the *Nuclear Posture Review Report* (NPR).²⁶ In this context, "posture" includes nuclear policy and doctrine plus the nature, capabilities, and deployment of the nuclear arsenal, and the status of the supporting infrastructure. Presidents have called for reviews of the nuclear posture at irregular intervals. The Department of Defense (DoD) took the lead in developing and writing the current NPR, but in close coordination with the Department of Energy (responsible for the maintenance of nuclear warheads), the Department of State, and the members and staff of the National Security Council, which advises the president directly. The report is signed by the Secretary of Defense, but was approved by the President Obama. The NPR produced by the Obama administration was the first ever to be completely unclassified and publicly available, so it is impossible to say how it differs in detail from previous reports.

The NPR and supporting documents should be read very carefully both for what they say and what they do not say. The NPR lays out five goals for U.S. nuclear weapon policies: (1) Preventing nuclear proliferation and nuclear terrorism, (2) reducing the role of U.S. nuclear weapons in the U.S. national security strategy, (3) maintaining strategic deterrence and stability at reduced nuclear force levels, (4) strengthening regional deterrence and reassuring U.S. allies and partners, and (5) sustaining a safe, secure, and effective nuclear arsenal.

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Note that the current *NPR* addresses, for the first time, not only U.S. nuclear weapons but all U.S. policies related to global nuclear dangers. Thus, the *Report*, as well as public statements by the president, make clear that the U.S. sees nuclear terrorism and nuclear proliferation as the greatest current nuclear threats.²⁷ The emphasis on the terrorist use of nuclear weapons reflects the administration's estimate of terrorists' motivations, not capability. No one today believes that any terrorist group has, or is anywhere close to obtaining, a nuclear weapon but the presumption is that, should some groups get a weapon, they would not hesitate to use it.



U.S. soldiers secure an AIM-9 Sidewinder air-to-air missile on an F-16 Fighting Falcon aircraft.
Copyright: DoD photo by Airman 1st Class George Goslin, U.S Air Force/Released.

arsenals not so much because of any great danger they pose, but more because they are largely irrelevant in the current security environment and both sides might save some money.²⁹ Finally, reducing the number of weapons held by established nuclear weapon states might marginally reduce the likelihood that one could be stolen by or sold illicitly to a terrorist group.

Downplaying the danger posed by Russian nuclear weapons reflects a realistic assessment of U.S.-Russian relations, but it may also be part of a political calculation. The American public is ambivalent about nuclear weapons, recognizing them as a great danger but also seeing U.S. nuclear weapons as the best counter to any nuclear threat posed by other nations. Advocates of disarmament could emphasize the potential cataclysmic danger posed by Russian nuclear weapons to increase the sense of urgency about nuclear elimination. But fear might also make part of the public all the more determined to hold onto nuclear weapons.³⁰ I believe that this caution about frankly discussing the dangers posed by Russian weapons, while perhaps a political necessity, weakens arguments for further cuts and also muddles the discussion of nuclear weapon deployments.

The *NPR* raises few alarms about China. Russia is not the primary threat and China is far less of a threat. The main concern about China is the lack of transparency about its intentions and plans for future nuclear weapon developments and, in particular, how U.S. allies in the region will view a Chinese build-up. The U.S. hopes greater Chinese transparency will enhance strategic stability, which seems to mean avoiding a measure-countermeasure arms race driven by worst-case assumptions.³¹

The *NPR* states that the “fundamental role” of U.S. nuclear weapons is to deter nuclear attack, but also notes explicitly that this is not the sole role. The U.S. reserves the right, under extreme conditions, to use nuclear weapons against nuclear-armed states or states not in

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The danger of having a thousand or so Russian nuclear weapons capable of destroying the U.S. is strongly downplayed. This leaves three tepid motivations for continuing reductions in the arsenals of the nuclear superpowers. First, reductions fulfill the Nuclear Non-Proliferation Treaty (NPT) obligations and create the moral authority needed to argue for greater international cooperation to combat nuclear proliferation and nuclear terrorism, the primary threats.²⁸ Second, the U.S. and Russia are no longer adversaries. Their arsenals are overwhelmingly holdovers from the past. Both sides should, therefore, reduce their

compliance with their NPT obligations. The *NPR* is largely silent on what those conditions might be. The Department of Defense is required by law to report to Congress any changes in nuclear deployment strategy. The most recent report, following the *NPR*, is more explicit than the *NPR* itself, stating that “The new strategy...makes clear that we must be prepared for the possibility that deterrence will fail.”³² Furthermore, “The new guidance requires the United States to maintain significant counterforce capabilities against potential adversaries.”

Thus, while official documents typically skirt the question, it seems clear that maintaining an option for a damage-limiting counterforce strike is one mission for U.S. nuclear forces. Perhaps this possibility applies only to attacks against smaller “rogue” states such as Iran or North Korea. The report to Congress states that “... the United States seeks to improve strategic stability by demonstrating that it is not our intent to negate Russia’s strategic nuclear deterrent.”³³ Yet, the size, character, and alert rates of U.S. nuclear forces are difficult to understand except in terms of maintaining at least some capability for a damage-limiting attack on Russian central nuclear forces. At the very least, whether true or not, it will appear to be so to Russian military planners. Thus, while the phrase “if deterrence fails” appears in policy documents with the implication that some attack against the American vital interests will have occurred, this is not explicitly spelled out and the context is a doctrine that explicitly allows first-use. So deterrence might also “fail” if the *U.S.* decides on the necessity of a disarming first strike. For example, if North Korea or Iran started readying nuclear weapons, then the *U.S.* might preempt with an attack that could be, in theory, (but in practice almost certainly would not be) nuclear. This would be an example of “the possibility that deterrence will fail.” Neither Russia nor any other nuclear-armed country is explicitly excluded from such cases.³⁴

In summary, the *U.S.* administration believes that the first and second greatest and most immediate nuclear dangers today are (1) a terror group with a nuclear weapon and (2) proliferation of nuclear weapons to potentially unfriendly regimes. The *U.S.* long-range nuclear arsenal is substantially smaller than during the Cold War, but the remaining weapons were designed during the Cold War for Cold War missions. One such important mission was to maintain at least an option for a damage-limiting first strike against Soviet central nuclear forces. This required fast-flying missiles armed with highly accurate, high yield warheads kept constantly at high alert. Those forces remain today, simply on a smaller scale. From the outside, the *U.S.* arsenal looks like a counterforce arsenal and little in *U.S.* doctrine explicitly contradicts this assessment. Some argue that the relative capability for a disarming first strike has actually increased since the end of the Cold War.³⁵

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Future Nuclear Forces

All three legs of the nuclear triad were inherited from the Cold War. Today, each is in high operational status but the missiles, submarines, and bombers continue to age and the planning and design time for such major weapon systems is at least a decade, so studies are already underway to determine what the next generation of weapons ought to be. The leading contenders for the next generation are a follow-on land-based missile, a follow-on submarine-based missile, and a follow-on long-range bomber. In other words, the current plan is to replace the “outmoded” Cold War triad with a look-alike post-Cold War triad.

The most detail is available for the future submarine (called the *SSBN-X*),³⁶ perhaps, in part, because of the very close cooperation required between the *U.S.* and the United Kingdom on both submarines and missiles.³⁷ The new submarine will have 16 launch tubes by contrast to the *Ohio* class, which has

24 (but four tubes per Ohio ship will be blocked soon to meet the launcher restrictions of New START). The launch tubes will be sized to carry the D-5 missile that can carry eight warheads. Although designed with fewer launch tubes, the new submarine will be slightly longer, wider, and heavier than the current Ohio. Plans call for a total of 12 ships to replace the 14 Ohio submarines. Fourteen ships are required today to have ten ships active at any one time.³⁸ By designing for easier maintenance, the Navy believes it can always have the same ten active ships with a total fleet of only 12. Most importantly, the ships will be built with a reactor with a 40-year fuel supply installed, avoiding the need for a multi-year, mid-life engineered refueling overhaul.

The follow-on bomber program is less well defined. For some time, the Air Force has been exploring options for a future intermediate range bomber. One concept was called the 2018 Bomber (that being the year it would first fly) or the Next Generation Bomber. Secretary of Defense Gates decided against that program and the current concept is for a Long Range Strike Bomber (sometimes called the LRS-B), a stealthy bomber of perhaps 6,000 nautical mile range. It may be capable of unmanned flight, but details are currently unclear.³⁹ The 2013 Defense Authorization bill specifies that the bomber be nuclear capable from the date of its initial deployment.⁴⁰

The Air Force seems to have little concern about maintaining an intercontinental ballistic missile. The Minuteman could remain in service for decades longer and is a good enough missile that one option for the “next” missile is to simply build new Minutemen. There is some question about basing modes. The Air Force is considering basing other than in underground silos, including mobile basing, but few details are available.⁴¹

The *NPR* states explicitly, and Air Force and Navy policies confirm, that the U.S. will maintain, into the foreseeable future, the triad of nuclear missiles and bombers developed for

the Cold War. The U.S. plan for future nuclear forces seems to have only a loose connection to estimates of future Russian and Chinese forces. The U.S. sees this as a desirable position, a sign of a stable strategic relationship. The U.S. does not want to have a panicked reaction if the Russians develop a new missile or the Chinese upgrade some part of their force.⁴² Indeed, with strategic nuclear systems having development times of well over a decade, production runs of two decades, and service lives of four decades, the weapons have to be planned more or less independent of fairly substantial changes in foreign arsenals. As a “hedge” against the possibility of a deteriorating military environment or increased hostilities with Russia or China, the U.S. will maintain additional warheads that could be reloaded onto deployed missiles over a period of months.

The W76 warhead for the D-5 missile is currently undergoing a Life Extension Program (LEP) rebuild that should be finished by 2020. In 2019, the five year rebuilds for the D-5’s W88 warhead and the B-61 air-delivered bomb are scheduled to begin, but the Department of Energy is notoriously bad at keeping to schedules or budgets so the dates may slip.⁴³

The Departments of Defense and Energy are also exploring a “3+2 Vision,” where “vision” suggests early formulation of a future program. The idea is to reduce the number of types of warheads from seven to five, three types for missiles and two airborne bombs. At least one and, ideally, all of the three types of missile warheads could be used on both land-based and sea-based missiles so that, if one type suffers some type-wide failure, it would not leave an entire leg of the triad without a warhead.⁴⁴ Some of these changes would involve extensive redesign, perhaps, for example, combining a primary from one weapon and a secondary from another. Congress has repeatedly refused to fund any new nuclear warheads and the *NPR* pledges not to build one, but the administration argues that rearranging existing components

does not constitute a “new” warhead, mainly because it would not require testing and would not have a new military capability.⁴⁵

Current missile defense plans are to add 14 interceptors at Fort Greely, Alaska, bringing the total to 44 interceptors. The DoD is exploring the possibility of a third missile interceptor site somewhere in the north-eastern United States. Support for this third site is weak and its future is quite uncertain.⁴⁶

After more than two decades of retiring non-strategic nuclear weapons systems, the United States is introducing a new nuclear-capable fighter-bomber, the F-35 Lightning, the first non-strategic nuclear weapons platform system since the F-15E became operational in 1989.

Prospects for Future Deep Reductions

President Obama seems genuinely and personally interested in reducing the salience of nuclear weapons, but has been able to take only modest steps in that direction and has done little to fundamentally change the roles of nuclear weapons or change attitudes in a way that will survive his presidency. No other leading U.S. political figure who might become president is on record advocating so strongly against nuclear weapons. History suggests that some future Republican president might have the political capital and national security credibility to surprise us all with a bold proposal, but surprises are hard to predict. The public is not clamoring for the elimination of nuclear weapons. Those Americans who do support deeper reductions seem to have little sense of urgency and reductions are not, even for this group, a high political priority.

The U.S. still sees a potential nuclear counterforce role for nuclear weapons and this is the greatest barrier to further deep reductions

from the U.S. side. Perhaps counterforce is not the primary role; the primary role remains dissuading attack by threatening nuclear retaliation. But as long as a war-fighting role remains, then weapons will have to be kept at high alert levels, will have high counterforce capability — through a combination of fast flight, high accuracy, and high yield — and the number of U.S. weapons will be tied to the number of Russian nuclear targets.

The U.S. does not seem to appreciate how threatening its nuclear arsenal appears from the Russian perspective. In particular, the U.S. does not see any disadvantage in keeping its counterforce capable weapons on constant high alert. SSBNs are one example. While the official position is that the nuclear triad will be preserved for the foreseeable future, many outside analysts have acknowledged that, with lower numbers, the U.S. will have to consider reducing the three nuclear delivery types to two or even one.⁴⁷ There is a growing consensus that submarines should form the backbone of any such nuclear force because they are considered the most survivable (at least while at sea).⁴⁸ What is almost entirely overlooked is how threatening U.S. SSBNs can appear to Russia. If submarines deploy off the Russian coast, then the potentially close-in launch points, the high accuracy of the D-5 missile, combined with a short time-of-flight of a depressed trajectory,⁴⁹ the ability to alter launch position to exploit gaps in the Russian early warning system, and the high yield of the D-5’s warhead, make SSBNs the ideal surprise first strike counterforce or decapitation weapons. Suggestions have been made to take nuclear weapons off alert, but taking SLBMs off alert in a *visible* way, while possible, would be difficult for the Navy to accept and execute.

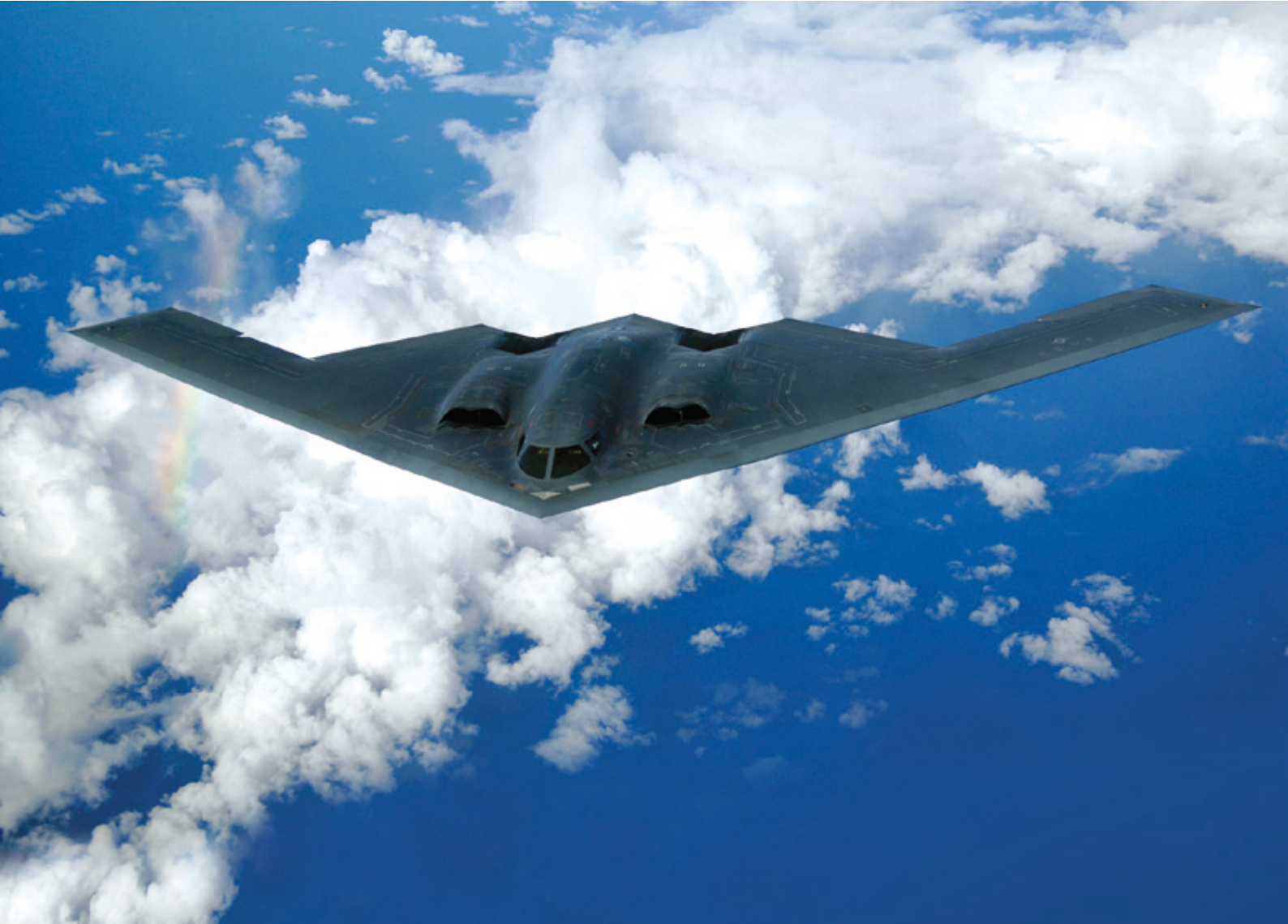
If Russia wants nothing more than an assured retaliatory force, it must keep a far larger force knowing that the majority of its weapons could be destroyed on the ground by an American attack. (And Russia also seems, unfortunately, to see other missions for its nuclear forces.)

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The way forward toward deep reductions requires the U.S. and Russia to coordinate in eliminating the vulnerability of their forces. Reducing vulnerability is a problem with two sides that must be coordinated: offensive capability must be reduced and, at the same time, both sides must make their forces harder to attack. The goal should be to make counterforce attack against a smaller set of nuclear targets impossible and then eliminate any remaining vulnerable weapons — essentially, giving up the ability to destroy weapons in exchange for negotiating them away.

Russia and the U.S. will have different solutions to basing nuclear weapons. The U.S. has the option of putting missiles on submarines that Russia cannot find and destroy. There are some reports that the latest Russian submarines are far quieter than their noisy Cold War models,⁵⁰ but, even if true, Russia cannot afford to put its entire missile fleet on submarines. Despite such asymmetries, the U.S. and Russia could work together creatively on new basing modes. For example, Russia seems to like land-mobile missiles, but these are survivable only if dispersed from garrison



The B-2A Spirit strategic bomber, also known as the Stealth Bomber, can carry up to 16 (1,100kg) B83 nuclear bombs. Copyright: U.S. Air Force photo/Staff Sgt. Bennie J. Davis III.

and that requires warning time. U.S. land-based missiles could be stored in deep tunnels, immune to attack. Deep basing options have been rejected in the past precisely because they made rapid launch impossible, but that is an asset if the U.S. wants to convince Russia it is incapable of a rapid first strike against, for example, Russian mobile land-based missiles. Russian monitors, human or robotic, could continually confirm that U.S. missiles were not being readied for launch.

Other options are possible, for example, restricting long-range nuclear delivery to slow-

flying air-breathing vehicles, perhaps along with monitoring of the launch areas. These could be manned bombers or invulnerable intercontinental-range cruise missiles. Once prompt launch and strike is abandoned as a requirement, many possibilities open up. (If the U.S. wants to retain prompt launch against some smaller countries, such as North Korea, then a dozen weapons would suffice and be irrelevant to Russia.) With the counterforce mission technically impossible, further major reductions in force would come naturally. In general, the U.S. has to shed nuclear missions before it can shed more nuclear weapons.

¹ U.S. Department of Energy, *Fiscal Year 2014 Stockpile Stewardship and Management Plan Report to Congress*, June 2013, Chap 2 (NB Fig 2-8, pp 2-17). Available at <http://www.lasg.org/documents/SSMP-FY2014.pdf>

² JASON Program Office, Lifetime Extension Program (LEP) Executive Summary, The Mitre Corporation, 9 September 2009. Available at <http://www.fas.org/irp/agency/dod/jason/lep.pdf> (The body of the report remains classified and is not publicly available.)

³ "Nearly the entire missile has been refurbished, including the flight controls and propellant in all three stages, the guidance system and the Propulsion System Rocket Engine. 'We are checking and balancing everything, but they are basically new missiles except for the shell,' Mr. Michael Knipp, ICBM Program Analyst, said. 'Over the last decade we've done more than \$7 billion worth of upgrades to 450 missiles.'" (Carla Pompe, "Life Extension Programs send missiles into the future," Air Force Global Strike Command, 24 October 2012. Available at <http://www.afgsc.af.mil/news/story.asp?id=123323606>)

⁴ Kevin P. Chilton, Chairman, Strategic Forces Command, testimony before the Senate Armed Services Committee, Strategic Forces Subcommittee, 12 March 2008. Available at http://www.stratcom.mil/speeches/2008/12/Senate_Armed_Services_Committee_Strategic_Forces_Subcommittee_Testimony/

⁵ Madelyn Credon and Andrew Weber, *Joint Statement for the Record on Fiscal Year 2013 National Defense Authorization Budget Request for Department of Defense Nuclear Forces Program*, to the U.S. Senate Committee on Armed Forces, Strategic Forces Subcom-

mittee, 28 March 2012, p 12. Available at <http://www.armed-services.senate.gov/statemnt/2012/03%20March/Creedon-Weber%2003-28-12.pdf>

⁶ Ronald O'Rourke, *Navy Ohio Replacement (SSBN(X)) Ballistic Missile Submarine Program: Background and Issues for Congress*, Congressional Research Service, 26 July 2013, pp 2-3. Available at <http://www.fas.org/sgp/crs/weapons/R41129.pdf>

⁷ Amy Woolf, U.S. Strategic Nuclear Forces: Background, Developments, and Issues, Congressional Research Service, 14 June 2013, pp 11-12. Available at <http://www.fas.org/sgp/crs/nuke/RL33640.pdf>

⁸ "Some ability to 'upload' non-deployed nuclear weapons on existing delivery vehicles should be retained as a hedge against technical or geopolitical surprise." *NPR*, DoD, April 2010, p 25. Available at <http://www.defense.gov/npr/docs/2010%20nuclear%20posture%20review%20report.pdf>

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- 25 Available at <http://www.cfr.org/elections/barack-obamas-foreign-policy-speech/p14356>
- 26 *NPR*, p 5.
- 27 "The most immediate and extreme threat today is nuclear terrorism." *NPR*, p iv.
- 28 "By reducing the role and numbers of U.S. nuclear weapons—and thereby demonstrating that we are meeting our NPT Article VI obligation to make progress toward nuclear disarmament—we can put ourselves in a much stronger position to persuade our NPT partners to join with us in adopting the measures needed to reinvigorate the non-proliferation regime and secure nuclear materials worldwide against theft or seizure by terrorist groups." *NPR*, p 7.
- 29 *NPR*, p 4.
- 30 Polling data shows a divided public. (Note that the majority of polling on nuclear weapons questions are conducted by advocacy organizations and their results should be viewed skeptically.) Some examples of recent independent polls include CNN, (Available at <http://politicalticker.blogs.cnn.com/2010/04/12/cnn-poll-public-divided-on-eliminating-all-nuclear-weapons/>), Gallup (Available at <http://www.gallup.com/poll/161198/favor-russian-nuclear-arms-reductions.aspx>), and Rasmussen (Available at http://www.rasmussenreports.com/public_content/politics/general_politics/june_2013/27_favor_cutting_size_of_u_s_nuclear_arsenal).
- 31 "But the lack of transparency surrounding its [China's] programs—their pace and scope as well as the strategy and doctrine guiding them—raises questions about China's future strategic intentions." *NPR*, p v.
- 31 See *Nuclear Employment Strategy*, p 4.
- 32 See *Nuclear Employment Strategy*, p 3.
- 34 The Congressional Commission on the Strategic Posture of the United States was clearer, stating: "One additional design factor requires discussion here: given that deterrence is uncertain and may prove unreliable, the United States must also design its strategic forces with the objective of being able to limit damage from an attacker if a war begins. Such damage-limitation capabilities are important because of the possibility of accidental or unauthorized launches by a state or attacks by terrorists. Damage limitation is achieved not only by active defenses, including missile defense, but also by the ability to attack forces that might yet be launched against the United States or its allies." William J. Perry et al., *America's Strategic Posture, The Final Report of the Congressional Commission*

on the *Strategic Posture of the United States*, (United States Institute for Peace: 2009), p 23. NB: This report does not represent official doctrine of the government. It is the result of a high level commission of highly respected military thinkers appointed by the Congress to make recommendations on future nuclear doctrine and was meant to inform the NPR.

35 Keir Lieber and Daryl Press, "The Rise of U.S. Nuclear Primacy," *Foreign Affairs*, March/April 2006, Vol 85, (No 2), pp 42-54.

Available at http://www.dartmouth.edu/~dpress/docs/Press_Rise_US_Nuclear_Primary_FA.pdf. Keir Lieber and Daryl Press, "The End of MAD? The Nuclear Dimensions of U.S. Primacy," *International Security*, Spring 2006, Vol 30, (No 4), pp 8-44. Keir Lieber and Daryl Press, "The Nukes We Need," *Foreign Affairs*, November/December 2009, Vol 88, (No 6), pp 39-51.

36 William Brougham, "Sea, Air, Space Symposium," 9 April 2013. Slides available at <http://www.navsea.navy.mil/Media/SAS2013/4.%20Ohio%20class.pdf>

37 Ronald O'Rourke, Navy Ohio Replacement (SSBN(X)) Ballistic Missile Submarine Program: Background and Issues for Congress, Congressional Research Service, 26 July 2013, pp 6-8. Available at <http://www.fas.org/sgp/crs/weapons/R41129.pdf>

38 "Because the Pacific Ocean is larger, we operate two additional SSBNs in the Pacific to accommodate range and survivability considerations. Six SSBNs in the Pacific and four in the Atlantic is the bare minimum required to provide uninterrupted alert coverage for the combatant commander", in Breckenridge, "SSBN Force Level Requirements".

39 Dave Majumdar, "U.S. Air Force May Buy 175 Bombers," *Defense News*, 23 January 2011. Available at <http://www.defensenews.com/article/20110123/DEFFEAT04/101230303/U-S-Air-Force-May-Buy-175-Bombers>

40 See SEC. 211. NEXT-GENERATION LONG-RANGE STRIKE BOMBER AIRCRAFT NUCLEAR CERTIFICATION REQUIREMENT, in H.R. 4310 (112th): National Defense Authorization Act for Fiscal Year 2013. Available at <http://www.govtrack.us/congress/bills/112/hr4310/text>

41 Elaine M. Grossman, "U.S. Air Force Eyes Mobile Options for Future ICBM," *Global Security Newswire*, 10 February 2012. Available at <http://www.nti.org/gsn/article/us-air-force-eyes-mobile-options-for-future-icbm/>

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43 See DOE *Stockpile Stewardship Report*, particularly Chap 2, Fig 2-8, pp 2-17.

44 *Ibid*, pp 1-2.

45 "NNSA will not develop new nuclear warheads or provide new military capability, except to improve safety, security, and reliability." *Ibid*, pp 1-5.

46 Paul McLeary, "Site for Potential East Coast Missile Defense Plan Selected," *Defense News*, 12 September 2013. Available at <http://www.defensenews.com/article/20130912/DEFREG02/309120013/Sites-Potential-East-Coast-Missile-Defense-Plan-Selected>

47 While the triad is justified as complicating Russian first strike planning or as increasing reliability, in fact, competition between the Air Force and the Navy initially drove the parallel development of land-based and sea-based missiles and justification for the triad was, in large part, a *post hoc* rationalization. These bureaucratic rivalries, now quiescent, may revive if one or another leg of the triad faces elimination. See Rita Clark, Vincent Giroux and Todd White, *History of the United States Strategic Command*, Command Historian's Office, United States Strategic Command, Offutt Air Force Base, Nebraska, 15 January 2004, pp 5-10. Available at <http://www.stratcom.mil/files/History.pdf>

48 Many proposals have been made but one is particularly important because amongst the authors is the current Secretary of Defense. See James Cartwright, et al., *Global Zero U.S. Nuclear Policy Commission Report Modernizing U.S. Nuclear Strategy, Force Structure and Posture*, Global Zero, May 2012. Available at http://www.globalzero.org/files/gz_us_nuclear_policy_commission_report.pdf

49 In March of 2005, a D-5 missile launched from the SSBN Tennessee was tested on a depressed trajectory with a guided reentry vehicle, providing both very short flight time and very high accuracy. See, Hans Kristensen, *Global Strike: A Chronology of the Pentagon's Offensive Strike Plan*, Federation of American Scientists, 15 March 2006. Available at <http://www.nukestrat.com/pubs/GlobalStrikeReport.pdf>

50 "Silent sub: Russian noiseless Borei class nuclear submarine immersed", RT, 30 December 2012. Available at <http://rt.com/news/russian-noiseless-borei-submarine-106/>

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About Deep Cuts

The Deep Cuts project is a research and consultancy project, jointly conducted by the Institute for Peace Research and Security Policy at the University of Hamburg, the Arms Control Association, and the Institute of World Economy and International Relations of the Russian Academy of Sciences. The Deep Cuts Commission is seeking to devise concepts on how to overcome current challenges to deep nuclear reductions. Through means of realistic

analyses and specific recommendations, the Commission strives to translate the already existing political commitments to further nuclear reductions into concrete and feasible action. Deep Cuts Working Papers do not necessarily reflect the opinion of individual Commissioners or Deep Cuts project partners.

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