NONSTRATEGIC NUCLEAR WEAPONS AT AN INFLECTION POINT

National Security Perspective

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Summary

The Trump administration inherited a world far different from the one envisioned in President Obama's 2009 Prague address and faces a hierarchy of national security threats far different from those underpinning the subsequent 2010 Nuclear Posture Review (NPR). Any new nuclear guidance is more likely to be framed by the emergence over the past decade of a more bellicose Russia than it is by threat of nuclear-capable terrorists. Notwithstanding the possibility that the new administration might enjoy a more amicable relationship with Russia in the short term, deep ideological and geopolitical differences between Russia and the West still pose an enduring structural threat for the foreseeable future.

Revising nuclear guidance involves a host of interrelated critical issues for which decisions will need to be made, and for which implementing a path forward is fraught with dangers and uncertainties. Our focus is on the European theater, motivated by concern over the threat posed by the combination of Russia's post–Cold War nonstrategic nuclear weapons developments and "escalate-to-deescalate" nuclear doctrine, which stand in stark contrast with the United States' neglect of its own nonstrategic nuclear weapon capabilities and stagnant NATO nuclear doctrine over that same time period.

We begin our paper with a review of the mind-set of the architects of the 2010 NPR, who asserted that "Russia and the United States are no longer adversaries" and that "the most immediate and extreme threat today is nuclear terrorism." We also identify warning signs that might have given its framers pause. The most glaring of such warning signs were, in retrospect, clear: Russia's oft-strident opposition to NATO enlargement and oft-expressed displeasure with the post–Cold War international order led by the United States.

We then examine events of an even more troubling nature from 2010 to the present and discuss the prospects for, and military utility of, Russia's continuing modernization of its nonstrategic nuclear weapons. In particular, its annexation of Crimea and its aggression in eastern Ukraine, accompanied by nuclear saber rattling directed at NATO states and an aggressive first-use nuclear doctrine, all point to Russia as a serious nuclear threat. The enabler of these troublesome events is Russia's comprehensive modernization program for its nonstrategic nuclear weapons, in violation of the spirit and perhaps the letter of its own Presidential Nuclear Initiatives of 1991–1992. We anticipate this modernization will continue with even lower-yield, more accurate, and higher fusion-fraction nuclear weapon systems with potential military applications in neutralizing NATO ground forces and air defenses and defeating underground facilities.

Our analysis continues by posing key questions and discussing choices that will confront the Trump administration as it formulates updated nuclear policy guidance. Are nonstrategic nuclear weapons still essential to European security? We argue that they are indeed essential to maintain allied confidence in the US commitment to European defense and thus to NATO cohesion. Do the US–Russian asymmetries—in warhead quantities, modern delivery systems, and nuclear doctrine—matter? We also answer these questions in the affirmative. These asymmetries enable Russia to seriously contemplate first nuclear use with the expectation that NATO will capitulate to Russian demands rather than retaliate in kind. To the extent that Russia's assessment of NATO's response is correct, the future efficacy of deterrence would be seriously—perhaps fatally—undermined. On the other hand, an incorrect Russian assessment poses the risk of unexpected and uncontrolled nuclear escalation. Neither possibility bodes well for a favorable conflict resolution.

Based on our analysis of these questions, we then identify options that NATO might consider for a path forward. Nuclear force structure options discussed range from doing nothing other than deploying the B61-12 per current plans to developing and deploying new nuclear weapons and alternative delivery systems. We also consider options of signaling readiness and resolve, enhancing conventional capabilities, increasing the number of nuclear weapons in Europe, relying on US strategic forces, and drawing support from allied nuclear forces.

Finally, we think more broadly about approaches we might consider to mitigate Russian–NATO tensions. We assess as problematic the option of withdrawing all nonstrategic nuclear weapons from Europe. The approaches we view as somewhat promising are stopping NATO's eastward expansion and laying the foundation for more comprehensive and flexible arms control initiatives.

In closing, we offer recommendations for the near and farther term. In the near term, we should unambiguously and repeatedly convey NATO's unity and resolve in the face of any Russian aggression and the extremely high risk to Russia of a NATO nuclear response to even the smallest nuclear attack. In the longer term, we recommend restoring US capability to design and deploy new nuclear warheads mated to more effective means of delivery. In particular, a submarine-launched cruise missile would provide a survivable nonstrategic nuclear weapon capability with high probability of penetration and ability to threaten Russian territory, all without violating the Intermediate Nuclear Forces Treaty.

There are no quick fixes to rectifying the imbalances in nonstrategic nuclear weapons in Europe that have been neglected since the end of the Cold War or to resolving US–Russian divergent worldviews. However, application of the deterrence principles that served us well during the Cold War can also help see us through this challenge. Thus, we conclude that revised nuclear policy regarding Europe should be based on the following assessments:

- Russia's escalate-to-deescalate doctrine requires a countervailing NATO strategy.
- Any effective NATO countervailing strategy demands a credible nuclear retaliatory capability.
- A credible nuclear retaliatory capability must be able to access proportionate rungs on the escalatory ladder for all plausible nuclear scenarios.

Neglect is an increasingly risky option.

The architects of the 2010 Nuclear Posture Review (NPR),[1] seeking to promulgate guidance implicit in the vision of a nuclear-free planet articulated in President Obama's 2009 Prague speech,[2] developed a document that radically reordered national security priorities. In the former president's words, "we must ensure that terrorists never acquire a nuclear weapon. This is the most immediate and extreme threat to global security." The NPR's complementary guidance echoed this perception of a changed international security environment and a reordering of threat priorities in which "the most immediate and extreme threat today is nuclear terrorism" by al-Qaeda and other terrorist groups, rather than from our traditional nuclear adversaries.[3] Thus, it asserted "the nature of the U.S.–Russia strategic and political relationship has changed fundamentally since the days of the Cold War . . . and the prospects for military confrontation have declined dramatically in recent decades."[4]

Irreconcilable ideologies, perspectives on the international order, and national goals represent an enduring structural threat for which a path forward will need to be clearly defined.

Since the presidential address in Prague, the international political and military environment has changed significantly. In particular, Russia's military aggressions against Ukraine, accompanied by its nuclear saber rattling, have markedly altered Western perceptions of the nature of security threats confronting the NATO alliance today. We examine implications of the current and evolving threat landscape for nuclear policy decisions the Trump administration will likely face. Rather than a comprehensive consideration of the roles of nuclear weapons in safeguarding national security, we expand on recent work[5] and focus more narrowly on understanding the roles (if any, some might argue) of US nonstrategic nuclear weapons in Europe.

The roles of nonstrategic nuclear weapons derive from our perception of the threat. After two decades of minimizing the post–Cold War Russian threat to NATO, we are now facing a revanchist Russia with ambitions to restore its "rightful place" as a global power and regional hegemon with reconstituted, modern nuclear capabilities and doctrine to further those ambitions. Our premise in writing this paper is that differences with Russia cannot be papered over, at least for long. While the new administration may pursue a path for an improved relationship with Russia—and may even succeed in the short term—irreconcilable ideologies, perspectives on the international order, and national goals, as well as the ever-present potential for continued geopolitical conflict, represent an enduring structural threat for which a path forward will need to be clearly defined.

We begin by considering what the world looked like to the framers of the 2010 NPR and identifying warning signs of a more troubling nature that went largely unheeded. We then examine further unsettling developments since 2010 that should not go unheeded in the next NPR. Looking toward the future, we identify plausible technical advances in Russian nuclear systems and their potential military utility. With this context established, we identify three key questions facing the Trump administration and assess alternative nuclear strategies that might be pursued to address the current imbalance in nonstrategic nuclear weapons. Our final sections consider options to improve the Russia–NATO

[1] Department of Defense, *Nuclear Posture Review Report* (Washington, DC: US Department of Defense, 2010).

[2] Barack Obama, "Remarks By President Barack Obama in Prague as Delivered," transcript and video, White House Office of the Press Secretary, April 5, 2009, https://obamawhitehouse.archives.gov/video/The-President-in-Prague#transcript.

[3] Department of Defense, *Nuclear Posture Review Report*, 3.

[4] Ibid., 4.

[5] George W. Ullrich, James Scouras, and Michael J. Frankel, "Nonstrategic Nuclear Weapons: The Neglected Stepchild of Nuclear Arms Control," *Air and Space Power Journal* 31, no. 1 (2015): 9–14.

relationship and provide specific recommendations for the near and farther term for US nonstrategic nuclear weapon deployments in Europe.

US defense analysts at the end of the first post–Cold War decade might well have considered that the world would continue to evolve in a more broadly peaceful direction.

Our principal conclusion is that the next NPR must address the asymmetry in US–Russian nonstrategic nuclear arsenals. Neither NATO conventional superiority nor the US–Russia balance in strategic nuclear forces can be presumed to trump the imbalance in nonstrategic nuclear forces. Casting a blind eye to this reality is to tread an increasingly dangerous path.

Looking Backward

During the Cold War, the primary military role of the thousands of US nonstrategic nuclear weapons deployed in Europe was to defeat a Soviet conventional attack against NATO. As such, they were conceived of as first-strike battlefield weapons with lower yields and shorter ranges than US-based strategic weapons. Nonstrategic nuclear weapons also contributed to the strategic objectives of strengthening extended deterrence and NATO cohesion. They provided additional rungs in the ladder of escalation so that NATO would not need to rely solely on US willingness to commit strategic nuclear forces and thus risk retaliation on the US homeland. They thereby helped to allay allies' security concerns without the necessity of arming themselves with their own nuclear weapons or capitulating to Soviet hegemony.

From the collapse of the Soviet Union through the first two post–Cold War decades, the United States reigned supreme as the sole global superpower. The threat of Soviet attack evaporated, and the nonstrategic nuclear weapon arsenals of both countries declined precipitously, although not to the same levels. Former Warsaw Pact nations clamored to join NATO, which by 2010 had expanded to encompass much of eastern Europe, including three former Soviet republics.

US defense analysts at the end of the first post–Cold War decade might well have considered that the world would continue to evolve in a more broadly peaceful direction. But there were also harbingers of a less optimistic future that were unfortunately disregarded.

Presidents George H. W. Bush and Mikhail Gorbachev met December 2–3, 1989, in Malta a few weeks after the fall of the Berlin Wall. While no agreements were signed during this summit, it has been viewed as the formal end of the Cold War and thus the beginning of the post–Cold War era. The hopeful expectations for this new era are reflected in President Gorbachev's statement at the post-summit joint news conference: "the world leaves one epoch of cold war, and enters another epoch. This is just the beginning. We are just at the very beginning of our road, long road to a long-lasting, peaceful period. . . . And thus, many things that were characteristic of the cold war should be abandoned, also the stake on force, the arms race, mistrust, psychological and ideological struggle, and all that. All that should be things of the past."[6]

Figure 1. George H. W. Bush and Mikhail Gorbachev at the Malta Summit

[6] AP, "The Malta Summit; Transcript of the Bush–Gorbachev News Conference in Malta," *New York Times*, December 4, 1989, http://www.nytimes.com/1989/12/04/world/the-malta-summit-transcript-of-the-bush-gorbachev-news-conference-in-malta.html?pagewanted=all.

The Mind-Set at the Drafting of the 2010 Nuclear Posture Review

To its architects, the 2010 NPR was the culmination of a series of highly positive developments whose origins may be loosely associated with the appointment of Mikhail Gorbachev as secretary general of the Communist Party of the Soviet Union in 1985. In 1987, after years of difficult negotiation, the Intermediate Nuclear Forces (INF) Treaty was signed,[7] eliminating the entire class of intermediate-range land-based missiles that threatened all of the European theater.[8]

In 1991, following closely on the heels of the INF implementation, the Presidential Nuclear Initiatives resulted in reciprocal commitments by the United States and the Soviet Union.[9] The United States pledged to (1) withdraw all ground-launched short-range weapons deployed overseas and destroy them and (2) cease deployment of tactical nuclear weapons on surface ships, attack submarines, and land-based naval aircraft during "normal circumstances."[10] The Soviet commitments,[11] later reaffirmed and expanded by the successor Russian state,[12] included (1) the elimination of all nuclear artillery munitions, nuclear warheads for tactical missiles, and nuclear mines and (2) removal of all tactical nuclear weapons from surface ships and multipurpose submarines.

The architects of the 2010 NPR could be satisfied that the arc of history was bending in a direction fully consonant with the priorities and goals expressed in President Obama's Prague address.

US and Russian attention subsequently focused on strategic arms control. The Strategic Arms Reduction Treaty (START),[13] which furthered the continuing

[7] Treaty between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (INF Treaty), signed December 8, 1987, http://www.state.gov/t/avc/trty/102360.htm.

[8] The treaty bans ground-launched ballistic and cruise missiles with ranges between 500 and 5,500 kilometers, including launch and support structures, production, and flight testing. Although Pershing Ia missiles owned by West Germany were not directly covered by the INF, they were also removed.

[9] George H. W. Bush, "Address to the Nation on Reducing United States and Soviet Nuclear Weapons," transcript, September 27, 1991, *The American Presidency Project*, http://www.presidency.ucsb.edu/ws/?pid=20035.

[10] The full list of US actions also included the elimination of US short-range, ground-launched nuclear weapons, including short-range ballistic missiles and artillery. Air-launched nonstrategic weapons would be withdrawn to the United States but not necessarily eliminated. Additionally, a number of intercontinental ballistic missile (ICBM) modernization efforts, including Midgetman, were abandoned and future modernization was limited to fixed-base single-warhead missiles. Strategic bombers and ICBMs scheduled for treaty deactivation would be de-alerted and scheduled eliminations would be accelerated. Further cuts in new weapons production were announced in the president's 1992 State of the Union address to Congress.

[11] The Soviet response included the promise to eliminate nuclear artillery, nuclear mines, and warheads for tactical missiles and to withdraw warheads from surface ships, nonstrategic submarines, ground-based naval aircraft and antiaircraft missiles, placing most in central storage and destroying some. Additionally, 503 ICBMs and all strategic bombers would be de-alerted, and development of new short-range missiles for bombers, new mobile launchers for existing ICBMs, and new mobile ICBMs would be abandoned. New restrictions on patrols of railway mobile ICBMs, a one-year nuclear testing moratorium, and a pledge to eliminate an additional one thousand weapons beyond START requirements were also announced. In the name of the Russian state, Boris Yeltsin made a number of additional pledges related to ending production and further development of some classes of nonstrategic nuclear weapons.

[12] There is controversy over the degree of Russian compliance with these commitments. See, for example, William J. Perry and James R. Schlesinger, *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States*, authorized ed. (Washington, DC: United States Institute of Peace Press, 2009), 13, https://www.usip.org/strategic-posture-commission/view-the-report.

[13] Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Reduction and Limitation of Strategic Offensive Arms (START Treaty), signed July 31, 1991, https://www.state.gov/www/global/arms/starthtm/start/start1.html.

drawdown in the numbers of deployed strategic weapons, entered into force in 1994. The Strategic Offensive Reduction Treaty (SORT)—sometimes referred to as the Moscow Treaty—entered into force in 2003,[14] and the New START Treaty entered into force in 2011.[15]

But there were also other signals that might have given the 2010 NPR architects some pause.

This succession of treaties continued the process of strategic arms reduction, with present arsenals on track to achieve the New START limit of 1,550 deployed strategic weapons available to each side by 2018.[16] The architects of the 2010 NPR could contemplate this story with some contentment, satisfied that the arc of history was bending in a direction fully consonant with the priorities and goals expressed in President Obama's Prague address.

At the same time, the new NPR articulated a shift in security focus away from peer nuclear nation-states, faithfully mirroring an intense preoccupation with terrorism that had consumed the nation's leadership ever since the disturbingly successful attack and subsequent trauma of 9/11. This preoccupation with terrorism now explicitly encompassed a nuclear dimension.

Pre-2010 Undercurrents of a More Troubling Future

But there were also other signals that might have given the 2010 NPR architects some pause. In the prior decade, leading Russian political and military figures—including President Putin—made pronouncements to the effect that the INF Treaty no longer met Russia's needs. Thus, in Putin's Moscow speech of 2007, he noted, "We need other international participants to assume the same obligations which have been assumed by the Russian Federation and the US. If we are unable to attain such a goal . . . it will be difficult for us to keep within the framework of the treaty in a situation where other countries do develop such weapons systems, and among those are countries in our near vicinity."[17] In the same speech, he also cited the eastward expansion of NATO as a "provocation" and warned against installation of a missile defense shield in Eastern Europe, which, in any event, Russia could "neutralize" by its own weapons developments. In the same year, General Baluyevsky, chief of the Russian general staff, said, "It is possible for a party to abandon the treaty [unilaterally] if it provides convincing evidence that it is necessary to do so. We have such evidence at present."[18]

Moreover, a drumbeat of complaints in the West had alleged that Russia was not in compliance with the particulars of its pledges under the 1991 Presidential Nuclear Initiatives reciprocal commitments[19] to eliminate all nuclear artillery, nuclear mines, and short-range nuclear missiles; to remove all tactical

[14] The Treaty between the United States of America and the Russian Federation on Strategic Offensive Reductions (The Moscow Treaty), signed May 24, 2002, https://www.state.gov/t/isn/10527.htm.

[15] The Treaty between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START Treaty), signed April 8, 2010, http://www.state.gov/t/avc/newstart/index.htm.

[16] The New START Treaty's counting rules treat bombers as one deployed weapon, regardless of how many weapons are actually carried.

[17] Luke Harding, "We Will Dump Nuclear Treaty, Putin Warns," *The Guardian*, October 12, 2007, http://www.theguardian.com/world/2007/oct/13/russia.international.

[18] "Russia May Scrap INF Treaty: Top General," *United Press International*, February 15, 2007, http://www.upi.com/Business_News/Security-Industry/2007/02/15/Russia-may-scrap-INF-treaty-top-general/46071171561553/.

[19] Thus, for example, the State Department's International Security Advisory Board stated in 2012 that Russia was not in compliance with the Presidential Nuclear Initiatives.

weapons from surface ships and submarines;[20] and to eliminate half its surface-to-air missile warheads and its air-delivered weapons stockpile. It is difficult to substantiate claims of noncompliance since the present number of Russian nonstrategic weapons is unknown and estimates of Russian tactical arsenals before 1991 vary widely.[21] What is, however, undisputed is that Russia retains a wide variety of nonstrategic nuclear weapons systems spanning their air and missile defenses as well as their ground, air, and naval forces.

By the end of the 1990s, spurred by the realization that the United States and its allies had achieved conventional military superiority through modernized precision strike weapons, convincingly demonstrated in the 1999 Kosovo war, Russian military planners moved to develop counters to this asymmetric capability. Nuclear arms were viewed as the only affordable "equalizer" in potential future conflicts with NATO forces. In an ironic twist, Russia effectively adopted core aspects of the NATO Cold War doctrine of flexible response—a doctrine that, in an earlier time, had emphasized NATO battlefield options through development of a diverse arsenal of nonstrategic nuclear weapons, including an "enhanced radiation weapon" (also known as a neutron bomb).[22] These were intended to prevent defeat by superior Warsaw Pact conventional forces without resorting to use of strategic nuclear weapons. Compounding the irony, the logic of flexible response as a viable deterrent strategy had been summarily rebuffed by Soviet military strategists of that era.[23]

Russia soon adopted a new nuclear-use doctrine that became known as escalate-to-deescalate.

Russian doctrine had already officially abandoned a nuclear no-first-use posture in 1993.[24] By 2000 it had enshrined the notion of first use in the context of responding to aggression involving conventional weapons in situations critical for the national security of the Russian Federation and its allies.[25] Russian war games and exercises began employing nonstrategic nuclear weapons in NATO conflict scenarios. ZAPAD-1999, ZAPAD-2009, and VOSTOK-2010[26] are understood to have employed nonstrategic

[20] Some warheads were to be to be eliminated; others were to be maintained in central storage. See Susan J. Koch, *The Presidential Nuclear Initiatives of 1991–1992*, Center for the Study of Weapons of Mass Destruction Case Study Series no. 5 (Washington, DC: National Defense University Press, 2012), http://ndupress.ndu.edu/Portals/68/Documents/casestudies/CSWMD_CaseStudy-5.pdf.

[21] For example, Nuclear Threat Initiative estimates fifteen thousand to twenty-one thousand (see "Russia: Nuclear," NTI website, last updated April 2015, http://www.nti.org/learn/countries/russia/nuclear/).

[22] The US neutron bomb design hardly resulted in a clean weapon, as it still had a fission component. A well-intentioned early public relations campaign, describing the neutron bomb as a "clean" weapon capable of killing tank crews by radiation while minimizing blast damage in the surrounding environment, backfired badly. The public outcry against the neutron bomb both in the United States and Europe contributed to its cancellation.

[23] Dmitry (Dima) Adamsky, "Nuclear Incoherence: Deterrence Theory and Non-Strategic Nuclear Weapons in Russia," *Journal of Strategic Studies* 37, no. 1 (2014): 91–134.

[24] "The Basic Provisions of the Military Doctrine of the Russian Federation" (also known as Principal Guidance on the Military Doctrine of the Russian Federation, or PGMD), Presidential decree no. 1833-02 (November 1993).

[25] Nikolai Sokov, *Russia's Nuclear Doctrine* (Washington, DC: NTI, 2004), http://www.nti.org/analysis/articles/russias-nuclear-doctrine/.

[26] ZAPAD (West) and VOSTOK (East) are large military exercises simulating conflicts with potential adversaries in Russia's border regions. The ZAPAD-1999 exercise involved simulated nuclear attacks against various NATO military targets. ZAPAD-2009 was a joint Russian–Belarusian exercise engaging NATO forces in and about Belarus and the Baltic states. Following initial air and missile attacks with conventional warheads, Russia escalated to nuclear attacks against both military and civilian targets. VOSTOK-2010 was a Russian combined arms exercise staged in its easternmost provinces against a capable but unnamed adversary. It too involved the use of nuclear-capable units.

nuclear weapons in first-use scenarios in concert with conventional force employment.[27]

Little Green Men was the term applied to masked soldiers in green army uniforms without identifying military insignia, but armed with Russian equipment, who appeared initially during the Crimean hostilities and subsequently during the secessionist fighting in eastern Ukraine. The annexation of the Crimean peninsula punctuated an already deteriorating relationship between Russia and the West and is the primary impetus for rethinking the Russian threat to Europe and the overall US–Russian relationship.

Figure 2. Little Green Men in Perevalne, Crimea

As an expedient counter to the perceived superiority of Western conventional military capabilities, Russia soon adopted a new nuclear-use doctrine referred to in the West as escalate-to-deescalate, a somewhat counterintuitive concept whereby Russian forces achieve conflict resolution (i.e., deescalation) by initially escalating. Thus, by being the first to use nuclear weapons in a conflict, Russia expects to inflict sufficient pain, with the threat of even more to come, so that NATO would calculate an unfavorable cost–benefit outcome to continued war and would therefore seek to retire from the conflict, terminating hostilities on terms favorable to Russia. Any potential for unconstrained escalation seems to have been discounted in Russian thinking.

Complementing the evolution of Russian military thinking was a distinct change from political perspectives that prevailed in Russia in the immediate aftermath of the demise of the Soviet Union. In his 2005 State of the Nation speech, Putin characterized the breakup of the Soviet Union as "a major geopolitical disaster of the [twentieth] century."[28] He frequently voiced his displeasure over NATO expansion and the creeping economic footprint of the European Union.

Russia continues to deploy many more nuclear weapons in theater, with estimates of about ten times the number on the NATO side of the ledger.

In 2008, he demonstrated his intolerance for Georgia's pro-Western overtures, using military force to occupy and effectively annex the Georgian regions of Abkhazia and South Ossetia, under the pretext of protecting Russian ethnic minorities. It was becoming apparent that Putin would resist further NATO expansion into what he viewed as Russia's rightful sphere of influence.

Unsettling Developments since 2010

Since 2010, the portents have actually worsened, and the architects of the Trump administration's NPR are unlikely to be as sanguine about the state of US–Russian relations. In 2014 the Department of State accused the Russian government of violating the terms of the INF Treaty by testing a ground-launched cruise missile within the impermissible treaty range of 500

[27] Olga Oliker, *Russia's Nuclear Doctrine: What We Know, What We Don't, and What That Means* (Washington, DC: CSIS, May 2016), https://www.csis.org/analysis/russia%E2%80%99s-nuclear-doctrine. The author argues, however, that analysts are reading too much into such exercises in arguing Russia has lowered its doctrinal threshold for nuclear use.

[28] Vladimir Putin, "Annual Address to the Federal Assembly of the Russian Federation," April 25, 2005, transcript, http://en.kremlin.ru/events/president/transcripts/22931.

to 5,500 kilometers.[29] Although the Department of State provided few details, some observers identified the offending system as the R-500/Iskander-K ground-launched cruise missile, an identification the State Department denied.[30] Russia also denied this allegation and, in turn, accused the United States of violating the INF Treaty by testing the ground-based interceptor component of national missile defense and pursuing Aegis Ashore (on the theory that an easy technical modification could convert both systems to a ground-to-ground role).[31] Russia has also accused the United States of being in violation of the Nuclear Non-Proliferation Treaty by virtue of its deployment of nuclear weapons in Europe.[32] Additionally, the United States has accused Russia of violating its Presidential Nuclear Initiatives commitments. With understated diplomatic parlance, the Department of State International Security Advisory Board assesses that "Russia is not believed to have fulfilled all of their unilateral pledges."[33]

In stark contrast to the United States, which steadily reduced its nuclear footprint in Europe to an estimated total of a few hundred nonstrategic nuclear warheads,[34] Russia continues to deploy many more nuclear weapons in theater, with estimates of about ten times the number on the NATO side of the ledger. Whether or not this numerical disparity should be a matter of concern—analysts have argued both sides of the question—it is understandably a source of considerable unease among political and military elites in those frontline countries situated in Russia's "near abroad."[35]

Beyond treaty violations, unfulfilled pledges, and asymmetric nonstrategic nuclear weapon deployments, Putin has also undertaken bold military actions since 2010. Following a playbook not unlike that of his 2008 invasion of Georgia, Putin occupied and annexed Crimea in 2014 while at the same time fomenting rebellion in the Donbass region of Ukraine and igniting a still-ongoing civil war pitting Russian-backed separatist forces against the government. The speed and efficiency of the Russian

[29] "2015 Report on Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments" (Washington, DC: US Department of State, 2015), http://www.state.gov/t/avc/rls/rpt/2015/243224.htm.

[30] Identification of the noncompliant system as the Iskander was subsequently denied by Under Secretary of State Rose Gottemoeller in an address at the Brookings Institution (see *U.S. Nuclear Arms Control Policy: A Talk with Under Secretary of State Rose Gottemoeller* [Washington, DC: Brookings Institution, 2014], https://www.brookings.edu/wp-content/uploads/2014/12/20141217_nuclear_policy_gottemoeller_transcript.pdf). The *New York Times* recently reported that the treaty-violating ground-launched cruise missile, the SSC-X-8, has been deployed, with the *X* now removed from reports to reflect that the missile is operational and no longer experimental (see Michael R. Gordon, "Russia Deploys Missile, Violating Treaty and Challenging Trump," *New York Times*, February 14, 2017, https://www.nytimes.com/2017/02/14/world/europe/russia-cruise-missile-arms-control-treaty.html).

[31] Larry Luxner, "Top Pentagon Official Disputes Russian Claims That Aegis Ashore Violates INF Treaty," *Atlantic Council* (blog), June 26, 2015, http://www.atlanticcouncil.org/blogs/new-atlanticist/top-pentagon-official-disputes-russian-claims-that-aegis-ashore-violates-inf-treaty.

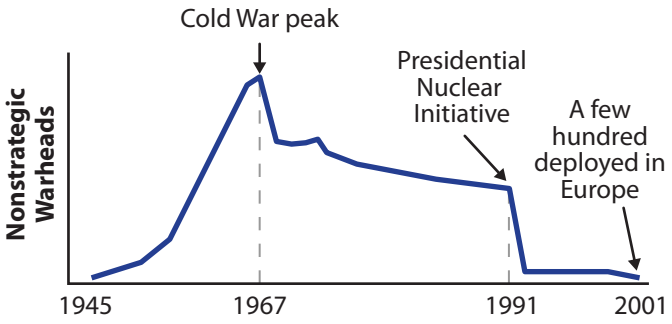
[32] "US Breaching NPT by Deploying Nuclear Arms in European Countries – Lavrov," *Sputnik News*, April 22, 2015, https://sputniknews.com/europe/201504221021239802/.

[33] International Security Advisory Board, *Report on Options for Implementing Additional Nuclear Force Reductions* (Washington, DC: US Department of State, November 27, 2012), http://www.state.gov/t/avc/isab/201191.htm.

[34] Amy F. Woolf, *Nonstrategic Nuclear Weapons* (Washington, DC: Congressional Research Service, March 2016).

[35] The near abroad roughly corresponds to the independent nations bordering Russia that used to be part of the Soviet Union. It is a translation of a Russian usage whose origins and alternative suggestions are described by William Safire's column "On Language" in the *New York Times* (May 22, 1994, http://www.nytimes.com/1994/05/22/magazine/on-language-the-near-abroad.html). Safire's preferred definition is "the claim by Russia of political interest and influence in states adjacent to it that were once part of the Soviet Union." The *Encyclopedia of Russian History* more simply and succinctly defines it as referring to the fourteen successor states, besides Russia, that were once part of the Soviet Union (*Encyclopedia of Russian History*, s.v. "Near Abroad," via *Encyclopedia.com*, http://www.encyclopedia.com/history/encyclopedias-almanacs-transcripts-and-maps/near-abroad).

military impressed many observers who noted the improved military performance since the lackluster engagement with Georgia only six years prior.[36]



The US nonstrategic nuclear stockpile peaked in 1967. Nonstrategic nuclear warhead quantities declined, first quickly, then more gradually, over the remainder of the Cold War and precipitously dropped after the Cold War as a result of the US Presidential Nuclear Initiative. Declassified data places the number of nonstrategic warheads stored in western Europe in 1965 in excess of five thousand. Today, a few hundred warheads remain deployed in Europe. By contrast, Russian nonstrategic nuclear warhead inventories remain uncertain, with estimates of about ten times that number.

Figure 3. US Nonstrategic Warheads over Time

There has also been a disturbing resurgence in Russian nuclear saber rattling in recent years. Notably, during the Russian incursion into Ukraine, President Putin proclaimed, "I want to remind you that Russia is one of the most powerful nuclear nations. This is a reality, not just words." Russia, he told listeners, is "strengthening our nuclear deterrence forces."[37] Former Ukrainian minister of defense Colonel General Valeriy Heletey stated, "The Russian side has threatened on several occasions across unofficial channels that, in the case of continued resistance they are ready to use a tactical nuclear weapon against us."[38]

A number of nuclear threats have also been issued in conjunction with NATO plans to deploy missile defenses; thus, the Russian ambassador to Denmark intoned, "I do not think that the Danes fully understand the consequences if Denmark joins the US-led missile defence shield. If that happens, Danish warships become targets for Russian nuclear missiles."[39] General Anatoly Nogovitsyn, then deputy chief of staff, stated, "Poland is making itself a target. This is 100 per cent certain. It becomes a target for attack."[40] And in 2008, General Nikolai Solovtsov, commander of Russian strategic missile forces, stated, "I cannot rule out that, in case the top military-political leadership makes such a decision, both the missile-defense facilities in Poland and the Czech Republic and other similar facilities in the future could be designated as targets for our ICBMs."[41]

Looking Forward

With the recent history of Russian belligerence, underwritten by the fruits of its sustained post–Cold War investment in nuclear capabilities, the growing divergence of US and Russian perspectives on the utility of nuclear weapons is particularly worrisome.

[36] Ariel Cohen and Robert E. Hamilton, *The Russian Military and the Georgia War: Lessons and Implications*, ERAP monograph (Carlisle, PA: US Army Strategic Studies Institute, 2011), http://www.strategicstudiesinstitute.army.mil/pdffiles/pub1069.pdf; and Gustav Gressel, "Russia's Quiet Military Revolution, and What It Means for Europe" (London: European Council on Foreign Relations, October 2015), http://www.ecfr.eu/page/-/Russias_Quiet_Military_Revolution.pdf.

[37] Greg Botelho and Laura Smith-Spark, "Putin: You Better Not Come after a Nuclear-Armed Russia," *CNN*, August 30, 2014, http://www.cnn.com/2014/08/29/world/europe/ukraine-crisis/.

[38] Damien Sharkov, "Russia Has Threatened Nuclear Attack, Says Ukraine Defence Minister," *Newsweek*, September 1, 2014, http://www.newsweek.com/russia-has-threatened-nuclear-attack-says-ukraine-defence-minister-267842.

[39] Adam Withnall, "Russia Threatens Denmark with Nuclear Weapons If It Tries to Join Nato Defence Shield," *Independent*, March 22, 2015, http://www.independent.co.uk/news/world/europe/russia-threatens-denmark-with-nuclear-weapons-if-it-tries-to-join-nato-defence-shield-10125529.html.

[40] Commenting on Poland's agreement to host US missile defenses, quoted in National Institute for Public Policy, *Russia's Nuclear Posture* (Fairfax, VA: National Institute Press, 2015).

[41] "Threat on Missile Site Repeated," *Moscow Times*, September 11, 2008, http://old.themoscowtimes.com/sitemap/free/2008/9/article/threat-on-missile-site-repeated/370828.html.

The NPR emphasizes that the remaining nonstrategic nuclear weapons "contribute to Alliance cohesion and provide reassurance to allies and partners who feel exposed to regional threats," conveying the impression that the United States considers nonstrategic nuclear weapons in Europe as serving mainly political purposes.

Russia seems poised to continue, as well as to exploit, its investment in modernization of nonstrategic nuclear forces for both political and, if necessary, warfighting applications.

By contrast, Russian strategists of the present era, contemplating Russia's technologically inferior conventional forces and perceived threats posed by NATO's encroachment on its western border, as well as political and sectarian instability on its southern borders and the potential for a more militant China, have executed a quite different calculus. Russia seems poised to continue, as well as to exploit, its investment in modernization of nonstrategic nuclear forces for both political and, if necessary, warfighting applications.

A Continuing Divergence in Modernization

Our projection into the near-term future (five to ten years) extrapolates trends evident since the end of the Cold War. Until the decision to end underground nuclear testing in 1992, the United States was at the forefront of exploring and extending the boundaries of nuclear weapon design. But soon thereafter, Congress proscribed all research pertaining to new advanced nuclear weapons concepts, directing instead that the US nuclear design community embark on a program of nuclear "stewardship," a term that connotes caretaking and stagnation rather than innovation and renewal.[42] Essentially, all nuclear research and development was abandoned except for those efforts required to support life extension programs.[43] The intent was to sustain a subset of the aging elements of the Cold War stockpile and to improve safety and security features but without changing their military characteristics. Thus, along with modernization of the nuclear production complex, the focus of US weapons efforts became refurbishment and replacement. New warhead designs were off-limits.

Given the optimistic mood of the country at the end of the Cold War and the congressional desire for a peace dividend, achieving even that level of support was a political accomplishment by a politically besieged nuclear weapons community. Most recently, new congressional legislation has reopened the door to the possibility of new weapon design research.[44] However, it is not yet clear whether this will lead to a revival of robust activity such as occurred during the Cold War.

Russia chose a different path. Recognizing that nuclear weapons were the only affordable means to offset the superior conventional weaponry of NATO, Russia continued to invest in a robust research and development program focused on low-yield nuclear weapons, some with tailored outputs including high fusion-fraction designs,[45] and fielding of modernized

[42] Spratt-Furse amendment to the NDAA; see Jonathan Medalia, *Nuclear Weapon Initiatives: Low-Yield R&D, Advanced Concepts, Earth Penetrators, Test Readiness*, report no. RL32130, 2004 update (Washington, DC: Congressional Research Service, March 8, 2004).

[43] The Stockpile Stewardship and Management Program also embarked on a series of detailed experiments, including underground subcritical nuclear tests to develop a more basic understanding of the physics underpinning nuclear weapon design.

[44] National Defense Authorization Act for Fiscal Year 2016, H.R. 1735, § 3112, Stockpile Responsiveness Program.

[45] Interest in high fusion-fraction designs was spurred in the United States by the Peaceful Nuclear Explosions (PNE) program of the 1950s and in the Soviet Union by its equivalent, which envisioned nuclear excavation of canals or harbors.

air, sea, and land platforms that provide an array of standoff and accurate delivery options.[46] Presently, these modernization efforts, which have already resulted in the fielding of numerous nuclear-capable systems, continue apace.[47] More advanced systems may also be anticipated further down the road.[48]

Russia has made significant investments in the design of high-precision, low-yield nuclear warheads whose effects may discriminately exploit target-unique vulnerabilities.

At the same time, Russian nuclear deterrence policy began to take on a more utilitarian tone, recasting such weapons as usable instruments for deterring, fighting, and terminating large-scale conventional conflicts, effectively adopting a strategy similar in a number of respects to NATO's flexible response strategy during the Cold War.[49] The evolution of this doctrine in the future poses an interesting analytic conundrum: after conventional Russian warfare capability is renewed, will mimicking of historical US doctrinal evolution continue, so that, after a Russian flexible response epoch, reliance on tactical nuclear weapons in the battlefield will decline as it did in the West? Or are circumstances of geographical proximity, demographic trends, dangerous neighbors, and national zeitgeist sufficiently different that nonstrategic nuclear weapons may be expected to remain a pillar of Russian defense strategy for the indefinite future?

The Potential Military Utility of New Russian Nuclear Designs

From a Russian perspective, one might readily envision situations where nuclear use affords an asymmetric advantage in a regional conflict against conventionally superior NATO forces—provided that unintended or self-inflicted collateral consequences can to some extent be mitigated through increased accuracy, reduced yield, and special warhead design features. To this end, Russia has made significant investments in the design of high-precision, low-yield nuclear warheads whose effects may discriminately exploit target-unique vulnerabilities. In particular, evidence has accumulated that Russia has been pursuing the development of low-yield nuclear weapons of a design whose energy output is predominately from the fusion of hydrogen isotopes rather than the fission of uranium or plutonium.[50]

Pure fusion, without the use of any fission trigger, remains the gold standard for a "usable" nuclear weapon in the sense that such a weapon would be fallout free.[51] Additionally, the resulting blast environment would be reduced, whereas the prompt

Workable pure fusion designs proved to be well beyond the state of the art. The United States ultimately deemed the residual radioactive contamination from these devices unsuitable for such applications, but not before twenty-six tests were conducted. The United States abandoned all related device design work and terminated its involvement in the PNE program in 1977. Not so for the Soviet Union, which did not terminate its program until 1989, after conducting 122 PNE tests and another 32 tests for device design and validation. See Milo D. Nordyke, "The Soviet Program for Peaceful Uses of Nuclear Explosions," *Science & Global Security* 7, no. 1 (1998): 1–117.

[46] These developments include, for example, the Iskander-M short-range ballistic missile, nuclear versions of the Kalibr sea-launched missile, a new class of attack submarine, nuclear-capable air defense systems, and others. See Hans M. Kristensen and Robert S. Norris, "Russian Nuclear Forces, 2016," *Bulletin of the Atomic Scientists* 72, no. 3 (2016): 125–134.

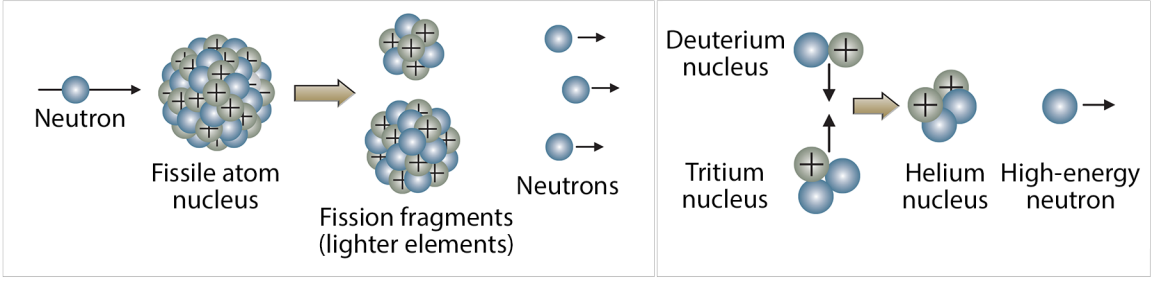
[47] Ibid.

[48] "Russia Reportedly Tests Nuclear-Capable Hypersonic Glider Warhead," *RT*, October 26, 2016, https://www.rt.com/news/364148-russia-tests-hypersonic-glider/.

[49] J. Michael Legge, *Theater Nuclear Weapons and the NATO Strategy of Flexible Response*, report no. R-2964-FF (Santa Monica, CA: RAND Corporation, March 1983), http://www.rand.org/pubs/reports/R2964.html.

[50] E. N. Avrorin, V. A. Simonenko, and L. I. Shibarshov, "Physics Research during Nuclear Explosions," *Physics Uzpekhi* 49, no. 4 (2006): 432–437.

[51] Most fusion reactions produce high-energy neutrons that can activate various elements found in the immediate environment.



All nuclear weapons are based on the fundamental physical processes of fission and/or fusion. Fission weapons require a critical mass to ignite an explosion. Energy is released when heavy nuclei break up into lighter elements and several neutrons are released, sustaining the chain reaction. By contrast, a fusion reaction releases energy by combining two lighter nuclei to form a single heavier nucleus, as in the case of isotopes of hydrogen fusing to create helium and a free neutron. A fusion reaction has no critical mass and will release more energy per unit mass than fission, but it requires extremely high temperatures and pressures to ignite.

Figure 4. Nuclear Physics 101

radiation footprint would be increased—a particularly effective combination if such weapons are to be used against enemy ground forces on friendly territory.

The usability and military utility of advanced weapon designs may provide greater contemporary value than the MAD-flavored weapons of the Cold War arsenals.

However, pure fusion, at yields sufficient for warfighting applications, would be extremely difficult to achieve,[52] and while it is highly unlikely that Russia has perfected such a device, there is evidence that the Russian nuclear design community is working toward such a goal and may have already fielded hybrid designs with high fusion-fractions.[53]

Contemporary Russian delivery systems are thought to be sufficiently accurate that most aboveground targets can be held at risk with very low nuclear weapon yields, ranging from tens to hundreds of tons. High fusion-fraction designs would provide additional advantages in maximizing target-specific lethal effects while minimizing undesired collateral consequences, as in the following engagements:

(1) ***Neutralizing NATO ground forces:*** In this example, Russian forces execute a disarming nuclear strike against forward-deployed NATO ground forces and associated command and control elements in concert with a military incursion into the Baltics. A hypothetical pure fusion device effectively doubles the range-to-effect for prompt lethal radiation, but with reduced undesired blast effects compared to fission weapons of the same yield. A strike using such weapons would have devastating consequences for both ground troops and electronic equipment, which for tactical systems is mostly unhardened to ionizing radiation. The diminished blast damage and fallout of high

Aneutronic fusion is possible using ^{3}He as the fuel, but it is even more difficult to trigger.

[52] Tremendously high pressures and temperatures are needed to overcome the repulsive force of two positively charged lighter nuclei to bring them in sufficient proximity to fuse them into a single heavier nucleus. Unlike fission, the conditions for nuclear fusion are virtually impossible to achieve with high explosives. Indeed, traditional thermonuclear weapon designs employ fission triggers to ignite fusion reactions.

[53] Russian leadership has laid claim to having developed weapons "of a new generation" based on "new physical principles [that] . . . can be used on a local or regional level . . . with no widespread effects" (unpublished notes from a meeting of representatives from Russian Nuclear Laboratories and a US delegation led by the Defense Special Weapons Agency, in Vienna, Austria, February 1997).

fusion output weapons also facilitates their use near and on Russian territory.

(2) ***Missile defense:*** The use of a low-yield, high fusion-fraction nuclear weapon for intercepting an incoming missile obviates the need for a highly complex and costly conventional hit-to-kill system. Achieving such accuracies for an interceptor armed with any nuclear warhead is almost trivial compared to a kinetic hit to kill, but employment of pure fusion or high fusion-fraction weapons provides additional lethality enhancements. A hypothetical one-kiloton pure fusion weapon could defeat such targets through multiple mechanisms within a distance of several hundred meters depending on the level of hardening. Additionally, intercepting an incoming missile with a pure fusion weapon would mitigate radar blackout because ionization of the air is considerably reduced. This means that if the target is a reentry or hypersonic flight vehicle capable of maneuvering and the first intercept attempt fails, it can still be continuously tracked with ground radar for subsequent intercept attempts.

(3) ***Defeat of underground facilities:*** Underground facilities have served as time-honored means to elude marauding armies, safeguard assets most valued, and in modern times, position command and control and other critical warfighting assets out of reach of conventional weaponry. Tunnel facilities situated deep under mountainous terrain pose targeting challenges that stress even high-yield strategic nuclear weapons. To maximize the ground shock needed to damage deep underground structures, a fission device must be detonated as close to the ground surface as possible and preferably below the surface, thereby converting more of its predominant x-ray output into ground shock. By contrast, the energy output of a fusion device is mostly in the form of high-energy neutrons, which couple much more deeply into the ground than x-rays, mimicking the mechanical penetration needed by a fission device to achieve enhanced coupling efficiencies. Thus, fusion weapons, in the absence of an available nuclear penetrator, effectively serve as virtual earth penetrators capable of holding underground facilities at risk with lower yields and far less and more localized fallout compared to their fission alternatives.[54]

These applications and others suggest that the usability and military utility of advanced weapon designs may provide greater contemporary value than the MAD-flavored weapons of the Cold War arsenals.

Key Nuclear Posture Considerations

The world today is one in which the threat of nuclear use seems substantially greater than it was at the time of the last NPR, and the scope of issues that will need to inform the next NPR is broad. Particularly urgent in the context of threats to deterrence are prospects of regional-scale instabilities accompanied by a threat of nuclear weapon use, a prospect not considered with the imminent urgency such a threat merits today. Thus, the policies emerging from the next NPR will be dependent to a large extent on consideration of the series of questions posed in the paragraphs that follow. We limit our discussion to only those questions directly impacting the future of

[54] Extensive research on energy coupling has shown that a fission weapon detonated a few meters below ground can enhance effective ground shock coupling by as much as a factor of fifteen to twenty-five compared to a weapon detonated at the surface. This understanding motivated the B61 Mod 11, which has some earth-penetration capabilities, and a subsequent program for the development of the more capable Robust Nuclear Earth Penetrator (RNEP), which lost political support and was canceled in 2005. However, a significant problem with both surface burst and below-surface detonations of the fission variety is that they produce significant radioactive fallout with the potential of creating extensive civilian casualties. By contrast, a hypothetical pure fusion energy release at the surface effectively couples at least five times as much to the ground as a comparable yield fission weapon, while producing only minimal fallout from neutron activation.

nonstrategic nuclear weapons in Europe, a critically important but analytically neglected subset of the broader issue of the role of nuclear weapons in US national security strategy.

Are Nonstrategic Nuclear Weapons Still Essential to European Security?

It has been over seventy years since nuclear weapons were employed for the first and only time in war. With remembrance of the horrific lethal effects of these weapons seared into the world's consciousness, and the passage of time with no further use, many perceive a taboo against their use and therefore argue that their presence in Europe no longer serves a useful military purpose. But the world is a very dangerous place, and it is fair to question whether such a social construct as taboo really plays a significant role in restraining the use of nuclear weapons, or indeed exists at all. Many would argue that it is rather a well-founded fear of the possible consequences of use (i.e., classic deterrence) that is solely responsible for limiting their use to date. Certainly in a world inhabited by nuclear-armed states such as North Korea or would-be and perhaps will-be states such as Iran and potentially others, driven by cultural histories and ideologies quite foreign to Western social and philosophical milieus, one must question the conjectured efficacy of taboos as a nuclear preventative. And even in a Eurasian power such as Russia, which shares in large parts of the European cultural patrimony, the enduring power of a conjectured nuclear taboo is questionable.

Others believe that virtually all credible military contingencies in Europe can be met with smart conventional weapons—a trend that dates back to the heady days following the first Gulf War, when Paul Nitze first posed the question, "Is it time to junk our nukes?"[55] Because smart precision weapons are effective against virtually any conceivable target, he argued, they are a more credible deterrent than nuclear weapons.

More recently, General James Cartwright, the former commander of USSTRATCOM, expressed a similar opinion in a *New York Times* op-ed article coauthored by Bruce Blair, the cofounder of Global Zero.[56] Cartwright and Blair advocate several US denuclearization actions, among them a no-first-use declaratory policy and the removal of all nonstrategic nuclear weapons in Europe. They argue that "our conventional and cyber weaponry and our technological advantages constitute a global military juggernaut unmatched in history," adding that nuclear weapons should never be viewed as "tools of aggression."

Yet, for others, nonstrategic nuclear weapons in Europe serve to demonstrate, if only by their presence, US commitment to allied security. They provide reassurance, in complementary concert with US strategic forces, that the US commitment to extended deterrence and reliance on the US nuclear umbrella is justified, and even if threatened by a nuclear-armed foe, there is no need to develop an independent nuclear capability for protection. In this view, nonstrategic nuclear weapons provide an essential rung in the deterrence ladder, consistent with NATO's doctrine of flexible response.

Such expert perspectives for and against maintaining nonstrategic nuclear weapons in Europe may be largely lost on the public. Dominating the public's opposition to maintenance of nonstrategic nuclear weapons in Europe are concerns about their safety and

[55] Paul Nitze, "Is It Time to Junk Our Nukes? The New World Disorder Makes Them Obsolete," *Washington Post*, January 16, 1994, https://www.washingtonpost.com/archive/opinions/1994/01/16/is-it-time-to-junk-our-nukes-the-new-world-disorder-makes-them-obsolete/e3580886-a891-462f-98bc-b3deaf07fdbd/?utm_term=.58dc2f8796d7.

[56] James E. Cartwright and Bruce C. Blair, "End the First-Use Policy for Nuclear Weapons," *New York Times*, August 14, 2016, https://www.nytimes.com/2016/08/15/opinion/end-the-first-use-policy-for-nuclear-weapons.html. Global Zero is an international group dedicated to the elimination of nuclear weapons.

security in both peacetime and conflict, recoil from the consequences of fighting a nuclear war on allied soil, and general antinuclear political opposition.

The need to reassure allies and convince adversaries of the constancy of US commitments has rarely seemed more urgent.

Consideration of allied reassurance extends beyond NATO. Further withdrawal of nonstrategic nuclear weapons from Europe may undermine more general confidence in the nuclear umbrella and the United States' commitment to preventing nuclear proliferation outside the European theater. For example, in South Korea, a country with a reported history of clandestine pursuit of nuclear weapons,[57] the *Joong Ang Ilbo*, a major newspaper, citing other Korean politicians and calling North Korea's latest test "an existential threat to Seoul," asks "whether the country should arm itself with nuclear weapons and if the United States will ultimately protect it if Pyongyang were to threaten a nuclear attack."[58] Similarly, the Japanese defense minister and, according to the Japanese press, an aspiring future prime minister, has in the past broached the idea of Japan's acquisition of nuclear weapons, couching her present position as, "It would also depend on future situations, but at this moment [Japan] should not consider arming itself with nuclear weapons."[59]

[57] Peter Hayes and Chung-in Moon, "Park Chung Hee, the CIA & the Bomb," *Global Asia* 6, no. 3 (2011): 46–58.

[58] Steve Herman, "Rising Voices in S. Korea, Japan Advocate Nuclear Weapons," *Voice of America (VOA)*, February 15, 2013, http://www.voanews.com/a/rising-voices-in-south-korea-japan-advocate-nuclear-weapons/1604309.html.

[59] See Reiji Yoshida, "Japan's New Defense Chief Dodges Questions on Yasukuni, Reverses Position on Nuclear Weapons," *Japan Times*, August 4, 2016, http://www.japantimes.co.jp/news/2016/08/04/national/politics-diplomacy/japans-new-defense-chief-dodges-questions-on-yasukuni-reverses-position-on-nuclear-weapons/#.V9_xGU32aUm.

At present, in an era of heightened tensions, explicit nuclear threats, and naked military aggression in Europe and the Middle East, venturing further into the unknown by a radical shift in US nuclear policies would seem fraught with too many dangers of unforeseen consequences. The need to reassure allies and convince adversaries of the constancy of US commitments has rarely seemed more urgent. Failure to do so could potentially lead to anything from a rush to develop independent deterrents to a collapse of individual member nations' commitments to the alliance, a Finlandization of the Baltics, and even to Russian military adventurism leading to nuclear war or allied capitulation in the face of threatened or actual escalation.

Does the US–Russian Asymmetry in Nonstrategic Nuclear Weapons Matter?

US–Russian asymmetry in nonstrategic nuclear weapons pertains not just to disparity in quantities but also to modern delivery systems and nuclear doctrine. We address each of these dimensions.

Asymmetry in Warhead Quantities

While a rough parity exists between US and Russian strategic arsenals, this is not so for nonstrategic weapons. Authoritative sources place the number of US nonstrategic weapons deployed in Europe at a few hundred, with hundreds more in US homeland storage.[60] While the latter could in theory be "anti-repatriated" back to Europe if needed, it could not happen quickly, and any move to do so—presumably in the context of rising tensions—would likely dangerously exacerbate any crisis situation for which the weapons were being recalled. The actual numbers of Russian nonstrategic warheads in Europe remain uncertain, with the majority of those

[60] Woolf, *Nonstrategic Nuclear Weapons*.

estimates clustered at about an order of magnitude greater than deployed NATO systems.[61]

Some argue that such numbers provide an effective deterrent against NATO first use and underpin the credibility of Russian first use in a broad set of circumstances. By contrast, the relatively few weapons we have in theater, along with doubts about their access to the battlefield in the face of highly capable air defense systems, might render NATO's nonstrategic systems more of a target than a threat.

Asymmetry in the number and variety of available delivery platforms matters a great deal in that it underpins Russia's escalate-to-deescalate doctrine.

Others argue that lack of sufficient numbers of nonstrategic weapons for effective battlefield use by NATO can be compensated by the availability of US strategic systems. However, blurring the distinction between nonstrategic and strategic weapons delivered by strategic platforms is fraught with many dangers of misinterpretation.[62]

Using strategic systems in retaliation for Russian first use of nonstrategic nuclear weapons could be seen as an escalation that could, in turn, motivate Russia to respond in kind. Whether and how such a strategic nuclear exchange could be controlled short of Armageddon is anybody's guess.

Asymmetry in Modern Delivery Systems

While the US nuclear inventory once contained a variety of nonstrategic delivery systems, including ground-launched cruise missiles, cruise missiles on submarines and surface ships, and atomic demolition munitions, the only present delivery option for nonstrategic weapons is dual-capable aircraft (including the F-16, the F-15E, and the Tornado). With the exception of the planned dual-capable F-35, none of these aircraft are stealthy, and their continued access to the modern battlefield in the face of the mobile and highly capable modern Russian air defense systems is questionable at best.

Russia, by contrast, has continued its investment in modernization efforts, fielding highly capable delivery systems, including short-range ballistic missiles, cruise missiles, surface and subsurface naval platforms, artillery, and air platforms.[63]

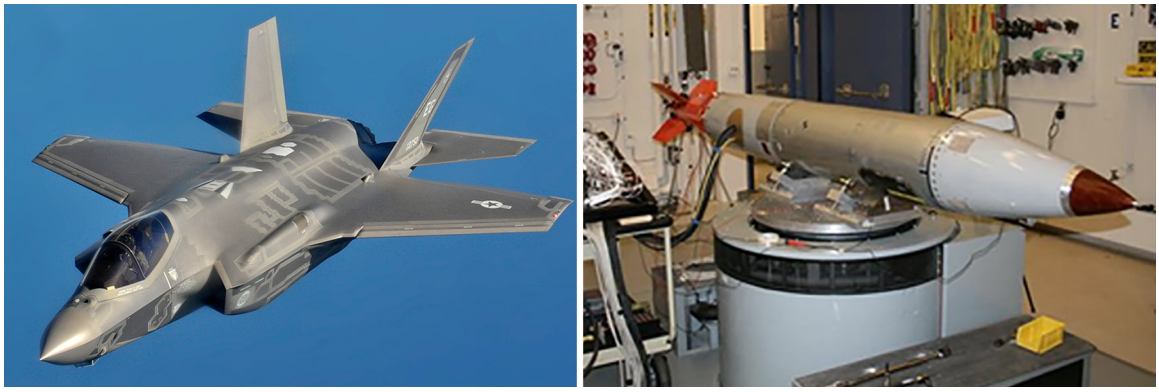
In short, Russia has a full range of delivery options that, if mated with highly accurate very low-yield warheads, would constitute a credible nuclear force for battlefield operations during an intense conventional war.

This asymmetry in the number and variety of available delivery platforms matters a great deal in that it underpins Russia's escalate-to-deescalate doctrine. It is the cornerstone of its ability to execute a nuclear operation at any level with assured access to the battlefield, and it lies at the root of its leaders' belief that they can control the escalatory ladder.

[61] Igor Sutyagin, in an occasional paper entitled *Atomic Accounting: A New Estimate of Russia's Non-Strategic Nuclear Forces* (London: Royal United Services Institute for Defence and Security Studies, November 2012), estimates numbers of operationally assigned warheads at 860 to 1,040. James N. Miller, principal deputy under secretary of defense for policy, estimated Russian nonstrategic weapons at 2,000 to 4,000 (*The Current Status and Future Direction for U.S. Nuclear Weapons Policy and Posture, Hearing Before the Subcommittee on Strategic Forces of the Committee on Armed Services*, 112th Cong. 1, 2011, https://www.gpo.gov/fdsys/pkg/CHRG-112hhrg71527/html/CHRG-112hhrg71527.htm).

[62] Presently all nuclear weapons in the US stockpile are formally designated as either strategic or nonstrategic. Strategic weapons are any that are delivered by a component of the strategic triad: ICBMs, submarine-launched ballistic missiles, or US-based heavy bombers. All others are nonstrategic or tactical. The B61 gravity bomb is the only bomb with variants spanning both strategic (heavy bombers) and theater delivery systems (dual-capable aircraft).

[63] Kristensen and Norris, "Russian Nuclear Forces, 2016."



The B61-12 nuclear bomb has a tail kit guidance package for improved accuracy. It is intended to replace all existing unguided B61 variants for both strategic and nonstrategic roles. Presently, the nonstrategic versions of the B61 bomb in Europe are carried by dual-capable aircraft, the F-15E, the F-16, and the Tornado. The Mod 12 version is ultimately intended to be delivered by the dual-capable version of the F-35 and other NATO aircraft.

Figure 5. The B61 Mod 12 Nuclear Bomb and the F-35 Stealth Fighter Bomber

Asymmetry in Nuclear Doctrine

In doctrine published in 2003, Russia, which had previously abandoned adherence to its no-first-use nuclear posture, specifically contemplated first-use scenarios in conjunction with regional conventional wars. Indeed, it has threatened first use in numerous instances, ranging from Ukrainian scenarios to attacks on Danish warships. It advances such threats within the context of an intellectually coherent doctrine that envisions the availability of many use options on the rungs of an escalatory ladder. Lending concrete credibility to this so-called escalate-to-deescalate doctrine are precisely the fundamental asymmetries in numbers and modernized systems described above. So modernization of Russian systems goes hand in hand with a coherent use doctrine. In contrast, NATO simply does not have an integrated nuclear-conventional doctrine that we have been able to discern, nor does it have the variety of use options available to Russia as a result of its sustained modernization efforts. In short, it would seem that Russia has a much better developed idea of how it might use nonstrategic nuclear weapons than NATO does.

These asymmetries matter. Most obviously, they underwrite escalatory options available to Russia for which NATO has no proportionate response and must perforce seek perhaps less effective offsetting strategies. Less obviously, an adversary whose assessment places decisive significance on the existence of such asymmetries may be emboldened to embrace riskier behavior than otherwise, with the potential for gross miscalculation leading to unexpected and uncontrolled nuclear escalation.

What Options Might NATO Consider for a Path Forward?

We assess the following force structure and posture options, some of which might be pursued simultaneously. We have also considered diplomatic, economic, and cyber options but, in our judgment, they are not a substitute for a robust military posture. We emphasize that our focus is not on restoring the numerical nuclear balance but rather enhancing the credibility of deterrence.

Do nothing other than deploy the B61-12: The 2010 NPR directed a life extension program for the B61 bomb with delivery options for the B-2 strategic bomber and the F-35 fighter bomber. The Air Force selected a single version as a replacement for all legacy B61 bomb variants. The B61-12 features a new tail kit assembly that will significantly improve its accuracy and enable the weapon to achieve

Russia possesses a variety of delivery systems for nonstrategic nuclear weapon employment in Europe, including submarines; surface ships; aircraft; short-range ballistic missiles; and air-, ground-, and sea-launched cruise missile systems. Shown above, clockwise from the top left, are an export version of the 3M-54 Kalibr anti-ship missile launched by both submarines and surface ships, the Iskander-M ballistic missile, a P-270 Moskit cruise missile (air-launched cruise missile, ground-launched cruise missile, submarine-launched cruise missile, and surface ship variants), and a KH-55 air-launched cruise missile.

Figure 6. Russian Nuclear-Capable Theater Delivery Systems

the same military effectiveness as its predecessors but at a lower yield and with reduced collateral consequences.[64]

Critics of the B61 life extension program have argued not only that is it the costliest among its class but that its low yield makes it more likely to be used. The distinction between usability and propensity to use notwithstanding, usability remains an essential tenet of nuclear deterrence and an attribute that would appear to give the B61-12 a credibility edge over the present NATO nuclear arsenal.

Assuming it receives full funding, the B61-12 is slated to enter full-scale production in 2020. Presumably, there will be a one-for-one swap-out of the B61 variants currently based in NATO member states, although it remains to be seen whether those states will acquire the dual-capable version of the F-35 or pursue alternative delivery means. Some NATO states are considering modifications to current F-16 and Tornado dual-use aircraft, enabling them to carry the B61-12 but likely without the necessary interfaces to realize its full functionality. In any event, operational

[64] Yields of the B61 family of bombs are classified. The B61-12 will allow consolidation of the B61-3/4/7/10 variants, and its yield was chosen to "use the lowest yield variant" from today's stockpile. References to the "lower yield" or "low yield" of the B61-12 or similar formulations in this document should be understood in the sense of the NNSA Congressional testimony—that they are the lowest yield of the legacy B61 family of gravity bombs. See *Nuclear Weapons Modernization Programs: Military, Technical, and Political Requirements for the B61 Life Extension Program and Future Stockpile Strategy, Hearing Before the Subcommittee on Strategic Forces of the Committee on Armed Services*, 113th Cong. 1 (2013) (statement of Dr. Donald Cook, deputy administrator for defense programs), https://www.gpo.gov/fdsys/pkg/CHRG-113hhrg86075/html/CHRG-113hhrg86075.htm.

deployment of the B61-12 on the dual-capable F-35 will likely take a number of years beyond 2020.

We believe the B61-12, with lower yield and improved accuracy, enhances the credibility of the NATO nuclear deterrent and outweighs concerns about lowering the nuclear threshold. In particular, it provides the ability to execute a credible proportionate response to Russian first use. However, it does not address critical operational shortfalls such as survivability of storage sites, airfields, and air operation centers.

The adage "Train as you fight—fight as you train" is deeply ingrained in military lore, but nuclear use in a theater conflict has been relegated to an abhorrent measure of last resort that is rarely discussed, let alone practiced.

Signal readiness and resolve: We have argued that the overall deterrence value of the NATO nuclear arsenal has eroded in Russia's eyes since the end of the Cold War, considering the vast reduction in numbers and types of warheads, a twenty-five-year hiatus in new warhead designs and development, and the allure of advanced conventional precision strike alternatives for NATO. Notwithstanding the more desirable warfighting attributes of the B61-12, its eventual deployment will do little to change this perspective absent attendant training, military engagement exercises, credible use doctrine, and committed leadership.

The adage "Train as you fight—fight as you train" is deeply ingrained in military lore, but nuclear use in a theater conflict has been relegated to an abhorrent measure of last resort that is rarely discussed, let alone practiced. Indeed, we are not aware of any NATO-sponsored war game since the end of the Cold War that has sanctioned nuclear use in the course of a conventional conflict scenario. The underpinnings of nuclear deterrence, whether strategic or nonstrategic, are premised on having a viable nuclear arsenal as well as the will and resolve to use it.

The latter must be unambiguously signaled to an adversary through declaratory policy and underwritten by training, transparent military exercises, and force readiness. While this may still be insufficient to dissuade Russia from executing its nuclear deescalation strategy, it is a relatively cost-effective and risk-free step in the right direction.

Enhance conventional offensive and defensive capabilities: NATO's conventional superiority is widely presumed. But that is an overly generalized assessment. At the point of potential conflict in the Baltics, for example, Russia could likely bring overbearing force to the battle before NATO could marshal an effective resistance. It is worth recalling that Operation Desert Storm, which demonstrated the overwhelming superiority of US conventional arms, required more than five months to deploy troops and equipment in theater.

Recent war gaming simulations in the Baltics suggest that forward-deployed Russian troops could launch a conventional attack, perhaps under the guise of an exercise, and occupy a Baltic country within a matter of days.[65] NATO has taken some initial steps to address this deficiency by deploying a multinational battalion to each of the Baltic countries and Poland in a rotational cycle. This action is intended primarily to demonstrate NATO cohesion and resolve but is likely to provide only marginal military utility.[66] More recent war games suggest that a larger brigade-size military presence may be needed to provide a significant impediment to an invasion and to buy

[65] David A. Shlapak and Michael Johnson, *Reinforcing Deterrence on NATO's Eastern Flank: Wargaming the Defense of the Baltics* (Santa Monica, CA: RAND Corporation, 2016), http://www.rand.org/pubs/research_reports/RR1253.html.

[66] "NATO Defence Ministers Agree to Enhance Collective Defence and Deterrence," *NATO News*, June 14, 2016, www.nato.int/cps/en/natohq/news_132356.htm.

at least some time for reinforcement.[67] In any event, there is general acknowledgment that steps must be taken to bring NATO's conventional superiority to bear earlier in the military calculus of both sides.

We believe it is prudent to fortify and forward deploy conventional forces in NATO states facing the threat of a potential invasion. It would be expensive, but a lot less so than trying to dig out occupying troops after an invasion has already occurred. It will also require NATO cooperation and will risk adverse Russian responses, but these challenges could be met through adept diplomacy.

Increase the number of nuclear weapons in Europe: Another approach might be to anti-repatriate a few hundred nonstrategic weapons from US storage back to the European theater. However, once B61-12 deployment to the European theater starts, legacy bombs will be swapped out and slated for eventual decommissioning. Given the Air Force's commitment to the B61-12 as the sole remaining nuclear bomb in the inventory, extending the life of legacy B61 variants is neither fiscally nor operationally feasible. Similarly, procuring additional B61-12 warheads would likely not compare favorably against the many competing demands of the country's strategic modernization program. The option of splitting the planned number of B61-12s in favor of theater deployment might further stress an already depleted strategic arsenal. And, of course, this option does nothing to address basing and in-flight vulnerabilities. All told, we do not see a credible path toward leveling the playing field on the basis of numbers alone.

Redress the imbalance in nonstrategic nuclear weapons with strategic forces: Another possibility would be to address the asymmetry in nonstrategic forces by tasking strategic forces with tactical missions in a regional conflict. In particular, many of the needs for a standoff capability in theater could be met by application of existing air-launched cruise missiles carried by B-52 and B-2 airframes and eventually by a long-range standoff cruise missile, also to be carried by the future B-21.

While this would greatly enhance the survivability and battlefield access of a nuclear response option—especially by the stealthy long-range standoff cruise missile—it would also blur the distinction maintained between strategic and nonstrategic systems. While it might be argued that such boundaries have already been crossed with Russia's doctrinal incorporation of nuclear use in regional conflicts and its ability to deliver such weapons into theater by long-range bombers normally associated with its strategic deterrent, this option seems to us to raise more serious problems than it was meant to solve.

We believe the primary concern should be that any use of such a nuclear weapon by a US strategic system greatly increases the prospects for the conflict to spin out of control and into a full strategic conflict. Nonetheless, absent nonstrategic alternatives, air-launched strategic cruise missiles in a theater role might serve to enhance regional deterrence.

Bring to bear the nuclear forces of US allies: US NATO allies, the United Kingdom and France, possess independent nuclear deterrents that could, at least in theory, be brought to bear in an accounting of relative arsenal numbers and delivery options when considering nuclear force structure available in a Baltic regional scenario. France maintains an arsenal of less than three hundred warheads[68] in the form of the ASMP air-to-ground missiles delivered by Dassault Rafale F-3 long-range fighter aircraft as well as four submarines, each capable of carrying sixteen intermediate-range ballistic missiles. While the exact number of British weapons remains classified, in a parliamentary statement in 2010, Foreign Secretary William Hague stated that the United Kingdom possesses no more than 160 operationally available

[67] Unpublished results from Hegemon simulations, provided to the authors by The Potomac Foundation.

[68] "France to Reduce Nuclear Arsenal, Warns of Iran Danger," *Outlook*, March 21, 2008, http://www.outlookindia.com/newswire/story/france-to-reduce-nuclear-arsenal-warns-of-iran-danger/555856.

warheads.[69] At present, operational British nuclear weapons consist of Trident missiles deliverable by its four *Vanguard*-class submarines, each of which can carry sixteen missiles with multiple warheads and one of which is always on patrol. Some warheads may also support a "substrategic" role dedicated to possible theater-scale operations.

We do not believe that relying on British and French nuclear forces is a credible option to address the theater asymmetries previously described. Indeed, when push comes to shove, some might question the readiness of both nuclear and nonnuclear NATO states to participate in military engagement against a nuclear-armed and threatening adversary under any circumstance, particularly if one's own national soil has not been invaded. Additionally, given the primary role of these arsenals as independent national deterrents, the prospect of depleting such a deterrent—or losing it entirely—during participation in an Article V common defense obligation renders it doubtful that either country would willingly give up such capacity for independent action at such a moment of heightened danger.

Develop new nuclear weapon designs: The B61-12 has been designed to give NATO additional flexibility in terms of lower yield and reduced collateral effects. The question we address here is whether it would be advisable to develop advanced warheads that offer even lower-yield options or tailored effects. Such designs might better match Russian nuclear strike options and provide capabilities for proportionate responses. The opportunity for reviving a new weapon design and development activity is in consonance with recent legislation that encourages the nuclear community to "continually exercise all capabilities required to conceptualize, study, design, develop, engineer, certify, produce, and deploy nuclear weapons" and to adopt "a nuclear posture that is agile, flexible, and responsive to change."[70]

It has long been the position of our defense establishment that no new weapon would be fielded without testing.[71] However, the United States has tested numerous advanced designs that never made it into the stockpile. Whether any such previously tested design could be weaponized without further underground nuclear testing remains unclear.

Availability of a submarine-launched system might seem particularly useful since it would be highly survivable, could more easily penetrate air defenses, and would not require withdrawal from the INF Treaty.

While the United States has not yet ratified the Comprehensive Test Ban Treaty, it complies with all treaty provisions. Absent a definition of zero yield in the treaty language, the United States has chosen the restrictive interpretation of allowing only subcritical tests.[72] Russia, which has a history of taking more liberal interpretations of treaty language, may well have chosen to conduct tests at yields that escape remote detection but sufficient to support advanced weapon designs. In any event, compliance with a test ban is difficult to verify if the test is small and active concealment, masking, and energy decoupling measures are employed.

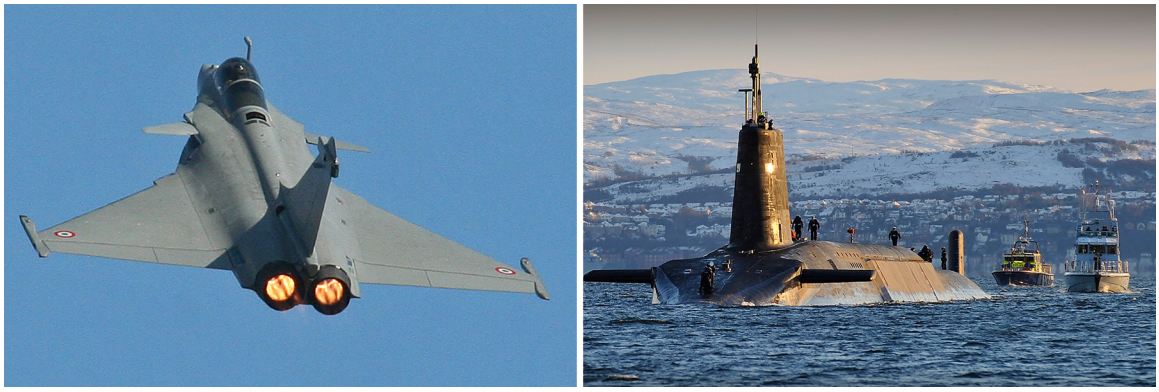
We advocate that serious consideration be given to the design and development of tailored output

[69] CBS/AP, "Britain Reveals Size of Nuclear Stockpile," May 26, 2010, *CBS News*, http://www.cbsnews.com/news/britain-reveals-size-of-nuclear-stockpile/.

[70] National Defense Authorization Act for Fiscal Year 2016, H.R. 1735, § Section 3112.

[71] The RNEP and Reliable Replacement Warhead (RRW), proposed but ultimately not approved by Congress, were claimed to be an exception because all the nuclear components of the device had been tested previously.

[72] Subcritical tests fall short of achieving a critical mass and hence produce no self-sustaining fissile chain reaction.



The French Dassault Rafale C multi-role fighter (left) is capable of carrying the nuclear ASMP-A, an air-to-surface, ramjet-powered, inertially guided supersonic standoff missile with a reported range of hundreds of kilometers. The United Kingdom's *Vanguard*-class submarines are capable of launching Trident II nuclear ballistic missiles. Shown here is HMS *Vanguard* (right) entering Faslane Bay, Scotland, where all four boats are based at Her Majesty's Naval Base Clyde.

Figure 7. Dassault Rafale C and HMS *Vanguard*

weapons with special effects not achievable with conventional weaponry. In particular, threatened use of special weapons capable of electromagnetic pulse or those that minimize radiation contamination of the environment might be assessed to be more politically credible, thereby enhancing deterrence. At the same time, with the development of the B61-12, we also believe the potential marginal advantages in flexibility of even lower-yield weapons are minimal and contrary to preserving a clear distinction between conventional and nuclear conflict.

Deploy alternative delivery systems: The Russians have many delivery options to engage NATO targets, while we rely exclusively on dual-capable aircraft, whose long-term prospects for penetration of increasingly capable and densely deployed Russian air defenses seem to us dubious at best. Russia's varied delivery options underpin a nuclear escalatory ladder consistent with its preplanned use doctrine, while we have essentially nothing. But development of systems that would allow us to access the battlefield would require rethinking our adherence to both unilateral policy decisions and the INF Treaty.

The highest-priority consideration should be given to those systems that provide significant new standoff capability. Of those systems, it seems to us that submarine-launched cruise missiles and air-launched platforms, neither of which would require withdrawal from the INF Treaty, rise to the top.

Availability of a submarine-launched system might seem particularly useful since it would be highly survivable, could more easily penetrate air defenses, and would not require withdrawal from the INF Treaty. Moreover, such a weapon would be our most politically feasible and militarily effective option for deployment to the Asian-Pacific theater should we decide to do so.

The advantages of survivability and basing lead us to prefer a submarine-based cruise missile system. But useful standoff capability might also be provided by an air-launched cruise missile (ALCM) that could be developed for external carry by dual-capable aircraft and/or by development of a ground-launched cruise missile (GLCM).[73] However, an ALCM would require fixed basing and would suffer from attendant

[73] Mathew Kroenig also considered NATO nuclear posture and concluded that a new air-launched cruise missile was the preferred option. Mathew Kroenig, T*oward a More Flexible NATO Nuclear Posture: Developing a Response to a Russian Nuclear De-Escalation Strike*, Issue Brief (Washington, DC: Atlantic Council, November 2016), http://www.atlanticcouncil.org/publications/issue-briefs/toward-a-more-flexible-nato-nuclear-posture.

base-escape vulnerability. A GLCM, which would also be highly vulnerable to preemptive attack, would predictably require diplomatic heavy lifting to obtain NATO siting acceptance. Nontrivially, it would also require US abandonment of the INF Treaty.[74]

Mitigating NATO–Russian Tensions

The options previously discussed would likely exacerbate tensions with Russia. We also consider a broader set of policies aimed at reducing tensions.

Withdraw nonstrategic nuclear weapons from Europe: A more ambitious but also more risky step would be to withdraw all remaining nonstrategic nuclear weapons from Europe. We have argued that our forward-based nuclear weapons, numbering only a few hundred gravity bombs, would not likely deter a Russian invasion of the Baltics. Here the difference in Russian nuclear doctrine vis-à-vis NATO is decisive. Russia has integrated use of battlefield nuclear weapons into planning and exercises for a regional war as part of its escalate-to-deescalate doctrine, and the prospect of Russia using these weapons seems credible. NATO does not appear to have a clear and compelling countervailing theater-nuclear-use doctrine. It might find itself in both a military and moral dilemma in identifying targets that it could not otherwise effectively engage with advanced conventional weaponry.

Another serious issue with US forward basing is security. While the security of forward-based nonstrategic nuclear weapons in NATO countries is generally considered to be rock-solid, the rise of indigenous terrorist cells and the potential for regional political instability pose new dangers whose security implications are not yet fully understood.

Exclusive reliance on NATO's superior conventional forces in response to Russian first nuclear use is fraught with perilous consequences.

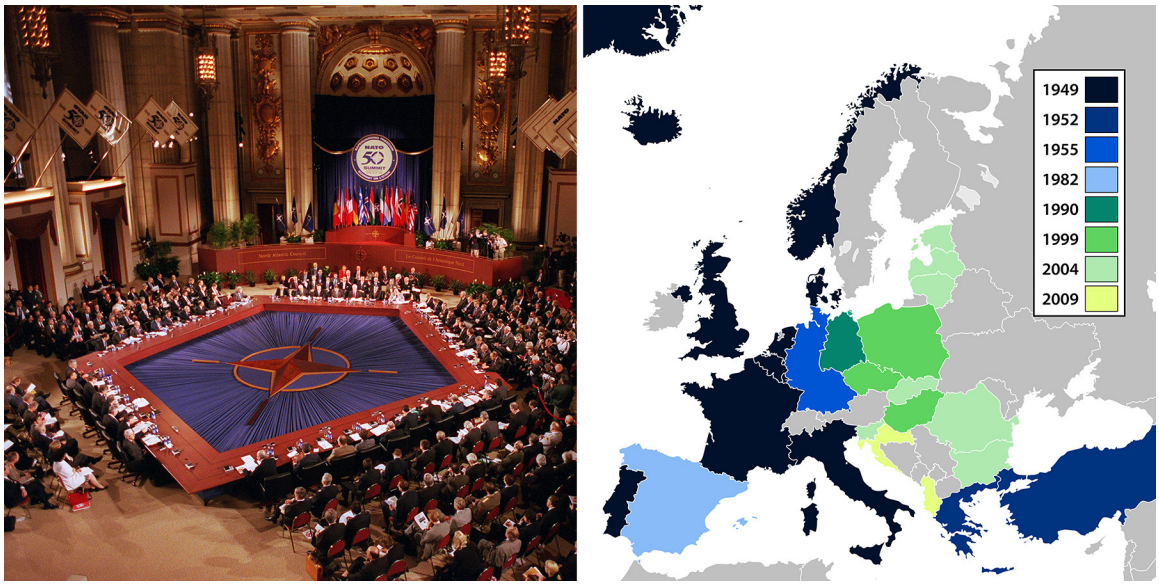
Finally, should we determine to respond in kind with our own B61 weapons, the highly capable Russian air defense systems make successful penetration by nonstealthy aircraft an uncertain prospect at best. In sum, the argument concludes, we may not have enough nuclear resources to make a warfighting difference, but we have enough to create problems that are entirely avoidable by their removal.

On the other hand, exclusive reliance on NATO's superior conventional forces in response to Russian first nuclear use is fraught with perilous consequences. It is unlikely to deter subsequent nuclear strikes and could set a precedent that violating the nuclear taboo will not incur a nuclear response.

The US Tomahawk land attack nuclear sea-launched cruise missile was deployed on surface ships, nuclear attack submarines, and converted ballistic missile submarines. All nuclear Tomahawks (TLAM-N) were withdrawn from deployment pursuant to the Presidential Nuclear Initiative of 1991. The 2010 NPR announced the TLAM-N retirement from the stockpile.

Figure 8. USS *Florida* Launching a Tomahawk Cruise Missile during an Exercise

[74] Senators Tom Cotton, Marco Rubio, and Ron Johnson, in response to reports that Russia has violated the INF Treaty with deployment of the SS-X-8, have introduced in the Senate the INF Preservation Act, which, inter alia, urges the United States to prepare for the development of their own GLCM systems. Parallel legislation was introduced in the House by congressmen Ted Poe and Mike Rogers.



NATO has grown from its twelve founding members (the United States and Canada plus ten shown in Europe) in 1949 to its present complement of twenty-eight nations. The 16th NATO Summit in Washington, DC, April 24–25, 1999, established an action plan for future accessions to NATO and was the first summit in which the recently joined new members Poland, the Czech Republic, and Hungary participated. Any NATO plans to further expand membership to former Soviet Socialist Republics that abut Russia (specifically, Georgia and Ukraine) are likely to encounter extreme Russian opposition.

Figure 9. NATO Enlargement

Whatever the merits of the arguments for or against withdrawal, now, amid an era of nuclear saber rattling and political bluster, is not the time to do so.

Stop NATO eastward expansion: NATO expansion into Russia's border states, some of which were former Soviet republics, and the ever-expanding reach of the European Union's economic footprint have been thorns in the side of President Putin and have motivated his increasingly aggressive tone and provocations against the West. The Russian leadership remains adamant that assurances were given back in 1990, albeit not formally documented, that NATO membership would remain closed to eastern European countries.

Mikhail Gorbachev, who personally participated in those negotiations, recalled during a 2009 interview that, in return for a Soviet concession on German unification, a promise was made not to expand NATO "as much as a thumb's width further to the East."[75] Yet, in 1999, Hungary, Poland, and the Czech Republic were granted membership in NATO, and seven more central and eastern European countries that included the Baltic states were inducted in 2004. During that same period, both Georgia and Ukraine sought to establish closer ties with NATO. While NATO's membership drives hardly justify Russia's recent aggression in Ukraine or its previous military adventurism in Georgia, there are those who find merit to Russia's accusation that the United States has reneged on its promise to contain NATO expansion.

The question that needs to be asked is whether the benefits of further NATO expansion outweigh the costs. The arguments for NATO expansion into

[75] Uwe Klussman, Matthias Schepp, and Klaus Wiegrefe, "Did the West Break Its Promise to Moscow," *Spiegel Online*, November 26, 2009, http://www.spiegel.de/international/world/nato-s-eastward-expansion-did-the-west-break-its-promise-to-moscow-a-663315.html.

central and eastern Europe are largely centered on the prospect of promoting peace and stability throughout (non-Russian) Europe and preventing, for example, such humanitarian crises as precipitated by the breakup of Yugoslavia. It is also thought to serve as a bulwark against a revanchist Russia intent on repatriating the now sovereign states in its western near abroad that were once part of the former Soviet Union.

As the minimum criteria for membership in NATO, each addition should strengthen the alliance and share its democratic principles. Arguably, some of the most recent entrants fall short, although they may offer advantageous territorial access. However, each new membership is burdened with the security commitments articulated in Article 5 of the governing treaty, stating that an attack on any one member is considered an attack on all. Given the increasingly fractious relationships among certain NATO member states and Russia's paranoia about NATO's further eastward expansion, the alliance risks getting entangled in messy regional disputes, not to mention a confrontation with Russia that could become nuclear. While we are not suggesting that any past NATO expansions should, or even could, be revisited, we believe that engaging in meaningful talks with Russia to clarify Western intentions could serve to normalize relations and dissuade Russia from taking military or other actions that are contrary to the interests of NATO and the United States.

Lay the foundation for more comprehensive and flexible arms control: In an ideal world, we would try to match our success in strategic arms control to redress the imbalance in nonstrategic nuclear weapons. However, the history of strategic arms control, as well as the INF Treaty, suggests that success requires leverage—that is, the ability and willingness to trade something of value to Russia. Such leverage is to be found neither in our current nonstrategic nuclear weapons posture nor in our plans for the F-35 aircraft and B61 Mod 12 bomb. In fact, there is no single lever likely to motivate Russia to reduce its nonstrategic nuclear weapons arsenal. However, a combination of inducements might succeed.

We offer three suggestions. First, we could bring British and French nuclear systems into the negotiations. Second, we could offer to consider missile defense limits. Third, among the considerations for evaluating the options discussed previously, we could include the options' ability to distress Russia to the point where it becomes motivated to participate in arms control negotiations. More generally, we should consider more imaginative approaches to arms control. In particular, we believe the "freedom to mix" concept, under which a limit would be set on all offensive (whether strategic or nonstrategic) nuclear weapons and missile defense systems, should be considered, and each state could configure its forces as it sees fit.

Conclusions and Recommendations

The revision of Russian nuclear-use doctrine detailed in this paper, especially its explicit abandonment of a no-first-use posture and the acquisition of new-generation nuclear weapons with tailored lethality options, suggests to us that any taboo that may exist, or to which Russia may have subscribed in the past, is no longer a reliable restraint. Since sometimes people do mean what they say, it would be imprudent in this instance not to credit Russian officials with sincerity, especially when threats are publicly proclaimed. Thus, it is our judgment that Russia's escalate-to-deescalate doctrine requires a countervailing NATO strategy.

We find that conventional options are inadequate for both deterrence and warfighting purposes. They are neither sufficiently timely in the event of a Russian conventional attack nor effective in the event of a nuclear attack. Moreover, the role of nonstrategic nuclear weapons in reassuring allies remains critical in light of the threats perceived by the European alliance today, and the potential for

any diminished role (e.g., through withdrawal from the European theater) signals weakness rather than resolve. Accordingly, it is our judgment that any effective NATO strategy demands a credible nuclear retaliatory capability.

A credible nuclear retaliatory capability, while necessary, may not be sufficient. Asymmetries in nuclear capabilities could support risky decision-making on the part of an overconfident adversary. In particular, even very limited nuclear first use may lead down a path of uncontrolled escalation rather than the deescalation counted on by a Russia convinced that nuclear engagements short of Armageddon can be controlled. We conclude that NATO must be able to access proportionate rungs on the escalatory ladder for all plausible nuclear scenarios.

To achieve this capability, we offer a number of specific recommendations for the near and farther terms. In the near term, we have no silver bullet to rectify asymmetries in arsenal size or composition. However, in concert with NATO, we can—and should—signal NATO's unity and resolve in the face of any Russian aggression, including nuclear strikes, and the extremely high risk that a NATO nuclear response to even the smallest nuclear attack would pose to Russia. Beyond declaratory policy, this will require a tangible commitment to training, exercises, and war games.

In the longer term, we recommend restoring US capability to design and deploy new nuclear warheads mated to more effective means of delivery. In particular, we need lower-yield warheads with discriminate lethality and more accurate and survivable delivery platforms. A submarine-launched cruise missile would provide a survivable nonstrategic nuclear weapon capability with high probability of penetration and ability to threaten Russian territory, all without violating the INF Treaty. At the very least, the prospect of such a system could provide much-needed negotiating leverage to constrain further Russian nonstrategic nuclear weapon deployments. As bad as the imbalance is now, it could get worse.

To reiterate our primary insight from this analysis: the starting point for our next nuclear guidance will be far different from that of the last one. President Putin has made it clear that reliance on Russia's modernized nonstrategic nuclear weapons arsenal, with its large numerical advantage over NATO and low-yield, high-accuracy, and other attractive warfighting characteristics, is central to its national security strategy. These weapons, along with Russia's post–Cold War nuclear doctrine, exercised in full-scale war games, and the ever-present potential for unanticipated surprise, presage a challenging future for the United States and NATO—one that cannot be ignored by the architects of the next NPR.

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