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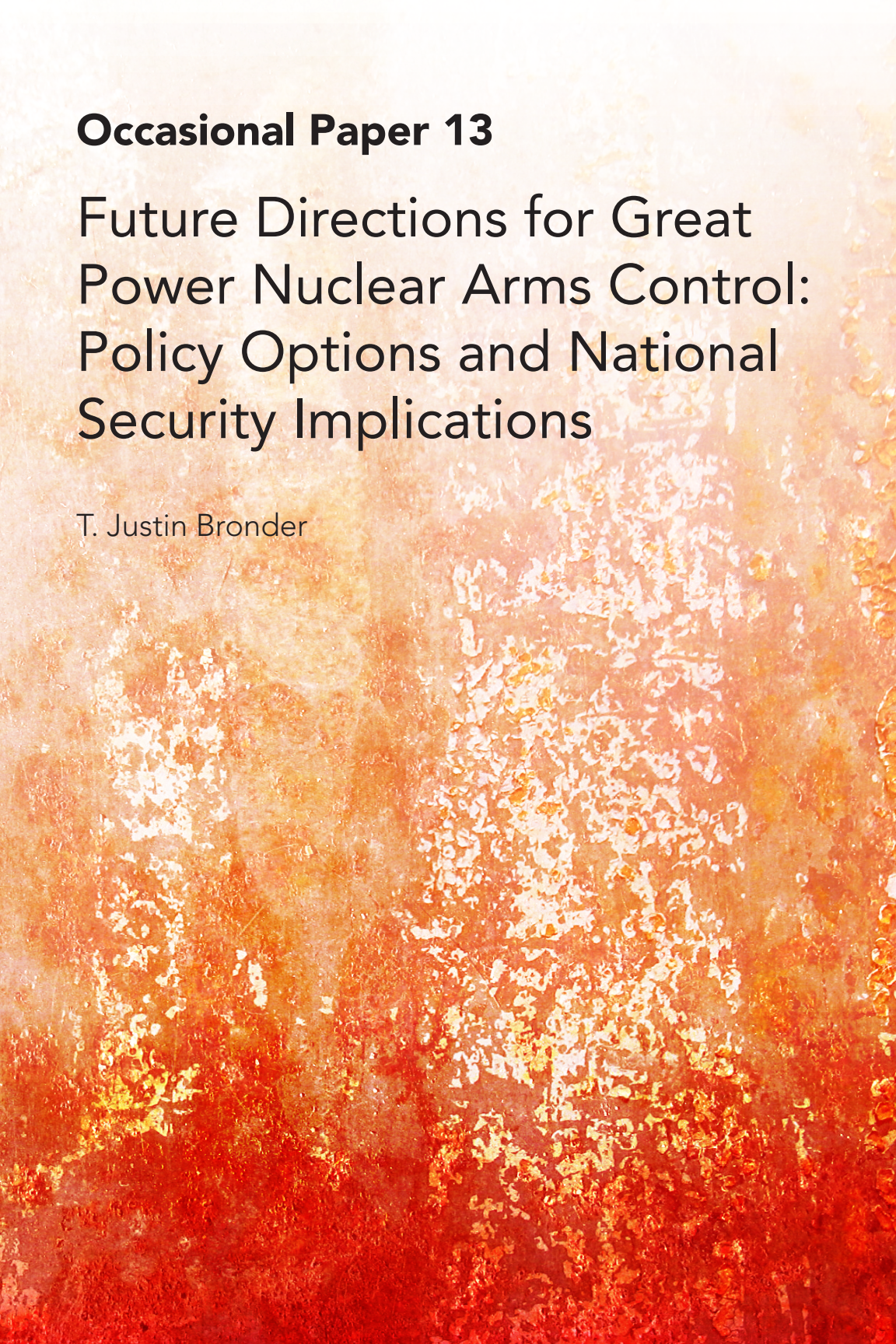
Future Directions for Great Power Nuclear Arms Control: Policy Options and National Security Implications

T. Justin Bronder



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Foreword

In 2015, the Center for the Study of Weapons of Mass Destruction (CSWMD) established a program with U.S. Strategic Command (USSTRATCOM) to sponsor National Defense University (NDU) student research in areas of interest to the command. The NDU-USSTRATCOM Scholars Program provides an opportunity for students across the University to conduct focused research on the most pressing strategic security questions facing the Department of Defense and the Nation. The topics addressed in these research projects—including cyber deterrence, space strategy, North Korea's nuclear challenge, deterring China, and the strategic implications of hypersonic weapons—attest to the many challenges our community faces as it works to understand and navigate an increasingly complex international security landscape. CSWMD is grateful to USSTRATCOM for its sponsorship and commitment to engaging with NDU students.

This occasional paper is the first formal NDU Press publication for CSWMD of student research performed under the NDU-USSTRATCOM Scholars program. Lieutenant Colonel T. Justin Bronder, USAF, provides a comprehensive assessment of alternative directions for nuclear arms control in an era of Great Power competition. He develops and applies a rigorous analytic framework to examine the relative merits of four distinct post–New Strategic Arms Reduction Treaty pathways for the United States. Using criteria that reflect the real-world considerations informing policy formulation in the nuclear domain, his findings speak to analysts and policymakers in a language they understand. The product of both deep research and incisive thinking, this paper will help those looking for approaches to reduce nuclear risks while sustaining deterrence and managing Great Power relations.

Defense leaders speak frequently about the importance of building intellectual capital, producing warrior-scholars, and leveraging our investment in professional military education to achieve advantage over competitors. This paper is an outstanding example of student scholarship that both deepens our understanding of a complex security challenge and provides actionable insights to policymakers.

It also represents the abiding CSWMD commitment to pragmatically integrate its education, research, and policy analysis missions to advance national security.

—Paul I. Bernstein
Distinguished Fellow
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Executive Summary

This study builds on the extensive collection of academic and advocacy publications regarding nuclear arms control to present a new paradigm analyzing potential costs, benefits, and risks associated with distinct approaches to arms control with the other Great Powers, Russia and China. These approaches include maintaining bilateral U.S.-Russian strategic arms limitations at similar levels to today, pursuing major long-term nuclear warhead reductions in a legally binding multilateral framework, creating a set of bilateral U.S.-Russian and U.S.-Chinese nonratified agreements covering nuclear and nonnuclear topics, and abandoning arms control to pursue U.S. nuclear superiority. Specific conditions for each potential arms control approach, grounded in the body of proposed options from current literature, provide details to scope each course of action.

Potential impacts from these four arms control approaches are evaluated across five criteria: strategic stability, extended deterrence, proliferation, cost, and competitive advantage. Differences among approaches are theoretically estimated to be positive, negative, or neutral from the U.S. perspective, using the 2021 status quo in each category as a baseline neutral rating. The four approaches are evaluated against these criteria for the decade following the recent New Strategic Arms Reduction Treaty (START) extension, from 2026 to 2036. This evaluation is further supported by projected strategic force structures for the three Great Power nations according to the conditions of each arms control framework. The impacts from the different resulting force structures are then reviewed quantitatively using simple models of U.S.-Russian strategic nuclear force exchanges.

The analysis extends the existing work in this area by projecting and then qualitatively comparing potential outcomes stemming from possible arms control agreements. The results highlight important considerations for policymakers and future researchers in this area. Four conclusions and associated recommendations include:

◆ Conclusion 1: Extending the current New START–like regime provides a feasible approach to maintain traditional strategic stability; however, such an

approach fails to address potentially destabilizing trends related to nonnuclear strategic technologies and China's modernizing forces.

◆ Recommendation 1: Elements of Approach 1 and Approach 3 as defined in this study can be combined for a more comprehensive framework addressing related concerns of stability, extended deterrence, proliferation, and competition. Military and political leaders should investigate the interplay of both traditional and new aspects of strategic stability to shape the priorities for expanded conditions in a post–New START regime that potentially encompasses multiple agreements.

◆ Conclusion 2: Analyzing the political feasibility of each approach revealed significant hurdles to each alternative. Comparing approaches indicates that there are potential alternatives to a traditionally ratified agreement in the form of political agreements coupled with sufficiently motivated mutual restraint.

◆ Recommendation 2: Given the major international and domestic obstacles to a new, fully ratified agreement, arms control discussions at all levels should include a review of measures that could be taken as backups or "offramps" from ratification that still secure as binding of an agreement as possible. An agreement, even nonratified, that addresses priority issues and helps motivate mutual restraint may prove to be an effective paradigm for major arms control breakthroughs in the future.

◆ Conclusion 3: An approach that seeks significant reductions in nuclear forces would entail serious risks in the contemporary security environment. Yet if the risks and tensions between major powers decrease, arms control could help catalyze a more benign geopolitical situation.

◆ Recommendation 3: Strategic leaders should look for indicators that the international geopolitical context is trending toward being more benign. If such indicators are present, leaders should be prepared to look for opportunities to leverage expanded multilateral arms control or disarmament options to help catalyze these trends in a way that advances the ability of the United States, its allies, and competitors to pursue common interests.

◆ Conclusion 4: Pursuing nuclear superiority without a supporting arms control framework leads to negative repercussions across evaluated criteria. Even if a force buildup is pursued as a negotiating tactic for an improved arms control agreement, the analysis completed in this study indicates the United States cannot achieve a clear advantage without significant nuclear and/or conventional weapon budget increases through 2036.

◆ Recommendation 4: An across-the-board arms race with Russia, even if leveraged as a negotiating tool, appears to have low likelihood of success in the next 15 years. This type of approach, if employed, should instead study and identify narrow areas of competition that could be leveraged for impact.

Introduction

Arms control in the nuclear age has proved a useful tool of national security, meeting ends as diverse as reducing the risks of nuclear war to channeling strategic competition.[1] Yet recent trends indicate arms control may be at an inflection point; the suitability of this tool in general and the viability of securing new agreements specifically are both unclear.[2] The unraveling of key U.S.-Russian agreements, an international security environment marked by Great Power competition (GPC), and the emergence of potentially destabilizing new technologies all underscore that the current arms control paradigm, which is essentially grounded in Cold War–era principles, is under duress. The recent New Strategic Arms Reduction Treaty (New START) extension somewhat reverses the trend that has witnessed the collapse of the foundational bilateral deals in the Anti-Ballistic Missile Treaty (ABM) and Intermediate-Range Nuclear Forces (INF) Treaty.

The pathway to a future ratified treaty, however, is uncertain due to continued mistrust between Washington and Moscow and the politically polarized domestic environment in the United States.[3] Russia's recent history of violating binding agreements, New START excluded, adds additional obstacles to continued bilateral coordination.[4] Looking beyond the two nuclear superpowers, uncertainty regarding China's nuclear modernization and expansion is also challenging how U.S. leaders consider both regional and strategic tability.[5] The continued development of nonnuclear strategic technologies such as precision strike or hypersonics and increased military competition in domains such as space and cyberspace add still further complications for long-held views on deterrence, stability, and arms control.[6]

In this dynamic geopolitical context, there is a wealth of academic, defense, and advocacy publications discussing new approaches for nuclear arms control.[7] These publications provide a wide range of detailed policy considerations on this critical subject, yet the broader implications of potential policy prescriptions are not thoroughly compared in any existing work. Important implications for interconnected elements of U.S. strategy—defense budgets, force postures, deterrence, and nonproliferation, to name a few—are often not fully explored. This study aims to close this gap by leveraging the extensive body of recent arms control proposals while

applying a well-defined analytical framework to enable a systematic and thorough comparison of potential arms control courses of action. This evaluation essentially takes a two-step approach: synthesizing proposed arms control approaches into four distinct options and then methodically comparing each approach against a set of qualitative criteria. This qualitative comparison is complimented by models estimating U.S.-Russian strategic nuclear force exchanges under the separate arms control regimes.

The resulting analysis clarifies the utility of each approach in achieving favorable geopolitical outcomes in the era of GPC. Implications for long-term U.S. security and nuclear policy are provided in the conclusion along with supporting recommendations for future research or policy discussions. The four proposed arms control policy approaches are:

- maintaining bilateral U.S.-Russian strategic arms limitations at similar levels as today
- pursuing major long-term nuclear weapon reductions in a legally binding multilateral framework
- determining a set of bilateral U.S.-Russian and U.S.-Chinese agreements based on purely political agreements covering a range of nuclear and nonnuclear topics
- abandoning arms control to pursue U.S. nuclear superiority.

Nuclear Arms Control: Historical Context

A review of nuclear arms control history helps ground an improved framework for evaluating potential policy futures. Historically, arms control has served goals such as managing proliferation of specific weapons, promoting general stability, and strengthening norms or institutions.[8] In the nuclear era, these objectives were further shaped by the classical philosophies of Thomas Schelling, Morton Halperin, Bernard Brodie, and others to form arms control approaches aimed at making nuclear war less likely or, should it occur, less costly.[9] These theories evolved alongside accompanying nuclear-related weapons and technology developments

throughout the Cold War until today, largely framed by the dynamics of U.S.-Soviet competition.

Spurred by political and conceptual breakthroughs that helped break the action-reaction cycle of arms buildups that characterized the initial years of the Cold War, arms control became a critical tool in managing this superpower nuclear competition and attendant nuclear risks.[10] The first major breakthroughs in this regard were the multilateral Limited Test Ban Treaty, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), as well as the U.S.-Soviet Strategic Arms Limitation Treaty (SALT) and ABM Treaty. These agreements required years of negotiations, a process that in itself provided some stability by making the terms of bilateral competition more explicit.[11] When ratified, this group of multilateral and bilateral treaties successfully accomplished several goals that can be generally categorized under the umbrella of strategic stability and risk mitigation.[12] These goals were furthered by additional confidence-building measures such as the "hotline" set up between Washington and Moscow to mitigate the risk of accidents or inadvertent escalation. That formal agreements such as ABM and SALT were reached after passing through multiple U.S. Presidential administrations testifies to the commonality of the classical thinking on nuclear arms control that existed in the era.[13] The long road to ratification for these agreements also helped solidify critical theories on deterrence and mutual vulnerability. Despite intense internal debates and competing priorities between domestic stakeholders and policymakers in both the United States and Soviet Union, the rough contours of these principles helped underpin decades of both nuclear force structure and arms control decisions.[14]

The continued growth in both the capabilities of the U.S. and Soviet nuclear forces and overall stockpiles that endured long after SALT and ABM ratification testifies to these crosscutting priorities that shaped these agreements.[15] These continued arms racing trends indicate how arms control accelerated the Cold War competition in certain directions—technologically and geopolitically—while still serving the ultimate goal of avoiding war.[16] The overall success of these treaties thus highlights their utility in appealing across multiple domestic and international agendas. This appeal proved pivotal for forging the needed coalitions for

ratification and helped the treaties remain relevant and stabilizing even as arsenals grew and potentially destabilizing technologies such as multiple independently targetable reentry vehicles (MIRVs) and ballistic missile defense (BMD) continued to evolve.

By the late 1970s, however, the nuclear and geopolitical landscape had evolved to a point where traditional arms control approaches were beginning to fall short. This was due in large part to degrading relations between Washington and Moscow—particularly after the Soviet invasion of Afghanistan—and deeper divisions between U.S. partisan political interests at home.[17] The U.S. arms control agenda also grew wider under the influence of more progressive interests. These interests prioritized overall weapons caps in a manner that was difficult to reconcile with other approaches focused on limiting certain characteristics of strategic nuclear weapons. These factors all combined to make new agreements such as SALT II unworkable.[18] Yet long-term competition trends ended up working out in favor of arms control and U.S. national interests by the mid-1980s. The North Atlantic Treaty Organization (NATO) Dual-Track Decision, which deployed new U.S. intermediate range missiles to Europe as leverage over Moscow for an agreement on future reductions, and the U.S. qualitative advantages pursued through the Strategic Defense Initiative, brought sufficient competitive pressure on the Soviet Union to negotiate on intermediate range and strategic forces. Just as important were internal dynamics within the Soviet Union, where decades of moribund economic performance forced Mikhail Gorbachev to make major nuclear weapons cuts in order to avoid an arms race that was proving beyond his country's capabilities.[19] The resulting U.S.-Soviet summit at Reykjavik in 1986 and (separately negotiated) INF Treaty in 1987 opened a new chapter in restricting the long-running nuclear competition by setting the stage for major strategic reductions and eliminating an entire class of "nonstrategic" nuclear weapons.

After continued debates throughout the rest of the decade, the collapse of the Soviet Union provided further impetus for completing the strategic reductions begun by Ronald Reagan and Gorbachev and to mitigate new proliferation risks. The Strategic Arms Reduction Treaty, signed in 1991, achieved significant nuclear force reductions through a limit of 6,000 warheads and 1,600 delivery vehicles.

At nearly the same time, the Cooperative Threat Reduction Program ushered in a new collaborative framework to address potential proliferation risks emerging in former Soviet states. The follow-on effects of this cooperation also strengthened the NPT as Belarus, Kazakhstan, and Ukraine joined as nonnuclear states after shedding their Soviet-era arsenals. These significant and binding regimes were also supplemented by the unilateral Presidential Nuclear Initiatives (PNIs), which accomplished the largest reduction of nuclear arsenals in history thanks to a confluence of domestic and international considerations.[20] These factors contributed to corresponding unilateral reductions on the Russian side, epitomizing the potential strength of mutual restraint in arms control under the right strategic conditions.[21] In a similar vein, the Comprehensive Test Ban Treaty was also negotiated and initiated during this period. Despite never being enforced, the agreement has effectively achieved its goals (with the notable exception of North Korea) and is supported by a rich landscape of international cooperation on nuclear test monitoring.

Continued management of proliferation risks dominated arms control priorities in the late 1990s and early 2000s. The presumed unipolar nature of the world in the era—a major assumption made by many influential U.S. policymakers—in conjunction with a focus on unilateral U.S. approaches during the George W. Bush administration prompted a pivot away from the principal U.S.-Russian axis in arms control. This new political approach complicated the bilateral arms control equation as the United States withdrew from the ABM treaty to address new threats from rogue regimes such as Iran with a European-based BMD system. NATO's existing capabilities were later coined the European Phased Adaptive Approach (EPAA) under the Barack Obama administration.[22] This decision, which culminated a domestic debate over BMD that began as far back as the Richard Nixon administration, has weighed heavily on U.S.-Russian negotiations since despite numerous offers of transparency measures from Washington.[23] Steps to mitigate the risks of the rising North Korean threat, specifically through BMD deployments, have likewise affected U.S.-Chinese relations.

The unique Strategic Offensive Reductions Treaty (SORT) provided some momentum for continued strategic weapons reductions in 2002. Though officially a ratified treaty—predominantly due to the Kremlin's preference on this point—

SORT gave no specific instructions warhead limits, force postures, or verification criteria and instead served as a guide for mutual restraint between the two nuclear powers within the bounds of the continuing START agreement.[24] The legacy of SORT can be viewed as helping to bridge the gap in continued reductions prior to the "reset" in bilateral relations undertaken by the Obama administration and the ratification of the New START agreement in 2010. This agreement, recently extended to 2026, limits each side to a maximum of 700 deployed launchers (for example, missiles and bombers) with an overall cap at 800 (which includes nondeployed systems) and 1,550 deployed nuclear warheads. Under New START rules, strategic bombers count as one launcher and one warhead regardless of payload capacity. The full New START regime also includes extensive rules governing verification and data exchanges to help incorporate new "strategic" systems.

Again, crosscutting policy priorities were on display for this latest agreement. Domestically, President Obama achieved the needed Senate support by reciprocating with a major nuclear modernization program.[25] The treaty also left out contentious topics for both sides that are still relevant today. This includes BMD and precision-strike capabilities that Russia views as destabilizing as well as nonstrategic nuclear weapons (NSNW), which are a priority issue for the United States. The continued maintenance of New START supports the idea that related theories of stability, deterrence, and mutual vulnerability developed during the Cold War still have some valence today. Yet as highlighted in the introduction, the current era of GPC and continued pace of technological development have resulted in a strategic context that is challenging these classical theories. The international environment in many ways looks much different from when New START first brought U.S. and Russian deployed strategic warheads and delivery vehicles to their current limits.

This short review of the history of arms control highlights a few key takeaways that should prove useful in framing policy choices in today's new era. First, even during eras of intense competition among Great Powers, arms control agreements proved to be valuable in reducing the risks of the nuclear war and promoting strategic stability. This was often accomplished in different ways. Depending on the strategic context, for example, agreements that successfully aided stability

did not always reduce forces or the associated costs of preparing for a potential nuclear war. Second, these agreements had impacts well beyond the specific weapons systems covered under their conditions. Examples include helping secure advantages in long-term arms races, shaping competition among global powers, and bolstering confidence for both international allies and domestic audiences.[26] Third, given these numerous and competing goals, a compromise between rival agendas—both domestically and internationally—has often proved crucial for the longest lasting agreements such as the ABM Treaty and New START. Many potentially workable agreements have also failed to come to fruition due to an inability to compromise competing motivations or from other complicating strategic factors. When both sides have similar levels of motivation, epitomized during the unilateral PNIs in the early 1990s, mutual restraint has proved effective as well and obviated the need for a binding agreement.

The overall conclusion, unsurprisingly, is that the worth of a nuclear arms control agreement must be judged in a greater strategic context. Interconnected topics such as deterrence, stability, alliance cohesion, and defense budgets need to be considered in light of overall strategic goals—not to mention the other parties' priorities—to ensure any arms control agreement is a useful tool of national security and not merely an end it itself. Indeed, the longest lasting agreements embodied multiple agendas while adapting to new contexts.

These conclusions are not novel in the rich intellectual history of arms control, but they do form a useful guide for framing a new analytical method to compare potential future arms control options. Completing this type of analysis is important to help the United States and its allies navigate a dynamic, multipolar international security environment. As the clock begins to wind down toward the 2026 sunset of the only remaining strategic bilateral agreement in New START, now is the time to set the trajectory for the next period of arms control agreements or, conversely, to determine if such tools remain suitable for achieving national security goals in this new era. Starting from the conclusion that disparate strategic considerations are required to fully understand the utility and implications of any arms control agreement, the next section defines several useful and specific criteria for adjudicating the relative merits of new arms control policies. This analytical

methodology is then applied to four specific arms control frameworks, synthesized from recent publications, to more fully explore the national security implications stemming from the many expert opinions on this crucial topic.

Methodology: Analytical Framework and Future Policy Options

The history of nuclear arms control reiterates important links between arms control and other aspects of national security. This study explores these interrelated elements in the context of plausible future arms control approaches to better understand the costs, benefits, and risks of potential future policy choices in today's dynamic geopolitical environment. The most relevant considerations that lend themselves to a comparative analytical framework include strategic stability, extended deterrence, proliferation, cost, and competitive advantage. In addition to their relevance to arms control, these categories are characterized by a fairly common understanding or "baseline" in the current strategic context. This baseline, understood from the point of view of the United States, thus provides a useful benchmark for evaluating *relative* changes against today's situation. Relative changes, from the U.S. perspective and according to each criterion can be assigned a "rating" of either positive, negative, or neutral, keeping the current 2021 status as a standard for a "neutral" rating. Given the inherently theoretical nature of the exercise undertaken in this study, the ability to ground the analysis against common benchmarks thus helps the methodology to the maximum extent practical. Additionally, two of these criteria—strategic stability and cost—also have quantitative characteristics to constrain the analysis as well. The following paragraphs define these criteria in more detail, summarize why each was selected to frame this study's methodology, and discuss any important caveats or limitations. This section concludes with a short summary of the existing publications that were leveraged to shape discrete future policy approaches.

Strategic Stability

Arguably one of the most important criteria in the context of the bilateral U.S.-Russian nuclear relationship, *strategic stability* in this study is understood to

be comprised of both first strike stability and arms race stability. The widely accepted definition of *first strike stability* is essentially the absence of an incentive to initiate a nuclear strike, while *arms race stability* refers to the absence of an arms race to pursue or maintain such a capability.[27] The category of strategic stability also provides a rough equivalence to deterrence, another key element of the strategic nuclear balance. Understanding that nuclear weapons inherently provide a significant advantage to the side that initiates war, a stabilizing deterrence posture should strongly disincentivize an adversary's first strike. When both sides are mutually deterred, a level of strategic stability thus follows.[28] While the basic definitions and implications of stability have been frequently debated, typically along the lines of the canonical and competing views from Thomas Schelling and Herman Kahn, these fundamental outlines of first strike stability and arms race stability are commonly understood enough to suffice for this theoretical and relative comparison.[29]

Within the strategic stability criterion, first strike stability considers the relative probability that an adversary would possess the capability and motivation to attack in a manner that would decapitate or overwhelm U.S. forces and avoid a crippling retaliatory strike. This qualitative estimate is complemented by results from the Arriving Weapons Sensitivity Model (AWSM).[30] This analytical model projects the number of surviving and arriving strategic nuclear weapons after absorbing a massive first strike under the various conditions of launch on warning and ride out attack in combination with a "day-to-day" or "generated" force posture.[31] The AWSM was used in recent studies by Stephen Cimbala to estimate the "deterrence stability and military viability" for U.S. and Russian forces under current and reduced strategic warhead limits.[32] A more complete discussion of AWSM results and implications follows in the analysis and results section.

To complete this quantitative comparison and better understand the qualitative implications stemming from each policy approach for strategic stability, specific force structures are required. This study presents projected force structures for the United States, Russia, and China that could result from each proposed arms control approach. These force postures were derived from the latest publicly available information, including reports from the Congressional Research Service,

Congressional Budget Office (CBO), Department of Defense (DOD), and analysis from *The Bulletin of Atomic Scientists*. Three of the proposed approaches leverage force structures discussed in the previous studies by Cimbala, providing a common point of comparison with existing literature as well as published AWSM results. The AWSM estimates for the fourth approach, which abandons arms control as a policy tool, are presented in this study for the first time.

As a baseline, the current 2021 status quo and AWSM results at New START levels are assumed to be *neutral*. The AWSM results are considered both in terms of total arriving warheads and the ratio of arriving warheads to the total deployed forces. Any relative changes that threaten first strike or arms race stability will contribute to a *negative* rating, while differences that potentially improve stability will be considered *positive*.

Extended Deterrence

Although there are overlapping considerations for strategic stability and deterrence, extended deterrence is unique enough to warrant its own category. Extended deterrence lacks an overarching definition due to the different regional factors affecting allies under the U.S. "nuclear umbrella."[33] This study qualitatively considers relative impacts to U.S. extended deterrence security guarantees with respect to key relationships in Europe and East Asia. These guarantees are generally grounded in the capability and credibility of the United States to deter a nuclear or other large-scale attack on these allies. The qualitative status quo in 2021 is assumed as the baseline; increased ambiguity or decreased commitment compared to today would lead to a negative assessment, for example. Similarly, losing nuclear parity with Russia, or ceding superiority over a potential regional opponent, would also be assessed as *negative*.[34] In this context, the relative force structures and AWSM results, which indicate potential impacts to both capability and credibility, are referenced as needed. Regional stability is also considered, given that conflict and escalation could challenge the credibility of U.S. extended deterrence guarantees.

Proliferation

Another topic potentially impacted by changes to extended deterrence is proliferation. A common consensus among nuclear weapons experts is that U.S. extended deterrence is an essential consideration in keeping other allied, latent nuclear powers from proliferating.[35] This implies impacts to extended deterrence could play some role when analyzing potential proliferation effects. Looking beyond U.S. alliances, this category also includes a qualitative assessment of the likelihood of new states pursuing nuclear weapons programs. Possible pressures on existing nuclear weapons states resulting from the assessed arms control pathways are estimated as well. A key variable in this regard is the likely emergence of new proliferation pressures for existing programs (for declared states such as India and Pakistan as well as rogue regimes in North Korea and Iran) and the emergence of new nuclear aspirants. Another important factor is the strength of the current NPT regime and first-order drivers such as U.S. and Russian commitments to this treaty's Article VI responsibilities.

Cost

The costs for implementing each set of policies are evaluated according to impacts to the U.S. budget. This assessment is made quantitatively by estimating the potential deviations from the most recent projected budgets as a baseline; some published budget projections extend to 2046 but the analysis focuses on the 2026–2031 and 2031–2036 time periods to better parse impacts to more near-term program milestones. Any changes within approximately +/- 15 percent are considered neutral, while higher and lower excursions are negative and positive, respectively. Supporting analysis is provided by relevant CBO, DOD, and Department of Energy (DOE) reports on nuclear forces and missile defense.[36] The estimated force postures under each arms control policy approach provide additional information to better bound this discussion on cost.

Competitive Advantage

This criterion considers the degree to which the theoretical arms control outcomes enable a U.S. advantage over Great Power competitors and how the

various policies potentially affect the direction and velocity of that competition. This criterion takes a broader view than just strategic stability, considering nonnuclear strategic impacts and other facets of Great Power arms races or geopolitical tensions. Using the global geopolitical situation among Great Powers today as a rough baseline, a decreased U.S. advantage or increased points of contention among Great Powers would lead to a negative assessment. For example, outcomes that enable China to more easily achieve strategic nuclear parity or increase regional hegemony would lead to a negative result. Implications from the cost analysis are also included, assuming that reduced nuclear weapons program costs could provide additional resources to better compete in other strategic areas.

This criterion implies some similarity to the type of holistic analysis done under net assessment, particularly the attempt to estimate the pace and intensity of long-term competition.[37] However, the intent is to capture the broad outlines of competition outside of the nuclear-specific considerations analyzed in the other criteria. The deep analysis completed under net assessment techniques is beyond the purview and classification level of this study.

Timelines and Feasibility

This study considers the impacts from arms control through 2036 to focus on the decade following New START. During the period of the New START extension, from 2021 until 2026, this study assumes there will be minimal changes across the qualitative criteria. The exceptions are any projected force structure updates from ongoing U.S. and Russian modernization plans. China's modernization plans are not well known, but a range of possibilities is highlighted based on open-source reports.[38] These timescales were also selected as they align with potential start times for a new arms control agreement and map to rough milestones in the funding, production, and deployment of U.S. nuclear modernization programs. Examples include the B-21 bomber, Ground Based Strategic Deterrent (GBSD, with initial deployments in late 2020s), and *Columbia*-class ballistic missile submarine (SSBN, with initial patrol projected for 2031). A summary of the evaluation criteria and the relative changes that merit positive, neutral, or negative ratings are summarized in table 1.

Table 1. Evaluation Criteria Summary

Category/ Rating	Strategic Stability	Extended Deterrence	Proliferation	Cost (%)	Competitive Advantage	Political Feasibility
Positive	More Stable	Improved capability, credibility, or commitment	Decreased pressures	Decreased >15	Increased advantage or decreased intensity	Likely
Neutral	No change from current status quo			Up to +/- 15 change	No change from current status quo	Less likely
Negative	Less stable	Decreased capability, credibility, or commitment	Increased pressures	Increased >15	Decreased advantage or increased intensity	Unlikely

Although not part of the evaluation criteria, the feasibility or political likelihood of each approach is also important. These factors are considered when defining the policy details for each of the proposed approaches below along with short discussion of potential steps that could bring each approach to fruition. Another factor not specifically covered by the evaluation is U.S. declaratory nuclear policy. Declaratory policy changes—such as U.S. acceptance of "no first use" or "sole purpose" doctrine—or other unilateral measures could affect U.S. force structures or the analytical results within any of the evaluation criteria. Similarly, any changes to NPT support or an updated stance on the Nuclear Ban Treaty could also play a role in future nuclear-related outcomes. However, future trends in these policy areas through 2036 are difficult to predict; the arms control approaches in this study are thus evaluated independently of these potential changes to better define this analytical exercise.

Future Policy Options

The unique challenges of today's dynamic security environment have prompted a large body of publications recommending future directions for nuclear arms control or competition. These proposals include new frameworks and conditions encompassing a wide range of policy choices, including:

- extending purely U.S.-Russian bilateral arms control regimes[39]
- how to incorporate America's other Great Power competitor in China[40]
- ways forward without an arms control agreement at all.[41]

The authors for these publications—ranging from leaders with expertise in negotiating agreements, such as Rose Gottemoeller, to leading thinkers representing U.S., Russian, and Chinese perspectives, such as Linton Brooks, Brad Roberts, Steven Pifer, James Acton, Dmitri Trenin, Alexey Arbatov, and Tong Zhao—provide some of the most well-informed viewpoints on this topic available outside of the official government and military agencies engaged in the nuclear enterprise. However, these works often lack a more complete treatment of policy recommendations, such as comparing the potential impacts of different courses of action.[42]

This study leverages these expert opinions to provide a new and focused analysis, synthesizing and methodically comparing plausible arms control courses of action and their impacts through 2036. Based on a thorough review of the publications most relevant to the potential post–New START world, four distinct arms control policy approaches are proposed:

- bilateral strategic arms limitations—maintaining bilateral U.S.-Russian strategic arms limitations at similar New START levels
- long-term multilateral reductions—pursuing major long-term nuclear warhead reductions in a legally binding multilateral framework
- bilateral nonratified frameworks—a set of bilateral U.S.-Russian and U.S.-Chinese agreements based on nonratified agreements covering a range of nuclear and nonnuclear topics
- pursue nuclear superiority—abandoning arms control to pursue U.S. nuclear superiority.

The following sections define these approaches, discussing overall strategy, assumptions, and conditions for each. Estimated force structures that could result under each set of policies are also presented. Considerations for the plausibility of

each agreement and potential steps that could make each approach a reality are briefly summarized as well. The supporting publications for each set of policy approaches are highlighted in the accompanying notes.

Arms Control Policy Approaches

Approach 1: Bilateral Strategic Arms Limitations

Strategy. This policy approach prioritizes U.S.-Russian bilateral strategic stability in a framework like New START. Leveraging this existing framework presumably maximizes the probability of legal ratification. The New START follow-on does not make any reductions but achieves a freeze on current active stockpiles with an updated verification and monitoring regime.[43] Some tradeoffs on nonstrategic issues are made to meet priority issues for both sides. For example, Russian BMD concerns could be met through transparency steps to confirm the purely defensive nature of these systems in addition to other data-sharing and confidence-building measures.[44] To meet U.S. concerns on NSNWs, Russia agrees to some mix of transparency measures, inspections, or portal monitoring.[45]

Assumptions. Further strategic reductions are not possible due to domestic pressures favoring the current force structure and continued execution of existing modernization plans. The agreement thus retains New START limits but adds a verifiable freeze on active stockpiles. Planned U.S. and Russian modernization programs would continue with new systems covered by the verification regime and New START–like limits. The existing verification regime would continue with additions to support the warhead freeze and transparency measures for BMD and NSNWs; the full details of these updated verification measures would be finalized by a collaborative joint commission.[46] Intermediate-range forces are not explicitly addressed; however, the transparency measures on NSNWs help blunt concerns over the continued lapse of an INF Treaty replacement. Strategic nonnuclear technology areas—such as space and cyberspace—are not addressed. China continues to refuse to take part in any strategic arms discussions with the United States and Russia.[47]

Conditions. These policies would maintain New START limits for deployed strategic warheads and delivery systems. They would also accommodate new systems fielded on or after 2026, which would include planned U.S. and Russian modernized systems and totally new launchers such as boost-glide missiles with strategic range.[48] A new feature would be an active stockpile freeze at current numbers with a mix of new mutual declarations and supporting verification measures. The United States would agree to transparency measures and data exchanges for European-based BMD sites, including notifications of new deployments and/or invitations to observe actual test events or share a selection of telemetry data.[49] In exchange, Russia could extend the proposed warhead freeze to NSNW with additional transparency measures such as storage site inspections, portal monitoring, and/or ensuring separate basing of nuclear and nonnuclear delivery vehicles.[50] Such separate basing conditions would also address additional concerns regarding heavy bomber conversions (a Russian point of contention) and counting rules for future deployed bombers (U.S. B-21 and Russian PAK-DA).[51]

Feasibility. A treaty closely following New START's conditions is thought to be the most politically feasible path to a ratified agreement.[52] Even so, a continuation of the New START–like regime would face pressures internationally and domestically that will complicate ratification. The most contentious international issues would include U.S. EPAA systems in Europe and Russia's unaccountable NSNWs.[53] Approach 1 would not completely resolve concerns in these areas but presents a pathway for compromise based on transparency steps in these areas. As a counterpoint, Russia could still demand additional binding limits on European-based BMD systems or refuse any transparency steps on NSNWs.[54] Similarly, basing agreements and inspection or verification measures for these systems, which go beyond the New START agreement, would be controversial for both sides. To overcome some of these obstacles, a multistep approach could be pursued, beginning with simple verification that key NSNW storage sites are empty and then grow to a more encompassing system of checks or monitoring.[55]

Despite the trend of worsening U.S.-Russian relations, this proposed approach could grow out of continued dialogues during the New START extension. This would also require that neither side makes any foreign policy steps to antagonize

the overall security situation in Europe. Looking at U.S. domestic prospects, continued support for long-planned triad modernization proposals and the addition of new measures for NSNWs would foster support from more conservative U.S. leaders, while the verifiable warhead freeze could help shore up tensions from politicians on the left advocating for nuclear reductions. The most feasible pathway to making Approach 1 a reality for U.S. Senate ratification would be continued dialogue and hands-on expectation management of the different factions along the political spectrum.

Estimated Force Postures. Tables 2, 3, and 4 summarize estimated force postures under Approach 1 conditions. The primary limits are similar to New START with 1,550 deployed warheads and 700 deployed strategic delivery vehicles. New START counting rules would continue to apply, counting total warheads and missiles for intercontinental ballistic missles (ICBMs) and submarine-launched ballistic missiles (SLBMs) while bombers are considered as single launchers and warheads regardless of carrying capacity. Note that any predictions for China's nuclear forces come with a high degree of uncertainty due to that nation's strategic ambiguity on its force postures. The estimates shown in table 4 assume a rough "doubling" of Chinese nuclear forces as discussed in open-source DOD reporting.[56] Recent discussions by senior military leaders indicate that China may be seeking greater increases to its nuclear arsenal in the upcoming decade and a focus on other weapons systems, such as stealth aircraft and road-mobile missiles, that could complicate U.S. deterrence.[57]

Approach 2: Long-Term Multilateral Reductions

Strategy. This policy approach describes a long-term effort aimed at achieving major reductions in both the number and role of nuclear weapons. This process would start with legally binding U.S. and Russian cuts in a treaty replacing New START, then make further reductions to help "multilateralize" this regime with United Nations Security Council five permanent members (P5; China, France, Russia, the United Kingdom, and the United States). Another central feature of these policies would include stockpile reductions to significantly reduce nuclear weapons risks and program costs.

Table 2. Approximate U.S.-Deployed Force Structure: Approach 1

Timeframe: 2026–2031	Total Launchers	Deployed Launchers	Deployed Warheads	Timeframe: 2031–2036	Total Launchers	Deployed Launchers	Deployed Warheads
ICBMs	450	400	400	ICBMs	450	400	400
SLBMs	240	200	Approx. up to 1,000	SLBMs	196	196	980
Strategic Bombers	66	Up to 60	50	Strategic Bombers	66	Up to 60	50
Total Active Stockpile	3,800			Total Active Stockpile	3,800		
Total Account-able	788	676	Approx. 1,450	Total Account-able	768	640	1,430

Sources: Vince Manzo, *Nuclear Arms Control Without a Treaty? Risks and Options After New START* (Arlington, VA: CNA, March 2019); *Navy Columbia (SSBN-826) Class Ballistic Missile Submarine Program: Background and Issues for Congress*, R41129 (Washington, DC: Congressional Research Service, January 15, 2021).

Note: Estimates for futures years draw from current modernization estimates as well as analysis in Manzo, 50–52. Changes from these sources include:

SLBMs:

2026–2031. According to the Navy's latest projections, the SSBN force will decline to 12 boats in FY29 due to *Ohio*-class retirements prior to the first *Columbia* delivery, scheduled for 2031 (CRS R41129, 6–7). The estimated force structure reflects 10 SSBNs deployed; impacts to overall deployed warhead numbers are mitigated by increasing warhead loads on SLBMs.

2031–2036. Continued transition to *Columbia*-class and retirement of *Ohio*-class reduces total fleet to 6x *Columbia*-class and 5x *Ohio*-class SSBNs by 2036 (ibid.). The deployed forces are assumed to comprise all 11 SSBNs while maintaining warhead loads to keep overall deployed warhead numbers near New START levels.

ICBMs and bombers:

Over this timeframe the only projected changes to U.S. deployed forces are initial deployments of B-21 bombers (sometime on/after 2026) and GBSD (on/after 2029), which are assumed to replace current strategic bombers and ICBMs on a one-for-one basis.

Key: ICBM: intercontinental ballistic missile; SLBM: submarine-launched ballistic missile

Assumptions. Mutual domestic interest in reducing U.S.-Russian nuclear risk, saving from nuclear program cost, and easing international tensions combine to support major arms limitations in a two-step process. Step 1 (2026–2031) would see the implementation of a similar New START replacement as described in Approach 1 that includes an active stockpile warhead freeze and

Table 3. Approximate Russian-Deployed Force Structure: Approach 1

Timeframe: 2026–2031	Deployed Launchers	Deployed Warheads	Timeframe: 2031–2036	Deployed Launchers	Deployed Warheads
ICBMs	302	900	ICBMs	280	950
SLBMs	Up to 160	475	SLBMs	Up to 160	539
Strategic Bombers	50	50	Strategic Bombers	50	50
Total Active Stockpile	4,310		Total Active Stockpile	4,310	
Total Accountable	512	1,425	Total Accountable	490	1,539

Sources: Vince Manzo, *Nuclear Arms Control Without a Treaty? Risks and Options After New START* (Arlington, VA: CNA, March 2019); Hans M. Kristensen and Matt Korda, "Russian Nuclear Forces, 2020," *Bulletin of the Atomic Scientists* 76, no. 2 (2020), 102–117.

Note: Baseline totals are from latest 2020 estimates (Kristensen and Korda, 102–105). The exact breakdown of ICBM and SLBM loading is unknown as Russia does not report detailed information regarding specific launcher deployments. The numbers used in this analysis are thus approximate based on Kristensen and Korda (102–108) and future options discussed in Manzo (52–56). Additional explanations include:

ICBMs:

2026–2031. Manzo (52–53) estimates 930 warheads under the "constrained force" description, while Kristensen and Korda (104) estimate only about 812 warheads are deployed. This analysis assumes the actual number is between these two estimates.

2031–2036. Following Manzo (52–54), the numbers reflect replacing 72 SS-25 ICBMs with 50 SS-27 Mod 2 ICBMs (potential gain of up to 128 warheads) and replacing SS-18 with SS-29 on a 1-for-1 basis (no net warhead change).

SSBNs:

2026–2031. Given that Russia's entire SSBN fleet consists of 10 ships (6x *Delta* IV, 1x *Delta* III, and 3x *Borei*) with 16 launch tubes each, the total deployed number is likely less than 160. The total available warheads (including in storage) is likely around 720 (Kristensen and Korda, 104).

2031–2036. Increased warhead numbers reflect planned replacements of Delta III/Delta IV SSBNs with *Borei*-class armed with 6-warhead SS-N-32 SLBMs (maximum possible net gain of 64 warheads).

Bombers:

Russia has indicated plans to deliver 10 new Tu-160M2 aircraft in 2027 with a goal of 50 deliveries through the mid 2030s and next-generation PAK-DA bomber sometime after 2029 (Kristensen and Korda, 110–111). For this analysis, it is assumed these aircraft replace legacy bombers at a 1-to-1 basis.

Key: ICBM: intercontinental ballistic missile; SLBM: submarine-launched ballistic missile

reductions in fielded forces (down to 1,000 deployed strategic warheads).[58] Step 2 (2031–2036) would follow with a U.S.-Russian agreement for additional reductions to a limit of 500 deployed warheads.[59] These major cuts are assumed to help foster an expanded effort with P5 nations for a multilateral legally binding agreement. The focus for Approach 2 is on strategic nuclear weapons but

Table 4. Approximate Chinese-Deployed Force Structure: Approach 1

Timeframe: 2026–2031	Launchers	Warheads	Timeframe: 2031–2036	Launchers	Warheads
ICBMs	280	258	ICBMs	350	350
SLBMs	72	72	SLBMs	96	96
Strategic Bombers	20	20	Strategic Bombers	50	50
Total Active Stockpile	350		Total Active Stockpile	500	
Total Accountable	372	350	Total Accountable	496	496

Sources: Hans M. Kristensen and Matt Korda, "Chinese Nuclear Forces, 2020," *Bulletin of the Atomic Scientists* 76, no. 6 (2020), 443–457; *Military and Security Developments Involving the People's Republic of China 2020*: *Annual Report to Congress* (Washington, DC: Office of the Secretary of Defense, September 2020).

Note: Baseline totals are from latest 2020 estimates (Kristensen and Korda, 443–445). The indicated numbers include projected deployments of new DF-41 ICBMs and two additional SSBNs in the early 2020s. Future projections are based on estimates from *Military and Security Developments Involving the People's Republic of China 2020*, 45, 51, 55–56, 87–88. The specific references to the DOD report include an overall assertion that China could "double" its arsenal in the next decade, add an additional 100 ICBMs, and increase its SSBN fleet to 8 via concurrent fielding of new Type 096 ships. Strategic bomber estimates are hypothetical based references in the DOD report to roughly doubling the current H-6N fleet and potentially adding several new H-20 bombers. Chinese officials indicate that their nuclear forces are kept in a "moderate alert" status with many of their launchers, missiles, and warheads maintained in separate storage. Numbers indicate potential force postures in case of a conflict or crisis understanding that current, day-to-day forces are potentially much lower (Kristensen and Korda, 446–447).

Key: ICBM: intercontinental ballistic missile; SLBM: submarine-launched ballistic missile

includes some necessary steps to limit INF-range systems. Strategic nonnuclear technologies are not explicitly addressed.

Conditions. A New START replacement along the lines of Approach 1 would be ratified that reduces deployed warheads to 1,000 and deployed launchers to 600 over an initial period between 2026–2031. After this time, both U.S. and Russian limits are reduced to 500 strategic warheads and 500 delivery systems. These continued reductions would be done in concert with expanded P5 engagement to foster a new multilateral treaty on or after 2036. This multilateral effort would set the deployed warhead limit to something around the current or projected arsenals for these nations, approximately 350 for China, 300 for France, and 215 for the United Kingdom.[60] A verifiable active stockpile limit would also be set, potentially

around 2,500 warheads for the United States and Russia. In the nonstrategic realm, Approach 2 would feature some breakthrough on missile defenses and NSNWs (similar to Approach 1) plus a return to a bilateral (U.S.-Russia) ban on intermediate-range ground-launched missiles in Europe and new launcher limits for INF-range systems for the United States, Russia, and China in Asia.[61]

Feasibility. These policies encompass substantial nuclear weapons reductions that do not appear feasible in the current international environment. A breakthrough in international relations and a corresponding reduction in global tensions would realistically be required to precipitate such a treaty, but this proposed two-step process could help stimulate such an environment for nuclear weapons specifically. In this context, any improved trends from today's tense security environment would be boosted by initial U.S.-Russian steps down to the 1,000-warhead limit. Such a limit has been previously discussed independently in U.S. and Russian think tank circles, indicating some plausibility, though actual defense officials on both sides are more skeptical of any further reductions.[62] More significant progress on the major issues of missile defense, NSNW, and potentially conventional forces in Europe could also be required to foster additional reductions.[63]

Assuming that U.S. and Russian leadership in the nuclear arena counts among the P5 nations, major cuts down to a 500-warhead limit at the second stage of this new regime could prompt a breakthrough multilateral agreement. This type of multilateral engagement could also unlock additional interest from China in joining this framework.[64] The polarized domestic political context for the United States offers other major obstacles to this approach. However, renewed public interest in disarmament—not unlike the antinuclear movements of the 1970s and 1980s—could combine with pressures from fiscal conservatives to spur the needed support.

Estimated Force Postures. Tables 5, 6, and 7 summarize estimated force postures under Approach 2 conditions. For comparison, New START–like counting rules are assumed. There are many options to reach the new limits under this proposed framework, but the estimated postures assume both the United States and Russia would maintain a triad to balance survivability and response options. Particularly for the United States, these strategic concerns would be augmented

Table 5. Approximate U.S.-Deployed Force Structure: Approach 2

Timeframe: 2026–2031	Total Launchers	Deployed Launchers	Deployed Warheads	Timeframe: 2031–2036	Total Launchers	Deployed Launchers	Deployed Warheads
ICBMs	330	300	300	ICBMs	130	115	115
SLBMs	240	200	650	SLBMs	176–196	176–196	335
Strategic Bombers	66	Up to 60	50	Strategic Bombers	66	Up to 60	50
Total Active Stockpile	3,000			Total Active Stockpile	2,500		
Total Account-able	700	576	1,000	Total Account-able	428	335	500

Sources: Stephen J. Cimbala, "Nuclear Arms Control: A Nuclear Posture Review Opportunity," *Strategic Studies Quarterly* 11, no. 3 (Fall 2017), 95–114; Stephen J. Cimbala, *Nuclear Deterrence in a Multipolar World: The U.S., Russia, and Security Challenges* (New York: Ashgate Publishing, 2016); *Navy Columbia (SSBN-826) Class Ballistic Missile Submarine Program: Background and Issues for Congress*, R41129 (Washington, DC: Congressional Research Service, January 15, 2021).

Note: Initial totals remain at New START limits as new legally binding treaties are finalized and ratified. After 2026, the United States would draw down to the 1,000-warhead limit. There are multiple possible approaches to reduce the arsenal to this number; the force structure is based on current modernization plans and simulated limits considered in Cimbala (*Nuclear Deterrence*, 105–111) and Cimbala ("Nuclear Arms Control," 100–106). These reductions assume the United States continues fielding a triad due to political obstacles against closing ICBM bases and other military strategic considerations. Changes from these sources include:

SSBNs:

2026–2031. According to the Navy's latest projections, the SSBN force will decline to 12 boats in FY29 due to *Ohio*-class retirements prior to the first *Columbia* delivery, scheduled for 2031 (CRS R41129, 6–7). The estimated force structure reflects 10 SSBNs deployed; warhead loads per SLBM are reduced to just over 3 to meet new treaty limitations.

2031–2036. Continued transition to *Columbia*-class and retirement of *Ohio*-class reduces total fleet to 6x *Columbia*-class and between 4x to 5x *Ohio*-class SSBNs. This reflects that under these limitations, the United States could consider retiring an *Ohio*-class SSBN early to reduce costs. The deployed forces are assumed to comprise all available SSBNs while decreasing warhead loads on each SLBM to stay within new treaty limits. Final *Columbia*-class purchases are capped at 10 in this new force structure.

ICBMs:

2026–2031. Total silos are reduced to 330 total with 300 operational day to day, maintaining a similar ratio to the currently fielded system. The ICBMs remain mated with one warhead only.

2031–2036. Further reductions to 130 total and 115 operational ICBMs to meet new treaty limits while maintaining the ratio of total to operational systems.

Bombers:

Over this timeframe, the only projected changes to U.S. deployed forces are initial deployments of B-21 bombers (sometime on/after 2026), which are assumed to replace current strategic bombers on a one-to-one basis.

Key: ICBM: intercontinental ballistic missile; SLBM: submarine-launched ballistic missile

Table 6. Approximate Russian-Deployed Force Structure: Approach 2

Timeframe: 2026–2031	Deployed Launchers	Deployed Warheads	Timeframe: 2031–2036	Deployed Launchers	Deployed Warheads
ICBMs	250	550	ICBMs	250	260
SLBMs	Up to 160	400	SLBMs	Up to 160	190
Strategic Bombers	50	50	Strategic Bombers	50	50
Total Accountable	460	900	Total Accountable	460	500

Sources: Stephen J. Cimbala, "Nuclear Arms Control: A Nuclear Posture Review Opportunity," *Strategic Studies Quarterly* 11, no. 3 (Fall 2017), 95–114; Stephen J. Cimbala, *Nuclear Deterrence in a Multipolar World: The U.S., Russia, and Security Challenges* (New York: Ashgate Publishing, 2016).

Note: Initial totals remain at New START limits as new legally binding treaties are finalized and ratified. There are multiple possible approaches to reduce the arsenal to this number; the force structure is based on current modernization plans and simulated limits considered in Cimbala (*Nuclear Deterrence*, 105–111) and Cimbala ("Nuclear Arms Control," 100–106).

Key: ICBM: intercontinental ballistic missile; SLBM: submarine-launched ballistic missile

Table 7. Approximate Chinese-Deployed Force Structure: Approach 2

Timeframe: 2026–2031	Launchers	Warheads	Timeframe: 2031–2036	Launchers	Warheads
ICBMs	280	258	ICBMs	280	258
SLBMs	72	72	SLBMs	72	72
Strategic Bombers	20	20	Strategic Bombers	20	20
Total Accountable	372	350	Total Accountable	372	350

Source: Hans M. Kristensen and Matt Korda, "Chinese Nuclear Forces, 2020," *Bulletin of the Atomic Scientists* 76, no. 6 (2020), 443–457.

Note: There is no consensus on the actual size of China's arsenal. The current projections are already at the proposed 350 limit. If this approach were to be accepted, it is assumed China would continue modernization plans but replace legacy systems at a one-to-one rate to stay at the new 350 warhead limit.

Key: ICBM: intercontinental ballistic missile; SLBM: submarine-launched ballistic missile

by strong domestic pressures to sustain a triad to avoid base closures and other impacts to the defense industry.

Approach 3: Bilateral Nonratified Frameworks

Strategy. This approach would sidestep ratification issues to pursue a more flexible policy framework, potentially better suited to meet the challenges of GPC.

Such policies would concede some of the transparency and predictability provided by legally binding regimes. However, this approach would also allow for greater U.S. freedom of action while possibly opening the aperture of cooperation with Russia and China. The primary goals would be to reduce major risks through political agreements and new communication channels, providing mutual transparency on priority nuclear topics and reinforcing agreed-upon norms in space and cyberspace. Separate bilateral arrangements with Russia and China would accomplish these goals, tailored for specific priority issues along these disparate bilateral axes. This policy framework could enable more transparent management of future arms racing for nuclear weapons and develop technologies by reducing ambiguity among Great Powers in these areas.

Assumptions. After the 2026 New START expiration, both the United States and Russia would remain interested in maintaining force levels similar to the expired New START–like limits. This interest would be motivated by strategic risk reduction considerations, NPT commitments, cost savings, or some combination of all three factors.[65] This mutual restraint could also be supported by continued dialogue or declarations related to forces previously covered under New START. In place of a binding agreement, Washington and Moscow would agree to continue to cooperate in a bilateral and nonlegally binding framework.[66] China would refuse to join any trilateral agreements but would be amenable to separate bilateral discussions with the United States. Inspection and verification measures under a nonlegally binding agreement would be limited, particularly in the case of China. Some tailored and mutually agreeable risk reduction and transparency measures would be defined by bilateral commissions. To help differentiate this flexible framework from Approach 1, it is assumed that such risk reduction steps would focus on data exchanges and declarations for nonnuclear strategic technologies, including hypersonics or activities in space and cyberpace. The assumed timing would include new U.S.-Russian bilateral pledges or political agreement negotiated during the New START extension to start on or soon after 2026. A possible U.S.-Chinese agreement would take longer to negotiate and would be implemented on or after 2031.

Conditions for Russia and the United States. Both parties would opt to remain near New START limits for strategic systems after 2026. This mutual restraint would be reinforced through data exchanges, prenotification standards, or by leveraging space-based sensors and other technological means to essentially emulate inspections remotely.[67] These informational efforts could be further supported by a reiteration of the Reagan-Gorbachev statement, a PNI-like or interim restraint policy, or other diplomatic initiatives. These post–New START mutual transparency efforts would be flexible enough to incorporate discussions on other topics such as BMD, NSNWs, and hypersonics. For the purpose of a more distinct comparison to the other proposed approaches, Approach 3 is presumed to encompass mutual restraint declarations related to national command, control, and communications (NC3); space; and cyberspace.[68] These declarations could be followed up by additional steps to define *red lines* for space and cyber domains and clarification of expected norms to avoid inadvertent escalation or accidental impacts to nuclear forces entangled with conventional ones.[69] In addition to nuclear-specific entanglement issues, these cyberspace discussions would clarify expected norms across critical infrastructure and industry sectors to provide additional frameworks to help preempt escalation risks in the cyber domain.[70] The dialogues could expand to include agreement on separate basing for INF-range systems and nuclear forces or limits on the geographic placement of these systems, keeping them out of Europe in the case of NATO and east of the Urals for Russia.[71]

Conditions: China and the United States. The novelty of a U.S.-Chinese agreement implies that it would start with a much smaller scope than a comparable U.S.-Russian treaty. China's reticence regarding verification would limit actual caps on nuclear forces, so this agreement would instead capitalize on mutual interests in minimizing risks of accident or inadvertent escalation. This would result in mutual transparency efforts, expanded communication channels, and confidential declarations or data exchanges for a range of nuclear and strategic nonnuclear technologies.[72] Following the precedent set among global powers in the Cold War, more specific steps could include bilateral prelaunch missile notifications and a Washington-Beijing nuclear hot line.[73] China would harbor concerns about U.S.

BMD systems, while Washington would prioritize receiving additional information on Beijing's capabilities and intentions with regional offensive missile systems. These interests could provide a framework for a mutually beneficial agreement on certain "nondeployment" zones for specific offensive and defensive systems to avoid undermining China's nuclear deterrent or U.S. extended deterrence guarantees.[74]

Feasibility. The basic steps to make Approach 3 a reality are possible based on historic precedents. The United States and Russia have a history of mutual restraint and political pledges that could be repeated to initiate a new post–New START regime. More recently, Vladimir Putin has indicated a willingness for bilateral discussions in order to support continued communication and risk reduction steps on nuclear- and cyber-related issues.[75] Russia has also outlined potential categories related to reducing risk in space-based activities.[76] Admittedly, such offers typically come with additional expectations that serve the Kremlin's ends or ignore Russia's own provocative military activities, but the concept indicates the potential for further bilateral work in this area.

Whether or not both the United States and Russia would continue the required mutual restraint to retain the parity currently defined by New START is less clear. Although the mutual steps undertaken by Bush and Gorbachev during the PNIs of 1991 and 1992 provide some precedent, the strategic context today is much different than in the immediate aftermath of the Soviet Union's collapse. These differences may make mutual restraint or interest in politically binding agreements less likely now. The lack of verification measures, which would cease after New START without a ratified replacement, would also undermine incentives for mutual restraint. However, some combination of continued noninterference in and use of new commercially available or open-source or crowdsource measures could help fill this gap and support this new post–New START regime.[77] Additional domestic and budget concerns, pressuring both Washington and Moscow, could also motivate these governments to limit deployed strategic forces at similar levels to today.

Collaboration with China presents greater challenges, yet outreach from Washington could play into Beijing's pursuit of acknowledged global power status.[78] China may also see the mutual benefit in cooperation to help manage crises

and avoid escalation, particularly if similar U.S.-Russian efforts were already well under way.[79] The joint U.S.-Russian restraint on INF-like forces could also help foster interest in dealing with both Washington and Moscow to avoid a regional arms buildup in Beijing's backyard.[80] China's stance on arms control could also quickly change if directed from Chinese Communist Party leadership or the General Secretary.

Other questions remain regarding the long-term sustainability of these types of agreements. The complicated history of the Joint Comprehensive Plan of Action (JCPOA), a politically binding deal struck to restrain Iran's nuclear program, illustrates how nonratified agreements could come under duress as U.S. Presidential administrations change hands between opposing political parties. Presumably, the long-lasting autocratic regimes in Russia and China would not face this problem, but the immense influence of a single leader like Vladimir Putin or Xi Jinping implies that future deals could be made—or broken—at their behest. The more flexible policy frameworks proposed in Approach 3 could survive these potential hurdles if they contained sufficient benefits to appeal to as many detractors as possible, motivating continued engagement and restraint.

Estimated Force Postures. This approach is aimed at tackling a more expansive set of nonstrategic nuclear issues and thus could have minimal impacts on future strategic force postures. The presumed mutual restraint for the United States and Russia would maintain forces at similar levels to those projected under Approach 1 and summarized in tables 2 and 3. China's forces would not be subject to any limits and would be predicted to evolve to similar levels shown on table 4, acknowledging the major uncertainty for any estimates of deliberately ambiguous Chinese nuclear program details.

Approach 4: Pursue Nuclear Superiority

Strategy. Under this paradigm, the United States would pursue the proposed benefits of strategic nuclear superiority with a more robust force structure. A benchmark for such an approach could be to achieve credible counterforce targeting against combined threats from Russia, China, and North Korea. The number of estimated deployed warheads to meet this goal at present would be about

2,300.[81] The budget impacts of such an approach would vary widely depending on the scope of increased forces and weapons programs. For illustrative purposes, a mix of potential choices under this approach is considered. Potentially significant increases in missile defense and space-based programs are included in addition to larger deployed strategic nuclear forces.

Assumptions. New START would not be replaced after 2026. Barriers to a legally binding agreement, combined with Russian violations of previous agreements and deepening tensions between Great Powers, are assumed to promote sufficient U.S. domestic support for this new paradigm. Additional funds would have to be appropriated or reprioritized to support expanded weapon development and deployment plans.

Conditions. Minimal changes would be likely in the near term due to budget and planning constraints, but the United States and Russia both would make modest increases after 2026 in daily deployed strategic and nonstrategic nuclear forces based on currently available warheads and launchers. Current triad modernization plans would continue, augmented by maximizing available ICBM silos and warhead loads on ICBMs and SLBMs. Washington would also pursue other qualitative advantages in submarine- and ground-launched cruise missiles; hypersonics; and intelligence, surveillance, and reconnaissance. The United States would also field expanded missile defense capabilities, including additional ground-based interceptor silos at Fort Greely, Alaska, an additional continental U.S. ABM site located somewhere like Fort Drum, Alaska, and additional Theater High Altitude Area Defense (THAAD) deployments.

To present a full range of policy options and corresponding budget impacts, more elaborate and technologically challenging programs, such as an air-launched boost-phase interceptor and constellation of space-based interceptors, are also considered. These more exquisite options vary widely in terms of technical feasibility and costs. The air-launched interceptors, for example, could be paired with either fourth- or fifth-generation aircraft for intermittent patrols with existing fleets or have dedicated F-35s for more persistent defense capabilities.[82] The options for space-based systems vary even more widely. In fact, some estimates predict a limited constellation of roughly 24 satellites could provide some kind of

partial boost-phase intercept coverage, while global coverage could demand up to 960 satellites.[83] Technical and political hurdles to these space systems would likely be significant, even for the longer horizon (2031–2036) considered in this study.

Feasibility. Approach 4 presents a hypothetical future that some may view as a radical departure from the decades-old practice of nuclear arms control between the two major powers. In the U.S. domestic context, the "grand bargain" that approved a major triad modernization was reached with bipartisan support in the context of a continued commitment to arms control.[84] Turning away from arms control could thus undermine previous bipartisan support for U.S. nuclear plans. Internationally, multiple U.S. allies have similar stances, exchanging their support for specific nuclear policies with the understanding that arms control agreements would also be a critical part of limiting overall nuclear risks. The public reaction from allies such as Germany could force influential partners also to push back against this new direction in U.S. policy.

From another perspective, however, this approach is a pragmatic or even likely extension of the current trend that has seen the ABM and INF treaties unravel. A realistic appraisal of the increased tensions among the Great Powers could lead to the conclusion that important arms control conditions may not be enforceable or could be too constraining for the United States to adequately address global security concerns from both near-peer and asymmetric threats.[85]

Estimated Force Postures. Tables 8 and 9 summarize potential strategic force posture changes in a world unconstrained by a binding U.S.-Russian agreement. Given the timeframe for this study, which extends to 2036, significantly diverging postures from today would not be fully possible due to the time required to develop and field new weapons systems. The approximate force postures mostly make use of available systems and warheads—some refurbished and put back into service after being in storage and some with additional modifications maximizing the capacity of currently fielded strategic launchers. The most dramatic changes could take place outside of strategic weapons. Potential changes in Russia's NSNW posture, easily achievable based on its large arsenal currently in storage, are not specifically shown but are considered against the analytical criteria. Potential U.S. advances in BMD, precision strike, and other nonnuclear strategic technologies

Table 8. Approximate U.S.-Deployed Force Structure: Approach 4

Timeframe: 2026–2031	Total Launchers	Deployed Launchers	Deployed Warheads	Timeframe: 2031–2036	Total Launchers	Deployed Launchers	Deployed Warheads
ICBMs	450	450	800–1,100	ICBMs	450	450	800–1,100
SLBMs	240	200	1,000–1,200	SLBMs	212	212	1,060–1,272
Strategic Bombers	66	Up to 55	Up to 55	Strategic Bombers	96	Up to 80	Up to 80
Total Account-able	788	788	1,955–2,355	Total Account-able	798	720	1,950–2,462

Sources: Vince Manzo, *Nuclear Arms Control Without a Treaty? Risks and Options After New START* (Arlington, VA: CNA, March 2019); *Navy Columbia (SSBN-826) Class Ballistic Missile Submarine Program: Background and Issues for Congress*, R41129 (Washington, DC: Congressional Research Service, January 15, 2021).

Note: Changes in the near-term include reactivating four launch tubes on the *Ohio*-class SSBNs and redeployment of up to all 50 ICBMs currently in storage (Manzo, 51–53). For 2031–2036, updated changes are again based on Manzo (51–53) and include converting 30 conventional B-52 bombers back to nuclear status. Additional details on changes include:

SSBNs:

2026–2031. According to the Navy's latest projections, the SSBN force will decline to 12 boats in FY29 due to *Ohio*-retirements prior to the first *Columbia* delivery, scheduled for 2031 (CRS R41129, 6–7). The estimated force structure reflects 10 boats remaining operational with a range of potential total warhead deployments by varying average warhead loads per SLBM from 5 to 6.

2031–2036. Reduction in overall fleet size due to the *Ohio* to *Columbia* transition (predicted to reduce the entire SSBN fleet to 11 boats [CRS R41129, 6–7]) is mitigated by accelerating the planned procurement for the second or third SSBN sometime in FY24–26. The deployed forces are assumed to comprise all 7x *Columbia*-class and 5x *Ohio*-class boats. A range of warhead deployments is again shown with augmented force postures averaging between 5 and 6 warheads per SLBM.

ICBMs:

2026–2031. The 50 nonoperational/vacant silos are put back into operational status, and ICBMs are armed with multiple warheads using the total available stockpile of W78 and W87 warheads. The higher numbers indicate an additional increase by returning a large number of the 340 W87s currently in storage back into service (Manzo, 51–53) regarding 800 warhead plans.

2031–2036. Similar to the 2026–2031 projections, assumes GBSD missiles replace legacy MMIII at a one-to-one basis.

Bombers:

Some combination of reconfiguring B-52H bombers (30 aircraft are currently in service that were previously converted to conventional status as part of New START) or fielding additional nuclear-capable B-21s is undertaken to increase the fleet by 30 launchers.

Key: GBSD: Ground Based Strategic Deterrent; ICBM: intercontinental ballistic missile; SLBM: submarine-launched ballistic missile

Table 9. Approximate Russian-Deployed Force Structure: Approach 4

Timeframe: 2026–2031	Deployed Launchers	Deployed Warheads	Timeframe: 2031–2036	Deployed Launchers	Deployed Warheads
ICBMs	302	1,226	ICBMs	302	1,226
SLBMs	Up to 160	600–720	SLBMs	Up to 160	600–720
Strategic Bombers	55	55	Strategic Bombers	55	55
Total Accountable	517	1,881–2,001	Total Accountable	517	1,881–2,001

Sources: Vince Manzo, *Nuclear Arms Control Without a Treaty? Risks and Options After New START* (Arlington, VA: CNA, March 2019); Hans M. Kristensen and Matt Korda, "Russian Nuclear Forces, 2020," *Bulletin of the Atomic Scientists* 76, no. 2 (2020), 102–117.

Note: Changes in the near term follow Manzo (52–54) and include maximizing ICBM warhead loading, a modest increase in SLBM warhead loads and deployment of additional *Borei*-class SSBNs. For 2031–2036, the lower bound reflects changes again based on Manzo (52–54) noting continued increases to deployed SLBM warheads (up to 720 maximum based on current arsenal estimates) as well as making more bombers in the inventory operationally ready.
The upper bound in 2031–2036 considers an extra 50 ICBM launchers mixing single-warhead and multiple-warhead systems for a total increase in approximately 250. The additional ICBMs are based on Kristensen and Korda (105–106) who quote a Russian official stating a total of 400 ICBM launchers were available, likely referring to the total inventory; the numbers assume some fraction of these 400 are not deployed for maintenance and sparing.

Key: ICBM: intercontinental ballistic missile; SLBM: submarine-launched ballistic missile

are similarly discussed but are not explicitly shown. Despite potential impacts to China's modernization plans, this study assumes Beijing would continue on a trajectory such as that shown in table 4 in the case of Approach 4, but could accelerate or augment its plans.

Analysis and Results

An evaluation of each approach against the five criteria follows. Due to the qualitative nature of this study, different perspectives, theoretical frameworks, or assumptions could lead to different conclusions. Potential points of contention and important caveats that highlight these different perspectives are noted throughout the discussion to provide balanced consideration. Tables 10 through 13 provide a summary of analysis results for each approach. Table 14 presents AWSM comparisons of total arriving warheads in hypothetical strategic force exchanges between the United States and Russia under the assumed force struc-

Table 10. Analysis Summary for Approach 1

	Strategic Stability	Extended Deterrence	Proliferation	Cost	Competitive Advantage	Political Feasibility
Bilateral Strategic Arms Limitations	Positive	Neutral	Neutral	Neutral	Neutral Negative	Likely

Table 11. Analysis Summary for Approach 2

	Strategic Stability	Extended Deterrence	Proliferation	Cost	Competitive Advantage	Political Feasibility
Long-Term Multilateral Reductions	Neutral Negative	Negative	Neutral	Positive Neutral	Positive Neutral	Unlikely

Table 12. Analysis Summary for Approach 3

	Strategic Stability	Extended Deterrence	Proliferation	Cost	Competitive Advantage	Political Feasibility
Bilateral Nonratified Frameworks	Positive	Positive	Neutral	Neutral	Positive	Likely
	Neutral	Neutral	Negative	Negative	Neutral	Less Likely

Table 13. Analysis Summary for Approach 4

	Strategic Stability	Extended Deterrence	Proliferation	Cost	Competitive Advantage	Political Feasibility
Pursue Nuclear Superiority	Negative	Negative	Negative	Neutral Negative	Negative	Less Likely Unlikely

tures in each arms control approach. This information provides some additional quantitative information to help shape the results, particularly strategic stability and extended deterrence considerations.[86] The overall results from this exercise are summarized in the conclusion in table 15.

Table 14. AWSM Comparison of Strategic Force Exchanges

Total Arriving Warheads for the United States and Russia Under Various Deployed Force Limits		
Approach 1. Deployment Limit: 1,550		
	U.S. Response to Russian First Strike	Russian Response to U.S. First Strike
GEN-LOW	1,275	1,062
GEN-ROA	911	607
DAY-LOW	955	591
DAY-ROA	615	101
Approach 2 (2026–2031). Deployment Limit: 1,000		
GEN-LOW	830	830
GEN-ROA	563	538
DAY-LOW	622	401
DAY-ROA	379	78
Approach 2 (2031–2036). Deployment Limit: 500		
GEN-LOW	411	424
GEN-ROA	293	213
DAY-LOW	286	262
DAY-ROA	192	39
Approach 4 (2026–2031). Maximum Forces		
GEN-LOW	2,114	1,729
GEN-ROA	1,223	1,205
DAY-LOW	1,530	977
DAY-ROA	639	454
Approach 4 (2031–2036). Maximum Forces		
GEN-LOW	2,199	1,959
GEN-ROA	1,308	1,232
DAY-LOW	1,562	1,204
DAY-ROA	671	476

Key: GEN-LOW: forces are on generated alert and launched on warning; GEN-ROA: forces are on generated alert and riding out the attack; DAY-LOW: forces are on day-to-day alert and launched on warning; DAY-ROA: forces are on day-to-day alert and riding out the attack.

Approach 1: Bilateral Strategic Arms Limitations

Summary. This approach presents one of the more politically feasible paths and maintains strategic stability with Russia as currently understood. However, continued adherence to a New START–like paradigm potentially fails to address

Table 15. Relative AWSM Exchange Results

Total Arriving Warheads for the United States and Russia Under Various Deployed Force Limits		
New START/Approach 1. Deployment Limit: 1,550		
	U.S. Response to Russian First Strike (%)	Russian Response to U.S. First Strike (%)
GEN-LOW	82	69
GEN-ROA	60	39
DAY-LOW	62	38
DAY-ROA	40	7
Ratio Comparing Percentage of Initially Deployed Warheads Arrving in Each Scenario to That Same Metric in Current 1,500 Limit Baseline		
Approach 2 (2026–2031). Deployment Limit: 1,000		
GEN-LOW	1.01	1.21
GEN-ROA	0.93	1.37
DAY-LOW	1.01	1.05
DAY-ROA	0.96	1.20
Approach 2 (2031–2036). Deployment Limit: 500		
GEN-LOW	1.00	1.24
GEN-ROA	0.97	1.09
DAY-LOW	0.93	1.37
DAY-ROA	0.97	1.20
Approach 4 (2026–2031). Maximum Forces		
GEN-LOW	1.09	1.26
GEN-ROA	0.86	1.54
DAY-LOW	1.05	1.28
DAY-ROA	639	454
Approach 4 (2031–2036). Maximum Forces		
GEN-LOW	1.09	1.27
GEN-ROA	0.88	1.40
DAY-LOW	1.13	1.40
DAY-ROA	0.69	3.24

Note: Results are a percentage of initially deployed forces arriving on target, baselined against this ratio for the current New Start postures.

Key: GEN-LOW: forces are on generated alert and launched on warning; GEN-ROA: forces are on generated alert and riding out the attack; DAY-LOW: forces are on day-to-day alert and launched on warning; DAY-ROA: forces are on day-to-day alert and riding out the attack.

other important considerations, including negative trends related to other technologies, nuclear-conventional entanglement, and China's expanding and modernizing arsenal.

Strategic Stability: Positive. As designed, the focus of this approach on maintaining existing bilateral strategic stability with Russia would likely hold the line on this criterion as currently defined. Additionally, the verifiable warhead freeze and increased transparency on Russian NSNWs (exchanged for similar measures on the EPAA BMD systems in Europe) would improve on noted shortcomings with New START. The continued incorporation of data exchanges and accountability for new strategic systems would also maintain or even improve stability in the years ahead, helping to mitigate future arms race issues related to future weapons with strategic range. The AWSM results support this status quo approach; under a potential worst-case strategic exchange with Russia, where the United States is in a typical day-to-day force posture and elects to ride out the attack, the arriving U.S. warheads in retaliation would number just under 700 (see table 14), indicating a secure second strike capability.[87] Assuming that the current situation is neutral as a baseline, the continued maintenance of stability through a secure second strike, the verifiable warhead freeze, and incorporation of some considerations for NSNWs warrant a positive rating.

Caveats to this positive rating are based on two principal issues: the role of China in future strategic stability considerations and the impact of continued developments of nonnuclear technologies. These two topics underscore that there are considerations for strategic stability in a changing and multipolar world that current definitions may not fully address as the United States, for the first time in history, competes concurrently with two potential near-peer nuclear powers. Under the analytical framework defined in this study, which leverages more traditional definitions of strategic stability, these impacts from China's increasing arsenal and evolution in other strategic technology are more appropriately weighed under extended deterrence and global competition.

Extended Deterrence: Neutral. For European allies, the new transparency on Russian NSNWs would positively influence regional stability and extended deterrence. However, the caveats related to nonnuclear technologies indicate these

benefits could be negated by other concerns. In Europe specifically, Approach 1 would not address pressures on stability from nonnuclear technologies and potential escalation pathways between NATO and Russia stemming from gray zone operations or actions in cyberspace.[88] The U.S.-Russian collaboration required to make Approach 1 a reality would offset some of the risks in this regard, but the overall trend would likely be more tenuous than now due to growing reliance on cyber and space domains and continued introduction of new technologies through 2036 that would not be captured under the more narrow construct of this New START–like regime.

Meanwhile, U.S. allies in East Asia could face increased security dilemmas based on China's nuclear and conventional force increases (see table 4). Since this approach does nothing to improve communication or risk-mitigation paths between Washington and Beijing, any increases in China's forces could prompt similar changes in the U.S. footprint in the region to reassure allies. Such a scenario could degrade U.S.-Chinese relations or initiate a tense action-reaction cycle. Conversely, the stability provided by this regime could help the United States better focus on regional deterrence against China, even though the approach itself does nothing to change the current dynamic between these nations. These potential issues with Russia and China offset the extended deterrence gains otherwise accomplished under Approach 1, indicating a neutral rating is a reasonable compromise among competing factors.

Proliferation: Neutral. As with extended deterrence, Approach 1 would lead to competing positive and negative effects on proliferation. On the positive side of the ledger, continued, legally binding limits on the top two nuclear powers—boosted by a new freeze on total stockpiles—would support NPT Article VI commitments for the benefit of the entire NPT regime.[89] U.S.-Russian collaboration in this approach could also foster teamwork to restrain other proliferators, as demonstrated under the multilateral JCPOA before the unilateral U.S. withdrawal by the Trump administration. The negative impacts again would primarily result from China's nuclear program. If China's forces grow under the predicted trajectory (table 4), or indeed if Beijing undertakes a more aggressive nuclear program, then India would likely augment its nuclear programs, for example.

This would prompt secondary effects in Pakistan, for example, by increasing proliferation risks across Asia.[90] This mix of positive and negative steps in supporting nonproliferation again indicates no real net change from today's status quo and a neutral rating.

Cost: Neutral. At face value, this approach would have no major deviations from projected U.S. modernization plans, substantiating a neutral change by default. The CBO reports that a combination of improving estimates for maturing DOD and DOE programs and historical cost increases on analogous weapons efforts could increase the nuclear budget by $62 billion (or 14 percent) through 2028.[91] Projecting out over the timespan considered in this study, these increasing cost trends could be exacerbated as major milestones for GBSD are met, DOE infrastructure and warhead programs mature, and *Columbia*-class SSBNs and B-21 bombers enter production and fielding. However, these cost increases would not result from this arms control approach specifically and are more of a general risk associated with any large DOD program. The baseline neutral rating is thus warranted in this case.

Competitive Advantage: Negative to Neutral. Although the impacts from unchecked Chinese defense programs and continued advances in nonnuclear technologies are difficult to predict for strategic stability, these trends are likely to increase the intensity of overall geopolitical competition. This type of competition could favor China, given current economic growth rates and the relative resources at Beijing's disposal. If U.S. nuclear modernization programs continue projected cost overruns, Washington would be further limited in allocating resources to compete equally in important nonnuclear technologies. Under this approach, some U.S.-Russian competition could be blunted due to continued mutual engagement on strategic limitations. Russia, however, would still be likely to find other ways to combat U.S. technological superiority through its suite of exotic programs, such as the Burestevnik cruise missile or Poseidon nuclear-unmanned submersible, while carrying on destabilizing (and cost-effective) actions in cyberspace and other associated gray zone activities. These efforts from Russia could erode U.S. advantages in traditional domains or at least put additional pressures on America as it competes multilaterally. Assuming no significant improvements

in U.S. economic growth over recent turbulent cycles, it is difficult to see how the overall contours of competition would improve under an approach that essentially tries to maintain the status quo in the face of increasing competitive pressures for a negative relative change.

One caveat is that the United States could potentially take advantage of these trends for positive outcomes. For instance, U.S.-Russian cooperation on strategic arsenals and the growing threat from China could be leveraged to defuse additional bilateral U.S.-Russian tensions in other areas, opening ways to collaborate better to constrain or pressure China. Additionally, the case could be made that an extended New START–like regime would provide a foundation to provide transparency on, or even limit, some of the Russian systems that are currently not accountable. These developments would at least maintain the status quo in this era of GPC for an upper-bound neutral rating.

Approach 2: Long-Term Multilateral Reductions

Summary. Approach 2 would be difficult to achieve without a breakthrough in international relations, but the proposed two-step process provides a possible pathway. Yet without assuming the more benign security environment required to make this approach a reality, the resulting arms control outcomes would result in negative changes across evaluated criteria. Specifically, the vast reductions in U.S. nuclear forces would present risks to strategic stability and extended deterrence, while the specific focus on nuclear arsenals may not adequately address new technologies in a way that positively affects U.S. competitive advantage.

Strategic Stability: Negative to Neutral. Approach 2 retains U.S.-Russian stability while bringing China into an official framework.[92] Strategic exchange calculations show that a secure second-strike capability remains for both the United States and Russia with little relative change from the percentage of arriving forces compared to today's New START–limited regime (tables 14 and 15), supporting a neutral rating. One possible destabilizing trend can be considered under Russia's worst-case scenario (day-to-day forces and electing to "ride out" the attack under the 500 warhead limit), in which "only" 39 warheads would reach targets in the United States. At this low number, Moscow could argue that U.S. BMD systems

and conventional prompt-strike capabilities present a destabilizing "splendid" first-strike capability. The potential erosion of Russia's second-strike capability could also foster a "use them or lose them" scenario in a major crisis.

From the U.S. perspective, the vastly reduced warheads could generate vulnerabilities beyond the primary U.S.-Russian dynamic from China or rogue regimes. U.S. Strategic Command (USSTRATCOM) leaders have highlighted the command has a built in "margin" at New START levels for deterrence beyond bilateral competition. At a 500-warhead limit and facing both Russian and Chinese arsenals with rough numerical parity, this margin would clearly be severely challenged.[93] These considerations warrant the inclusion of a negative lower bound.

Hypothetically, the new geopolitical environment required to foster such a multilateral treaty regime would be characterized by reduced risks of conflict, supporting strategic stability in a more holistic sense despite these smaller nuclear force margins. Looking beyond strategic stability, this theorized regime would strongly reduce the incentive for arms racing if the parties abide by the agreement's conditions. Assuming Russia continues to view strategic stability as a barometer reflecting bilateral relations, Moscow could see the limits under Approach 2 as being positive changes if accompanied by increased détente with Washington. These considerations imply positive impacts from Approach 2, yet they violate the methodology of this study, which focuses on comparing potential impacts relative to today's status quo resulting *from* each arms control approach and not the assumed international conditions required *for* new agreements. These more holistic considerations thus should not be used to adjudicate potential impacts. The overall relative changes to strategic stability directly related to Approach 2 thus range from neutral to negative.

Extended Deterrence: Negative. The reduced role of nuclear weapons and collaboration with potential adversaries are steps under Approach 2 that could reassure allies and reduce risks to extended deterrence. In comparison with the contemporary status quo, however, the degraded ability of the United States to concurrently deter Russia and China would generate concerns from allies about the credibility or effectiveness of U.S. deterrence guarantees. The United States could make up for these concerns with expanded conventional force deployments.

Yet such an increased American footprint could spur additional tensions or escalation possibilities, again damaging extended deterrence in a self-fulfilling security dilemma. From today's perspective, these concerns would be severe enough to warrant a solidly negative rating regarding the perception of U.S. extended deterrence capabilities.

Proliferation: Neutral. The major reductions in U.S. and Russian arsenals and caps on other P5 nations could heavily dampen some proliferation pressures. The necessary multilateral cooperation for this approach could also open additional pathways to address proliferation threats in North Korea and Iran. This regime would also significantly bolster the NPT for continued multinational nonproliferation cooperation. However, if extended deterrence was perceived to be weaker due to the relatively reduced margins of U.S. nuclear forces, latent powers could proliferate in order to secure their own stability. These competing trends would likely cancel each other out for a tenuous neutral rating compared to proliferation threats today.

Cost: Neutral to Positive. As summarized in table 5, a potential force structure under the major reductions in Approach 2 would still include a triad but would heavily draw down U.S. ICBMs. Ignoring some of the costs required for decommissioning silos and missiles, the initial phase for this approach (2026–2031; a 1,000-deployed warhead limit with 300 ICBMs) would result in an average annual savings of $500 million in the mid-2020s, growing to $4.4 billion later in the decade even without reducing planned GBSD purchases then.[94] Around this same time, Washington could also cancel the last two planned *Columbia*-class SSBN purchases, saving an additional $21 billion over several years.[95] In the second phase (2031–2036; a 500-deployed warhead limit with 115 ICBMs), these savings would increase as ICBMs continue to be retired and savings from operating and sustaining a smaller triad are realized. Looking at CBO predictions of annual costs—which are broken down by operations, sustainment, and modernization—and scaling the first two categories down by the new relative force sizes, additional savings would add up to approximately $800 million annually for SSBNs and $1.1 billion annually for ICBMs.[96] By that point, the GBSD purchases would also be curtailed. This reduction would not affect the budget allocated for research, development,

initial production, and some nonrecurring DOE costs. These GBSD savings can be roughly estimated by multiplying the average unit costs of $53 million per missile against a decrease of roughly 450 planned purchases for an additional $23.8 billion savings spread over the early 2030s.[97]

The CBO's estimated total nuclear budget over the two phases considered in this study is approximately $240 billion (2026–2031) and $254 billion (2031–2036). Combining all the savings outlined herein, the total over the entire 10-year period is roughly $80 billion, or just over 16 percent of the $494 billion total. Although these rough estimates indicate a positive cost impact for Approach 2, Washington could instead be forced to dramatically increase spending on conventional forces to make up for any instability resulting from nuclear force reductions. The budget impacts in this regard are difficult to estimate but could offset any cost savings for a lower bound neutral rating.

Competitive Advantage: Neutral to Positive. Even with a more benign geopolitical environment in Approach 2, competition in nonnuclear technologies would certainly continue. Cost savings from nuclear program cuts could ensure the United States is better positioned to maintain competitive advantage by increasing funds for key nonnuclear technologies. There is also a strong constructivist argument that in achieving this new multilateral arms control regime, the U.S. leadership could increase its prestige and strengthen America's ability to compete in reinvigorated alliances and international institutions. However, the security concerns discussed in strategic stability and extended deterrence could overwhelm these positive developments. These complicated resulting dynamics offer mixed impacts, but assuming the United States can better capitalize on reduced nuclear competition and international prestige, impacts ranging from neutral to positive are logical conclusions.

Approach 3: Bilateral Non-Ratified Frameworks

Summary. This approach would sidestep some of the political obstacles to a fully ratified treaty and provide flexibility for the United States to adjust programs and force postures in response to changing international dynamics. The conditions for Approach 3 would provide transparency to support mutual U.S.-

Russian restraint on strategic nuclear forces while also expanding dialogues on nonnuclear technologies. This improved dialogue could address significant issues that are not typically covered under more orthodox strategic stability frameworks. Risks abound without the backing of a legally binding regime, but these could be somewhat offset by the flexibility U.S. leaders would have to respond in kind to any negative developments from Russia or China.

Strategic Stability: Neutral* to Positive*. (These ratings are noted with a relative asterisk to acknowledge the assumptions regarding mutual U.S.-Russian restraint around New START levels, which although plausible, still go beyond specific assumptions that impact the other analyzed approaches.) As defined, Approach 3 presumes there would be some mutual interest between the United States and Russia to maintain parity at approximate New START limits. Even without a formal verification framework, mutual interest in strategic risk reduction, NPT commitments, or cost savings could make continued maintenance of roughly New START levels possible. Even if this proves untrue, both sides would still have interest in keeping up communication channels that could be leveraged to preserve some degree of strategic stability and avoid any major force posture changes. These channels could be used to set up a range of potential exchanges, including additional prenotification standards, remote emulation of inspections, aggregate force level declarations, or more in-depth data transfers to strengthen mutual restraint despite the lack of more thorough inspections.[98] Emerging technologies and publicly available information could offer creative ways to support this new postverification regime as well.[99] Taking a page from the PNI precedent or the interim restraint policy employed during SALT II discussions, U.S. and Russian leaders could work on executive agreements, public pronouncements, or nondenial pledges to mitigate risks of arms racing in a post–New START world.[100] If these nontreaty measures proved insufficient for maintaining parity or stability, the United States would retain the ability and the freedom to respond accordingly, thus hedging against risks to upholding a secure second-strike capability.

Approach 3 is also designed to mitigate risks in other areas not explicitly covered under traditional strategic stability definitions. The specific conditions, not fully specified in this theoretical treatment, could include a range of risk reduction

measures that would be pursued under the more flexible framework, targeting areas such as space, cyberspace, and NC3. Increased dialogue on these strategic but nonnuclear technologies could help mitigate a destabilizing arms race while addressing risks and escalation in new areas.

The flexibility in this approach is also intended to finally bring China into bilateral discussions with the United States, further reducing tensions that could otherwise affect both regional and strategic stability. Given that the United States has never had to concurrently deter two near-peer nuclear rivals, any sort of opening to build discussion channels or actual arms control agreements with China could prove to be positive developments. Arms control proved to be useful in avoiding risks and channeling competition during the ebbs and flows of U.S. relations with the Soviet Union and Russia and thus might prove critical in this dynamic new era. Overall, the impacts from Approach 3 are more ambiguous to estimate through more traditional strategic stability considerations as used in this study, but continued dialogues with Russia, expanded relations with China, and flexibility to respond to any major changes in the strategic landscape imply this approach would do no worse than maintaining today's status quo for a neutral rating while offering benefits that could prove positive as well.

Extended Deterrence: Neutral to Positive. Assuming the U.S. and Russia adhere to the spirit of this agreement regarding strategic forces, this approach would offer increased transparency on nonnuclear strategic technologies for both Russia and China and remove ambiguity to clarify and potentially defuse escalation pathways. The net effect on extended deterrence from these new bilateral U.S.-Russian and U.S.-Chinese dialogues could prove a positive development. Conversely, relying on mutual restraint to maintain the overall stability currently provided by New START entails some risks—noted in the previous section—that allies could perceive as a negative trend. These impacts offset for a lower bound neutral impact.

Proliferation: Negative to Neutral. Executive agreements and ongoing dialogues to aid mutual U.S.-Russian restraint would minimize certain proliferation risks, but these may not be enough to fully support NPT Article VI commitments without a legally binding regime. The expanded discussions on nonnuclear tech-

nologies, though important for overall escalation management, would similarly have limited impacts on the NPT regime or other regional proliferation issues. Although the new framework proposed under Approach 3 could positively affect the calculus of latent powers allied with the United States, this treaty regime would be more limited in influencing other potential proliferators in Southwest Asia or the Middle East. Without a binding treaty securing U.S.-Russian cooperation, multilateral steps to address other proliferators could also be limited. The net effect would likely be neutral, but some of these impacts also warrant a negative consideration as a realistic floor.

Cost: Neutral to Negative. Similar to Approach 1, there would be no major deviations from projected U.S. modernization plans, keeping these costs neutral. In the case where mutual restraint and the proposed additional measures proved unsuccessful at fully blunting an arms race, the United States could pursue its own additional forces as appropriate with potentially increased budget impacts. The lack of a thorough verification regime, which would expire in this scenario along with New START, could require increased spending on intelligence collection and analysis.[101] These potential changes are difficult to quantify, but the overall potential for increased spending in these areas indicate Approach 3 could have a neutral to negative effect on defense costs.

Competitive Advantage: Neutral to Positive. The transparency measures and dialogue on nonnuclear technologies could play an important role in managing competition in these areas and help rein in multidomain competition. This approach also enables new discussions in the case of the U.S.-Russian dynamic and an entirely new framework for U.S.-Chinese relations. These connections could foster improvements that would dampen competition or build pathways for new legally binding agreements. Noting the potentially significant caveats and risks in a regime that lacks full legal ratification, if even a handful of the major conditions proposed under Approach 3 are adhered to, the result would have positive changes in the velocity and direction of GPC. The inclusion of a neutral lower bound acknowledges the significance of these caveats and risk potential.

Approach 4: Pursue Nuclear Superiority

Summary. If geopolitical tensions continue to worsen and obstacles to a ratified treaty remain, there could be pressures for augmented strategic competition proposed under Approach 4. This approach would undoubtedly increase costs while potentially undermining key aspects of strategic stability, extended deterrence, and nonproliferation. The outcome regarding U.S. competitive advantage would likely be mixed.

Strategic Stability: Negative. Approach 4 would depart from the current thinking on strategic stability and seek to replace it through nuclear superiority. Under traditional definitions, mutual U.S.-Russian vulnerability would still be valid, but the lack of the framework provided by arms control would increase the potential for action-reaction cycles. The associated effects from this change could expand the scope of possible arms racing and also present new risks to crisis stability.

Specific AWSM estimates (tables 14 and 15) under likely future force postures (tables 8 and 9) also show negative trends through 2036 for the United States under this proposed regime.[102] Strategic exchange calculations under the augmented force postures for Approach 4 result in a larger relative percentage of arriving Russian warheads than under New START and a smaller relative percentage of arriving U.S. warheads as well (see tables 14 and 15) in two specific scenarios. These results stem from two intersecting trends in this scenario. The first trend results from U.S. SSBN modernization timelines that result in a reduced number of available submarines in the mid-2030s, negatively impacting an area where the United States currently has a marked advantage. Simultaneously, Russia would be able to make the most of either warheads in storage or warheads available through production rates that have been maintained in recent years to potentially make larger increases to MIRVed ICBM forces. This net change, negative for the United States and positive for Russia, results in the degraded surviving weapons ratios relative to an exchange under New START limits in future exchanges under Approach 4 (table 15). Looking beyond force structures, Russia's broader considerations of stability, which account for the intensity and velocity of competition with the United States, would result in similarly negative views of strategic stability even if Moscow did gain a slight advantage in deployed forces.

These results substantiate a negative relative change to strategic stability when compared to today's status quo.

There are arguments for the stabilizing effects of a more robust nuclear force posture, such as the positive impacts to credibility, the ability to hold more of a competitor's targets at risk, and improved capabilities along the escalation "ladder" in a crisis. However, the predicted force structures, AWSM results, increased risks from arms racing, or degraded crisis stability indicate these effects would not be easily realized under Approach 4. The result is an overall negative change to strategic stability.

Extended Deterrence: Negative. Approach 4 would field larger nuclear forces, indicating a more capable and credible U.S. extended deterrence guarantee. However, the lack of an associated arms control framework would exacerbate cross-cutting domestic and international pressures among NATO and East Asian allies on nuclear issues, undermining U.S. deterrence. Some allies would potentially welcome additional BMD deployments and a larger U.S. nuclear force posture possible under this approach, but this would likely only constitute the minority opinion.[103] Furthermore, resulting force posture increases in Russia and China would intensify regional security issues for European and Asian allies, putting U.S. extended deterrence at more of a disadvantage rather than improving it. In the more competitive environment under Approach 4, Russia could easily more aggressively posture its large NSNW arsenal, for example, further complicating deterrence and escalation management for the United States. These considerations imply overall negative changes from today's already complicated extended deterrence situation.

Proliferation: Negative. The lack of nonproliferation efforts from the nuclear superpowers and the corresponding larger force postures from the United States, Russia, and China would exacerbate regional issues and proliferation pressures. The secondary and tertiary effects from these impacts could prompt cascading proliferation among current declared states and potential proliferators. These trends, and the lack of U.S.-Russian leadership in arms control, would severely challenge the NPT as well. These effects could even conceivably threaten the continued existence of this multinational agreement. Advocates of nuclear superiority would contend

that the larger U.S. arsenal could be used for more effective coercive or compellent strategies to combat potential proliferators.[104] However, the United States already enjoys a marked advantage over rogue regimes in North Korea and Iran, and this has proved to be limited in curbing their nuclear ambitions. These impacts highlight another negative change from the U.S. perspective.

Cost: Neutral to Negative. As summarized in table 8, there are a range of total deployed force structures the United States could pursue under a push to achieve nuclear superiority simply by maximizing available forces. The CBO estimates that expanding U.S. forces through such steps would not increase DOD costs relative to current plans.[105] One minor caveat is that the proposed force structure in table 8 accelerates a *Columbia*-class SSBN purchase, shifting these funds left by 2 to 4 years but otherwise not affecting the total budget considered through 2036.

Although the negligible cost impacts support the plausibility of an improved force posture under Approach 4, the AWSM results (discussed under strategic stability above and summarized in tables 14 and 15) show that increases to even 2,400 deployed warheads may not be enough to achieve a desirable margin for nuclear superiority. In this case, expanded measures would be required to aim for 2,700 or even 3,900 deployed warheads, returning the U.S. arsenal to START II or START I levels, respectively. The CBO estimates a return to START II–like levels would have relatively modest cost impacts, adding $100 million in one-time costs and an additional $5 billion in annual operating costs over the timeframe considered for this study.[106] But implementing START I–like forces would "nearly triple" what DOD is planning to spend on modernization in upcoming years, putting significant pressures on defense budgets.[107]

Missile defense would be another important budget consideration for Approach 4. Currently, U.S. missile defense plans are postured against threats from rogue regimes. Yet these systems would potentially have a much more important role in helping the United States compete against Great Power rivals in a world where nuclear superiority is a top priority. Even more so than the possible routes for increased strategic nuclear forces, missile defense options present a diverging range of potential costs. A modest set of new BMD programs, such as adding 20 silos to Fort Greely, installing a new ground-based interceptor base in a location

such as Fort Drum, and fielding four additional THAAD systems total in Europe and Asia would increase the missile defense budget by roughly $12 billion in procurement costs and another $1 billion in operating costs through 2036.[108] These steps could be complemented by more technologically challenging and costly programs, encompassing anything from a new air-launched boost-phase interceptor (with or without dedicated aircraft for varying degrees of patrol coverage) to a space-based boost-phase interceptor supported by anywhere from 24 to 960 satellites.[109] The cost excursions along this spectrum of options are fairly significant as the CBO summarizes, increasing from tens of billions to hundreds of billions of dollars over the next 20 years. At the lower end, such programs would be under the 15 percent increase to planned budgets, which aligns with a neutral cost impact yet could scale higher for a solidly negative rating as well.

Competitive Advantage: Negative. The preceding categories for Approach 4 tangentially considered other important considerations in this post–arms control treaty regime, namely, Russian advantages in NSNWs and near-term warhead production timelines. Moscow could choose to quickly field a large number of dual-capable INF-range systems and make use of its inventory of approximately 2,000 NSNWs to achieve a robust regional deterrence posture that would be difficult for the United States to overcome. Combined with challenges from rapidly modernizing Chinese arsenals, the path for the United States to gain a clear competitive advantage in this multipolar competition is not clear. Potentially, the more extreme missile defense and strategic nuclear arsenal increases noted in the preceding cost discussion could achieve a U.S. force posture that surpasses the capabilities fielded by Great Power adversaries. Yet aside from the cost impacts, even pursuing these options would certainly accelerate the velocity and intensity of competition and arms racing across multiple domains. U.S. efforts in this manner, without any arms control agreements, would also heavily incentivize already budding Russian-Chinese cooperation to further complicate GPC. Overall, these negative trends indicate the strong likelihood that the United States would be in a relatively worse position regarding its competitive advantage in this future regime compared to today.

AWSM Results and Comparisons

Tables 14 and 15 compare the AWSM results for a hypothetical strategic nuclear exchange between the United States and Russia under the force structures derived for each arms control approach. This analytical tool is a decremental model that works by assuming an initial, all-out attack is launched by the opposing side. The surviving and arriving weapons for the retaliatory second strike (after launching on warning or riding out the attack) are then estimated by decrementing initial available forces by multiple ratios in sequence. These ratios roughly account for the survivability, reliability, and accuracy of each weapon system to estimate the final results of this second-strike attack by the side under question. Also in tables 14 and 15, the results under the U.S. column show American second-strike effectiveness after an attack initiated by Russia. The results under the Russia column show the arriving Russian warheads after a U.S. first strike. Approaches 1, 2, and 4 are considered in this AWSM analysis; Approach 3 presumes some mutual restraint to maintain roughly New START–like force limits—which would equate to Approach 1—and was not evaluated independently.

This simplified model shows that both sides have a deterrent second-strike capability under all scenarios. One potential exception is for Russia under Approach 2, where the combination of major reductions and a day-to-day posture after riding out attack results in a scenario where 39 total strategic warheads launched by Moscow reach designated U.S. targets. Although this number represents significant devastation and would likely suffice for a secure second strike, Russia could argue the low number leaves it vulnerable to a combination of U.S. BMD and conventional precision attacks that could resemble a "splendid first strike." As discussed in the Approach 2 summary, this logic would undermine strategic stability from Russia's perspective or could prompt risk-prone "use them or lose them" thinking in a crisis.

A more nuanced consideration of the AWSM results is displayed in table 15. Since the current 2021 "baseline" is used to help adjudicate *relative* differences stemming from each approach in this study, table 15 shows the ratio of arriving warheads compared to this baseline exchange under New START limits.

These ratios were first normalized against the total deployed warheads for a more equivalent comparison across the disparate force structures summarized in tables 2 through 9. The highlighted areas show where Russia is relatively stronger, and the United States is relatively weaker, and only arise in Approach 4. That is, compared to the New START baseline, these are cases where there are large swings that favor Moscow with over three times as many arriving warheads on U.S. targets versus what Russia would achieve under today's New START–limited baseline. These same cases disfavor the United States, where the calculated strike is only about two-thirds as effective proportionally compared to the same attack under a New START–limited force posture. Again, the raw numbers of arriving warheads in table 14 show both sides still have secure second-strike capabilities, but the relative comparison points to a more nuanced comparison vs. today's New START limited status quo.

The driver in these highlighted cases—day-to-day posture and ride out attack under Approach 4—stems from the *relative* advantages Moscow would acquire during the period under consideration in this regime. In the mid-2030s, U.S. SSBN modernization plans leave this leg of the U.S. triad at a nadir in available submarines while, under Approach 4, Russia could make relatively larger increases to MIRVed ICBM forces (see tables 8 and 9 for a summary of these potential force postures). As discussed in the Approach 4 analysis, these results indicate if the United States truly wanted to achieve nuclear superiority, a larger and more expensive nuclear force expansion would be required. If such plans were determined to be cost prohibitive, these two specific scenarios are potential future situations where the relative differences in U.S.-Russian survivability have given the latter a potentially strategic advantage compared to today's status quo. Whether or not this would be destabilizing would be a point of debate that would have to incorporate additional nuclear and nonnuclear considerations for a more holistic picture of the U.S.-Russian balance. At the very least, these two specific scenarios strengthen negative impacts stemming from Approach 4. These results also highlight some hard thinking and careful planning is required before selecting into a world where relatively unconstrained strategic nuclear competition with Russia is a national priority.

Table 16. Analysis Summary for All Approaches

	Strategic Stability	Extended Deterrence	Proliferation	Cost	Competitive Advantage	Political Feasibility
Approach 1	Positive	Neutral	Neutral	Neutral	Neutral Negative	Likely
Approach 2	Neutral Negative	Negative	Neutral	Positive Neutral	Positive Neutral	Unlikely
Approach 3	Positive Neutral	Positive Neutral	Neutral Negative	Neutral Negative	Positive Neutral	Likely Less Likely
Approach 4	Negative	Negative	Negative	Neutral Negative	Negative	Less Likely Unlikely

Conclusions and Recommendations

Table 16 presents a summary of the potential impacts from all four proposed arms control policy approaches. Note that the political feasibility of each approach was not adjudicated as with the other criteria but was discussed in some detail when defining each approach. This discussion on feasibility enumerated many major obstacles to each approach regardless of the overall likelihood summarized in table 16. Looking at the five primary criteria, the results appear mixed for Approaches 1 and 3. Conversely, Approaches 2 and 4 result in more overall negative outcomes. The following paragraphs consider these two predominantly negative policy frameworks—Approaches 2 and 4—before discussing the potentially complementary aspects of Approaches 1 and 3.

Approach 2 results in negative impacts for stability and extended deterrence based on a comparison using the contemporary geopolitical context. Looking beyond the definitions and methodology used in this analysis, it is likely that a global security paradigm marked by the type of cooperation required for the leading nuclear powers to agree to major reductions would be more stable and feature

less competition than today. In such an environment, the potentially negative repercussions that a reduced U.S. strategic posture could have on strategic stability and extended deterrence would be mitigated by this more benign international security environment. In such a world, the benefits of Approach 2 could be realized without the negative repercussions. A constructivist-based approach to arms control and disarmament would also argue that pursuing these reductions could cultivate a feedback loop and actually bring such an environment into being. Dynamic cooperation between the two nuclear powers in this manner could be initiated from reduced international tensions while also catalyzing these same trends to reduce global risks and nuclear program costs and help channel competition into other nonnuclear areas.

A new multilateral agreement such as Approach 2 could be made possible even in a tense geopolitical environment. In this scenario, the leading powers could decide to collectively sideline strategic nuclear competition at some level of mutual stability to mitigate the existential risks of this particular branch of arms racing while still actively engaged in other Great Power struggles. Notably, the limited historical success from unilateral actions in fostering such reductions indicates that a bilateral or multilateral effort would be critical to make these hypothetical situations more plausible.[110] Even with multilateral buy-in, the long-term durability of such a dichotic approach—collaborative on one topic yet still competitive in others—would depend on its legal conditions or require a breakthrough in the perceptual issues that typically drive hedging or outright cheating.[111] These wider considerations for Approach 2 highlight some real factors for future disarmament discussions while reiterating that major nuclear reductions in and of themselves could negatively impact national security priorities.

The negative changes potentially resulting from Approach 4 are more attributable to the approach itself rather than any underlying assumptions. No major hypothetical assertions are required to project how aggressive nuclear posture changes from the United States or Russia would have negative reverberations in an increasingly tense international security environment. However, this analysis has ignored the potential for the overt pursuit of nuclear superiority to help auger an improved arms control agreement. Echoing NATO's Dual-Track efforts in

the 1980s, many of the negative projected impacts from Approach 4 could be turned to positives if done in conjunction with persuasive arguments to foster an improved bilateral or multilateral arms control agreement. Again, history shows that multilateral engagement is key to such an undertaking. Without buy-in from NATO or Asian allies, who could be directly affected by such an approach, its chances of success would be limited. Domestic or constitutional fitness factors for each competitor in such a scenario would play a significant role as well, considering how the moribund Soviet economy proved crucial to the ultimate success of the arms race control dynamic of the 1980s.[112]

Even assuming a united front from the United States and its allies and weaknesses in Russia's domestic economic or political foundation, today's geopolitical context indicates Approach 4 is unlikely to repeat the dual-track success. The projected force postures (see tables 8 and 9) and potential strategic exchanges (see tables 14 and 15) do not point to a clear enough asymmetry that would motivate Russia to seek a new bargain. Statements by Putin possibly indicate the opposite case is true and that Russia's leaders feel their pursuit of destabilizing new systems such the Status-6 Poseidon autonomous submarine or Avangard hypersonic glide vehicle have put Washington at a disadvantage.[113] Even more distressing, Moscow could choose to rapidly employ a large fraction of its NSNWs with intermediate- or short-range systems, increasing its leverage while directly threatening NATO Allies.

Some caveats to this logic are needed, particularly looking beyond the 2036 horizon considered in this paper. Russia's apparently strong hand would depend on the continued long-term stability of its economy and society. Russia is challenged by its reliance on a predominantly oil-based economy, endemic corruption, and declining demographic trends. A significant drop in oil prices or other domestic instability resulting from these pressures could weaken Russia's ability to field the types of forces presumed in table 9 or to continue competing with the United States. Yet the scale of these structural changes would need to be massive to revert Russia back to anything similar to the situation faced by the Soviet Union in the early 1980s and drive the nation to again earnestly negotiate on major nuclear weapon reductions.

With no clear advantage for either side in this scenario in the near term, the chances for a successful dual-track version of Approach 4 require more in-depth analysis of the full range of nuclear and nonnuclear force structure options. As discussed in the previous section, the U.S. nuclear forces shown in table 8 could be fielded with relatively minor deviations to the currently planned modernization budget. To pursue the type of superiority necessary for an edge in negotiations, either expensive increases in nuclear forces or unique BMD or conventional systems would need to be considered. Some mix of measures—missile defense and precision strike are candidates—could help channel competition toward U.S. strengths. The lens of constitutional fitness also reminds that other factors in this type of competition, such as the domestic palatability of these efforts and their ability to prompt negotiations rather than a further arms race, would also be crucial.[114]

Turning attention to Approaches 1 and 3, the analysis indicates how these paradigms should be considered in tandem to make the most of their competing strengths and weaknesses. Extending the current New START–like regime provides a feasible approach to maintain strategic bilateral stability, for example, but fails to address potentially destabilizing trends related to nonnuclear strategic technologies and China's modernizing forces. Approach 3 provides necessary flexibility to make some headway on these issues, offering pathways for dialogue on a broad range of topics that could reduce risks or strengthen stability beyond the purview of a more traditional bilateral regime. Yet such a flexible approach has its own shortcomings, grounded in the lack of ratified legal backing and potentially tenuous maintenance of strategic parity through mutual restraint.

Looking more closely at the evolving nature of strategic stability, table 4 shows how China could field a mix of strategic and INF-range systems by 2036 that add up to roughly a third of the New START–like limits constraining U.S. and Russian forces in Approach 1. Under a potential worst-case strategic exchange with Russia, where the United States is in a typical day-to-day force posture and elects to ride out the attack, the arriving U.S. warheads in retaliation would number just under 700 (see table 14).[115] If the strategic situation called for the United States to deter or retaliate against China as well in such conditions, some would argue that this warhead number would not be sufficient. These arguments are stronger still if

China surpasses current estimates and fields even larger forces. The situation grows even more complicated if Russia and China collaborate to present a combined, coherent, and possibly coercive threat to U.S. interests. An unofficial component of U.S. nuclear policy has been the motivation to be "second to none."[116] Yet in a future world where competition has increased with both China and Russia, strategic and extended deterrence could depend instead on a U.S. nuclear force that is "second to no combination" of strategic competitors. If so, the force differences highlighted in tables 2 through 4 and table 14 may not provide the necessary margin that USSTRATCOM currently relies on. This possible reconsideration of strategic stability hints at the pressures to a construct that is primarily defined bilaterally when a third party begins to field relatively large numbers of forces, implying that some policy changes to more specifically address China may be required to further national security interests.

Additional impacts to Approach 1 from nonnuclear strategic forces are harder to estimate. Potentially destabilizing dual-use systems, such as the Russian Avangard hypersonic glide missile, would likely be captured under an ongoing New START–like regime.[117] However, the future proliferation of other ground-launched hypersonic missiles or air-launched glide vehicles is difficult to predict, as is the best approach to incorporate such weapons under a verifiable control regime.[118] In the context of Russia's INF-violations in testing and deploying the 9M729 missile, there is reason to think an arms race is possible with or without a specific agreement over new substrategic classes of weapons.[119] Yet even these hypersonics-related questions are likely easier to take into consideration than more exquisite and diffuse technologies leveraging space, cyberspace, or artificial intelligence.[120] The narrow and traditional definition of strategic stability in this study is not well-suited to consider the impacts of these various new technologies. By extension, Approach 1, grounded in this orthodox perspective, does little to address these technologies as well.

Notably, Approach 1 and Approach 3 were made disparate by definition in this study to enable more distinct comparison. The shortcomings for Approach 1 in addressing China and nonnuclear technologies could be addressed in reality by combining a more traditional arms control agreement with the broader terms

captured in this study under Approach 3. Taking the best elements of each illustrates a potentially fruitful path looking forward. The ratified nature of a New START–like regime with its accompanying verification measures benefits traditional trategic stability and keeps extended deterrence guarantees and proliferation pressures at least at the levels they are at today. Meanwhile, the additional topics addressed through separate bilateral measures aimed at Russia and China provide pathways to ameliorate other important risks. Indeed, the advantages of keeping New START while working to improve it by adding further topics to independent bilateral agendas with Russia and China appear to be animating the arms control agenda for the Joseph Biden administration.[121] The analysis in this study supports the logic behind such a course of action. The more "extreme" arms control scenarios pursuing major reductions (Approach 2) or nuclear superiority (Approach 4) complement this thinking with further considerations to frame a broader scope of U.S. policy options for arms control.

These hypothetical approaches and the methodology employed in this study could also augment contemporary deterrence analysis. For the past several years, USSTRATCOM leaders have indicated their command has been integrating considerations across domains and capabilities for a broader strategic deterrence posture.[122] More recently, USSTRATCOM has emphasized additional analytical tools to assess risks of strategic deterrence failure (ROSDF) to better inform deterrence thinking.[123] Although the details of this revised assessment process are not publicly available, there is likely some utility in pairing the type of qualitative analysis from this study with ROSDF considerations to shape options for arms control and deterrence. Doing so could help maximize the utility of arms control in protecting and advancing national security interests.

In summary, the analysis points out the following notable conclusions and associated recommendations.

Conclusion 1. Extending the current New START–like regime provides a feasible approach to maintain traditional strategic stability; however, such an approach fails to address potentially destabilizing trends related to nonnuclear strategic technologies and China's modernizing forces.

Recommendation 1. Elements of Approach 1 and Approach 3 could be combined for a more comprehensive framework for related concerns of stability, extended deterrence, proliferation, and global competition. Military and political leaders should investigate the interplay of both traditional and new aspects of strategic stability to shape the priorities for expanded conditions in a post–New START regime that potentially encompasses multiple agreements. This investigation should also be paired with relevant aspects of USSTRATCOM-specific analysis of risks of strategic deterrence failure to understand the best role that arms control could serve in advancing national security. Analysis into parallel bilateral agreements with Russia and China should be prioritized as a feasible and flexible path to such an expanded strategic stability regime.

Conclusion 2. Analyzing the political feasibility of each approach reveals potentially significant hurdles to each alternative. Comparing approaches indicates there are potential alternatives to a traditionally ratified agreement in the form of political agreements coupled with sufficiently motivated mutual restraint.

Recommendation 2. Given the major international and domestic obstacles to a new and fully ratified agreement, arms control discussions at all levels should include a review of measures that could be taken as backups or "off-ramps" from ratification that still secure as binding of an agreement as possible. This mutual restraint would be reinforced through data exchanges, prenotification standards, or by leveraging space-based sensors and other technological means to essentially emulate inspections remotely. An agreement, even nonratified, that addresses priority issues and helps motivate mutual restraint may prove to an effective paradigm for major arms control breakthroughs in the future.

Conclusion 3. An approach that seeks significant reductions in nuclear forces would entail serious risks in the contemporary security environment. Yet if the risks and tensions between major powers begin to decrease, arms control could help catalyze a more benign geopolitical situation, especially if supported in a binding, multilateral framework.

Recommendation 3. Strategic leaders should look for indicators that the international geopolitical context is trending toward being more benign. If such indicators are present, leaders should be prepared to look for opportunities to

leverage expanded, multilateral arms control or disarmament policy options to help catalyze these trends in a way that advances the ability of the United States, its allies, and competitors to pursue common interests.

Conclusion 4. Pursuing nuclear superiority without a supporting arms control framework leads to negative repercussions across evaluated criteria. Even if a force buildup is pursued as a negotiating tactic for an improved arms control agreement, the analysis in this study indicates the United States cannot achieve a clear advantage without significant nuclear and/or nonnuclear budget increases through 2036. This is due to the readily available strategic and nonstrategic nuclear arsenal that Russia could leverage in response to a U.S. arms race efforts over this period.

Recommendation 4. An across-the-board arms race with Russia, even if leveraged as a negotiating tool, appears to have low likelihood of success in the next 15 years. This type of approach, if employed, should instead study and identify narrow areas of competition that could be leveraged for similarly exact impact. Similarly, "mirroring" strategies should be avoided to instead focus on extending areas where U.S. qualitative advantages offer the best course of action, potentially including missile defense, precision guidance, and spaced-based technologies.

Notes

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[38] Hans M. Kristensen and Matt Korda, "Chinese Nuclear Forces, 2020," *Bulletin of the Atomic Scientists* 76, no. 6 (2020), 443–445; *Military and Security Developments Involving the People's Republic of China 2020*, 45, 51, 55–56, 87–88.

[39] See, for example, Pranay Vaddi and James M. Acton, *A ReSTART for U.S.-Russian Nuclear Arms Control: Enhancing Security Through Cooperation* (Washington, DC: Carnegie Endowment for International Peace, October 2020); Pifer, *Nuclear Arms Control Choices for the Next Administration*; Rose Gottemoeller, "Rethinking Nuclear Arms Control," *The Washington Quarterly* 43, no. 3 (Fall 2020), 15; Perkovich and Vaddi, *Proportionate Deterrence*; Timbie, "A Way Forward"; Cimbala, *Nuclear Deterrence*.

[40] Brad Roberts, ed., *Major Power Rivalry and Nuclear Risk Reduction: Perspectives from Russia, China, and the United States*, Center for Global Security Occasional Paper, (Livermore, CA: Center for Global Security Research, May 2020); Tong Zhao, "Opportunities for Nuclear Arms Control with China," *Arms Control Today* 50, no. 1 (2020), available at <https://www.armscontrol.org/act/2020-01/features/opportunities-nuclear-arms-control-engagement-china>.

[41] Linton Brooks, "The End of Arms Control?" *Daedalus* 149, no. 2 (Spring 2020), 84–100; Patty-Jane Geller, *New START: The U.S. Should Not Extend the Dangerously Flawed Treaty for Five More Years*, Issue Brief 5043 (Washington, DC: Heritage Foundation Center for National Defense, March 6, 2020), available at <https://www.heritage.org/sites/default/files/2020-03/IB5043_0.pdf>; *The Potential Costs of Expanding U.S. Strategic Nuclear Forces If the New START Treaty Expires*, 56475 (Washington, DC: CBO, August 2020); Manzo, *Nuclear Arms Control Without a Treaty?*

[42] Exceptions to this include Vince Manzo's *Nuclear Arms Control Without a Treaty?* which systematically compares different bilateral arms control options according to their difficulty and potential value and predicts future force postures in a post–New START regime. In a similar vein, Stephen J. Cimbala's *Nuclear Deterrence in a Multipolar World* describes potential arms reduction options between the United States and Russia, adding Arriving Weapons Sensitivity Model estimates of large-scale nuclear exchanges between the two nations to quantify the impacts of these reductions on deterrence and stability. Another comparable publication worth noting is a summary from a conference hosted by the Polish Institute for International Affairs, which graded hypothetical transparency and confidence building measures between NATO and Russia according to likelihood,

costs and benefits. See Jacek Durkalec and Andrei Zagorski, *Options for Transparency and Confidence-Building Measures Related to Non-Strategic Nuclear Weapons in Europe: Cost-Benefit Matrix* (Warsaw: Polish Institute for International Affairs, 2014).

[43] James E. Doyle, "How Biden Can Achieve a First in Arms Control: A Verifiable Nuclear Warhead Freeze," *Bulletin of the Atomic Scientists*, December 2020, available at <https://thebulletin.org/2020/12/how-biden-can-achieve-a-first-in-arms-control-a-verifiable-nuclear-warhead-freeze/>.

[44] This falls short of previous Russian demands for *legally* binding limits on American ballistic missile defense systems but is supposed to be sufficient in the context of this new agreement. See, for example, Steven Pifer, *Missile Defense in Europe: Cooperation or Contention?* Arms Control Series Paper 8 (Washington, DC: Brookings, May 2012), 1–3; Andrew Futter and Benjamin Zala, "Advanced U.S. Conventional Weapons and Nuclear Disarmament—Why the Obama Plan Won't Work," *Nonproliferation Review* 20, no. 1 (2013), 112; Tom Countryman and Kingston Reif, "Intermediate-Range Missiles Are the Wrong Weapon for Today's Security Challenges," *War on the Rocks*, August 13, 2019, available at <https://warontherocks.com/2019/08/intermediate-range-missiles-are-the-wrong-weapon-for-todays-security-challenges/>; Trimbie, "A Way Forward," 97–199; Perkovich and Vaddi, *Proportionate Deterrence*, 87–89.

[45] Perkovich and Vaddi, *Proportionate Deterrence*, 87–89.

[46] Gustav Gressel, *Under the Gun: Rearmament for Arms Control in Europe*, Policy Brief (London: European Council on Foreign Relations, November 2018), available at <https://www.ecfr.eu/page/-/under_the_gun_rearmament_for_arms_control_in_europe5.pdf>.

[47] See, for example, Zhao Lijian, Foreign Ministry Spokesperson Regular Press Conference, Embassy of the People's Republic of China in the United States, July 20, 2020.

[48] Gottemoeller "Rethinking Nuclear Arms Control," 155; Anya Loukianova Fink and Olga Oliker, "Russia's Nuclear Weapons in a Multipolar World: Guarantors of Sovereignty, Great Power Status & More," *Daedalus* 149, no. 2 (Spring 2020), 53–54; Vaddi and Acton, *A ReSTART for U.S.-Russian Nuclear Arms Control*, 2; Roberts, *Major Power Rivalry and Nuclear Risk Reduction*, 8, 10–11; Dmitry Stefanovich, "U.S. Inspection of New Russian Missile May Revive Stalled Arms Control Talks," *Moscow Times*, December 2, 2019, available at <https://www.themoscowtimes.com/2019/12/02/us-inspection-of-new-russian-missile-may-revive-stalled-arms-control-talks-a68437>.

[49] See, for example, James M. Acton, Thomas D. Macdonald, and Pranay Vaddi, *Revamping Nuclear Arms Control: Five Near-Term Proposals*, Working Paper (Washington, DC: Carnegie Endowment for International Peace, December 2020), 16–20; Timbie, "A Way Forward"; Perkovich and Vaddi, *Proportionate Deterrence*, 87–89.

[50] Pavel Podvig, Ryan Snyder, and Wilfred Wan, *Evidence of Absence: Verifying the Removal of Nuclear Weapons* (Geneva: United Nations Institute for Disarmament, 2018),

15–27; Brooks, "The End of Arms Control?" 93–94. Note that portal monitoring for warheads would be technically challenging given the size and weight of these components; the specific technical steps to accomplish this monitoring would need to be worked out in detail.

[51] Vaddi and Acton, *A ReSTART for U.S.-Russian Nuclear Arms Control*, 24–25. This type of basing agreement helped reassure Russia that U.S. B-1s were no longer part of the nuclear fleet. However, the basing options for future bombers may be limited, prompting pushback from U.S. and Russian air force leaders or other domestic stakeholders due to the logistics, sustainment, and manning considerations impacted by such an option.

[52] Brooks, "The End of Arms Control?" 86–92; Gottemoeller, "Rethinking Nuclear Arms Control,"155.

[53] Note that other nonnuclear technical and political issues exist as well. These include Russian concerns regarding overall U.S. intentions, impact of precision-strike capabilities on stability, and potential fielding of space-based weapons. See, for example, Brooks, "The End of Arms Control?" 84–87. Similarly, Russia's recent history of Intermediate-Range Nuclear Forces Treaty violations and other belligerent international actions present additional hurdles to extending and expanding the New Strategic Arms Reduction Treaty.

[54] Brooks, "The End of Arms Control?" 88; Dmitri Trenin, "Stability amid Strategic Deregulation: Managing the End of Nuclear Arms Control," *The Washington Quarterly* 43, no. 3 (Fall 2020), 164.

[55] Acton, McDonald, and Vaddi, "Revamping Nuclear Arms Control," 18–20; Perkovich and Vaddi, *Proportionate Deterrence*, 87–89; Podvig, Snyder, and Wan, "Evidence of Absence," 21–27.

[56] *Military and Security Developments Involving the People's Republic of China 2020*, 45, 51, 55–56, 87–88.

[57] See, for example, U.S. Strategic Command, Admiral Charles Richard interview with Mitchell Institute for Aerospace Studies Web Series, July 30, 2020, available at <https://www.stratcom.mil/Media/Speeches/Article/2300365/interview-with-mitchell-institute-for-aerospace-studies-web-series/>.

[58] Steven Pifer, *The Next Round: The United States and Nuclear Arms Reductions After New START*, Arms Control Series Paper 4 (Washington, DC: Brookings Institution, December 2010), 3–4, 25, available at <https://www.brookings.edu/wp-content/uploads/2016/06/12_arms_control_pifer.pdf>. Reductions to 1,000-deployed warheads were also considered during President Obama's administration and could come up again amongst likeminded national security staff in the incoming Biden administration. See Kaplan, *The Bomb*, 229–234.

[59] Cimbala, *Nuclear Deterrence*, 37–47.

[60] Arbatov and Dvorkin, *Beyond Deterrence*, 156–157.

[61] Zhao, "Opportunities for Nuclear Arms Control with China." Zhao recommends an overall limit at 600 launchers as a near-term goal and then scaling down. Given the scope of arms reductions in this Approach 2, a more aggressive initial goal below this limit could be considered.

[62] See, for example, Perkovich and Vaddi, *Proportionate Deterrence*, 84–85; Alexey Arbatov and Vladimir Dvorkin, *The Great Strategic Triangle* (Moscow: Carnegie Moscow Center, April 1, 2013), available at <https://carnegieendowment.org/files/strategic_triangle.pdf>.

[63] Michah Zenko, *Toward Deeper Reductions in U.S. and Russian Nuclear Weapons*, Special Report no. 57 (New York: Council on Foreign Relations, November, 2010), 20–23.

[64] Anna Peczeli et al., "Nuclear Risk Reduction in an Era of Major Power Rivalry," Center for Global Security Research Workshop Summary, Lawrence Livermore National Laboratory, February 19–20, 2020, 8–11; Austin Long, "Russian Nuclear Forces and Prospects for Arms Control," RAND Testimony CT495, presented before the House of Representatives Committee on Foreign Affairs, Subcommittee on Terrorism, Nonproliferation, and Trade, June 21, 2018.

[65] Manzo, *Nuclear Arms Control Without a Treaty?* 80–88.

[66] Ibid., 69–71; Gressel, "Under the Gun," 30. Moscow also previously indicated it would support "interagency, high-level dialogue" on a range of security topics. See "Statement by President of Russia Vladimir Putin on a Comprehensive Program of Measures for Restoring the Russia-U.S. Cooperation in the Field of International Information Security," The Kremlin, September 25, 2020, available at <http://en.kremlin.ru/events/president/news/64086>.

[67] Manzo, *Nuclear Arms Control Without a Treaty?* 68–78; Gottemoeller, "Rethinking Nuclear Arms Control,"149–155.

[68] Christopher S. Chivvis et al., *Strengthening Strategic Stability with Russia*, PE234 (Santa Monica, CA: RAND, 2017), 2–5; James Acton, ed., *Entanglement: Russian and Chinese Perspectives on Non-Nuclear Weapons and Nuclear Risks* (Washington, DC: Carnegie Endowment for International Peace, 2017), 6; Erik Gartzke and Jon R. Lindsay, "Thermonuclear Cyberwar," *Journal of Cybersecurity* 3, no. 1 (January 2017), 46; Sarah Bidgood, "Risky Business: Four Ways to Ease U.S.-Russian Nuclear Tension," *Arms Control Today* 49, no. 7 (September 2019), 5; James M. Acton, "Cyber Warfare & Inadvertent Escalation," *Daedalus* 149, no. 2 (Spring 2020), 143–145.

[69] King Mallory, *New Challenges in Cross-Domain Deterrence*, PE-259-OSD (Santa Monica, CA: RAND, 2018), 20–21; Brooks, "End of Arms Control," 95; Theresa Hitchens, "Multilateralism in Space: Opportunities and Challenges for Achieving Space Security," *Space and Defense* 4, no. 2 (Summer 2010), 19–20.

[70] As this publication was being prepared, President Biden and Putin held their first face-to-face summit, and the American leader highlighted cyberspace norms as one of the priority topics during this discussion. See Joseph Marks, "The Cybersecurity 202: Here Are Four Cyber Takeaways from the Biden-Putin Summit," *Washington Post*, June 17, 2021.

[71] Ulrich Kuhn, "Uncharted Waters: Europe and the End of Nuclear Arms Control," *Turkish Policy Quarterly* 19, no. 2 (Summer 2020), 101–109.

[72] Peczeli et al., "Nuclear Risk Reduction in an Era of Major Power Rivalry," 7; Trenin, "Stability amid Strategic Deregulation," 164; Manzo, *Nuclear Arms Control Without a Treaty*? 94–95, 110.

[73] These measures were previously proposed by Frank Rose during his tenure as the Assistant Secretary of State for Arms Control, Verification, and Compliance. See also Caitlin Talmadge, *The U.S.-China Nuclear Relationship: Why Competition Is Likely to Intensify* (Washington, DC: Brookings, September 2019), 9; Nina Tannenwald, "Life After Arms Control: Moving Toward a Global Regime and Restraint and Responsibility," *Daedalus* 149, no. 2 (Spring 2020), 215.

[74] Christian Alwardt, "U.S. Missile Defence Efforts and Chinese Reservations in East Asia," *Asian Affairs* 51, no. 3 (September 2020), 605–620.

[75] "Statement by President of Russia Vladimir Putin."

[76] Hitchens, "Multilateralism in Space," 19–20.

[77] Gottemoeller, "Rethinking Nuclear Arms Control," 152–155.

[78] Li Bin, "Chinese Thinking on Nuclear Weapons," *Arms Control Today* 45, no. 10, (December 2015), 6–7.

[79] Ankit Panda, "The United States, China, and the Future of Arms Control," *The Diplomat*, July 8, 2020, available at <https://thediplomat.com/2020/07/the-united-states-china-and-the-future-of-arms-control/>.

[80] Gottemoeller, "Rethinking Nuclear Arms Control," 147.

[81] Kroenig, *The Logic of American Nuclear Strategy*, 198.

[82] *Costs of Implementing Recommendations of the 2019 Missile Defense Review*, 56949 (Washington, DC: CBO, January 2020), 15–16.

[83] Ibid., 15–16.

[84] Kaplan, *The Bomb*, 242–243, 247–248.

[85] Steven E. Miller, "A Nuclear World Transformed: The Rise of Multilateral Disorder," *Daedalus* 149, no. 2 (Spring 2020), 35.

[86] As a reminder, for continuity with previous studies, the force postures for Approach 1 and Approach 2 closely follow cases presented by Cimbala, *Nuclear Deterrence*; and Cimbala, "Nuclear Arms Control." The AWSM results for this study match results from these two studies in similar cases.

[87] See also, Cimbala, *Nuclear Deterrence*, 72–78; and Cimbala, "Nuclear Arms Control," 100–105.

[88] George Koblentz, *Strategic Stability in the Second Nuclear Age* (New York: Council on Foreign Relations, November 2014), 3–5, 37; "Warsaw Summit Communique," NATO press release, July 9, 2016, available at <https://www.nato.int/cps/en/natohq/official_texts_133169.htm>.

[89] Brooks, "The End of Arms Control?" 90.

[90] See, for example, Koblentz, *Strategic Stability in the Second Nuclear Age*, 27–30.

[91] *Projected Costs of U.S. Nuclear Forces 2019–2028*, 54914 (Washington, DC: CBO, January 2019), 1, 6–8, 12, available at <https://www.cbo.gov/system/files/2019-01/54914-NuclearForces.pdf>.

[92] Estimated first- and second-strike responses under a range of deployed forces at limits similar to those proposed in Approach 3 show that in all cases nations would have a secure second-strike capability. See Cimbala, *Nuclear Deterrence*, 89–93.

[93] The Mitchell Institute, interview by Admiral Charles A Richard, U.S. Strategic Command.

[94] *Approaches for Managing the Costs of U.S. Nuclear Forces, 2017 to 2046*, 53211 (Washington, DC: CBO, October 2017), 46–49. The larger number results from combined savings of retiring legacy systems and a smaller purchase of new Ground Based Strategic Deterrent missiles. Note that the costs for decommissioning are much lower than the annual savings amounts cited here. For example, the Air Force estimated that removing missiles from silos and putting them into storage costed $20 million between 2014 to 2018. See CBO Publication 56475, 13.

[95] CBO Publication 53211, 40.

[96] CBO Publication 54914, 3; and supplemental data. The cited amounts are similar to other independent calculations that reviewed costs through 2046. See Kingston Reif and Alicia Sanders-Zakre, *U.S. Nuclear Excess: Understanding the Costs, Risks, and Alternatives* (Washington, DC: Arms Control Association, April 2019), 34–36.

[97] CBO Publication 53211, 40, 53–55. The 450-missile decrease is estimated by scaling the planned purchase—642 missiles to support a total active force of 450 silos per New START limits or a ratio of 1.4—down to match the 130-missile force proposed under Approach 2 and maintaining the same ratio for a new planned lifetime buy of roughly 185 missiles.

[98] Manzo, *Nuclear Arms Control Without a Treaty*? 68–78.

[99] Gottemoeller, "Rethinking Nuclear Arms Control," 149–155.

[100] Manzo, *Nuclear Arms Control Without a Treaty?* 72–81.

[101] Ibid., 41–43.

[102] Kroenig, *The Logic of American Nuclear Strategy*, 127–143.

[103] Manuel Lafont Rapnouil, Tara Varma, and Nick Witney, *Eyes Tight Shut: European Attitudes Towards Nuclear Deterrence* (London: European Council on Foreign Relations, December 2018).

[104] Kroenig, *The Logic of American Nuclear Strategy*, 114–126.

[105] CBO Publication 56475, 11–13.

[106] Ibid., 16–21.

[107] Ibid.

[108] CBO Publication 56949, 13–19.

[109] Ibid., 19–22.

[110] Micheala Dodge, "History Shows U.S. Nuclear Restraint Is a One-Way Street," *War on the Rocks*, November 18, 2020, available at <https://warontherocks.com/2020/11/history-shows-u-s-nuclear-restraint-is-a-one-way-street/>; Christopher A. Ford, "To Tango Alone: Problems of Theory and Practice in the Sociology of Arms Control, Nonproliferation, Disarmament and Great Power Competition," *Arms Control and International Security Papers* 1, no. 14 (July 30, 2020), 1–5.

[111] See, for example, Scott Plous, "The Nuclear Arms Race: Prisoner's Dilemma or Perceptual Dilemma?" *Journal of Peace Research* 30, no. 2 (May 1993), 163–179.

[112] Amy Woolf, "Bargaining With Nuclear Modernization: Does It Work?" *Arms Control Today*, October 2020, available at <https://www.armscontrol.org/act/2020-10/features/bargaining-nuclear-modernization-does-work>; Green, *The Revolution That Failed*, 247–260.

[113] "Presidential Address to the Federal Assembly, March 1, 2018," The Kremlin, available at <http://en.kremlin.ru/events/-president/news/56957>; "Meeting with Representatives of Russian News Agencies and Print Media," The Kremlin, February 20, 2019, available at <http://en.kremlin.ru/events/president/news/59865>.

[114] Green, *The Revolution That Failed*, 55–58, 257–260.

[115] See also, Cimbala, *Nuclear Deterrence*, 72–78; Cimbala, "Nuclear Arms Control," 100–105.

[116] Brooks, "The End of Arms Control?" 90.

[117] Gottemoeller, "Rethinking Nuclear Arms Control," 155; Perkovich and Vaddi, *Proportionate Deterrence*, 84–85.

[118] George Perkovich, "A Brittle Nuclear Order," in *Revitalizing Nuclear Arms Control and Nonproliferation* (Luxemborg: International Luxemborg Forum on Preventing Nuclear Catasptrophy, 2017), 128–129, available at <https://carnegieendowment.org/2017/12/18/brittle-nuclear-order-pub-75057>.

[119] Ford, "U.S. Priorities for 'Next Generation Arms Control,'" 1–3; Long, "Russian Nuclear Forces and Prospects for Arms Control."

[120] See, for example, Christopher F. Chyba, "New Technologies & Strategic Stability," *Daedalus* 149, no. 2 (Spring 2020), 150–170.

[121] Kingston Reif and Shannon Bugos, "U.S., Russia Extend New START for Five Years," *Arms Control Today* 51, no. 2 (March 2021), available at <https://www.armscontrol.org/act/2021-03/news/us-russia-extend-new-start-five-years>.

[122] C. Robert Kehler, "Nuclear Weapons & Nuclear Use," *Daedalus* 145, no. 4 (Fall 2016), 52.

[123] Charles A. Richard, "Forging 21st-Century Strategic Deterrence," U.S. Naval Institute *Proceedings* 147, no. 2 (February 2021), 12–14.

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