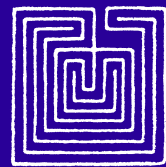


# Dædalus

Journal of the American Academy of Arts & Sciences

Spring 2020

## Meeting the Challenges of a New Nuclear Age

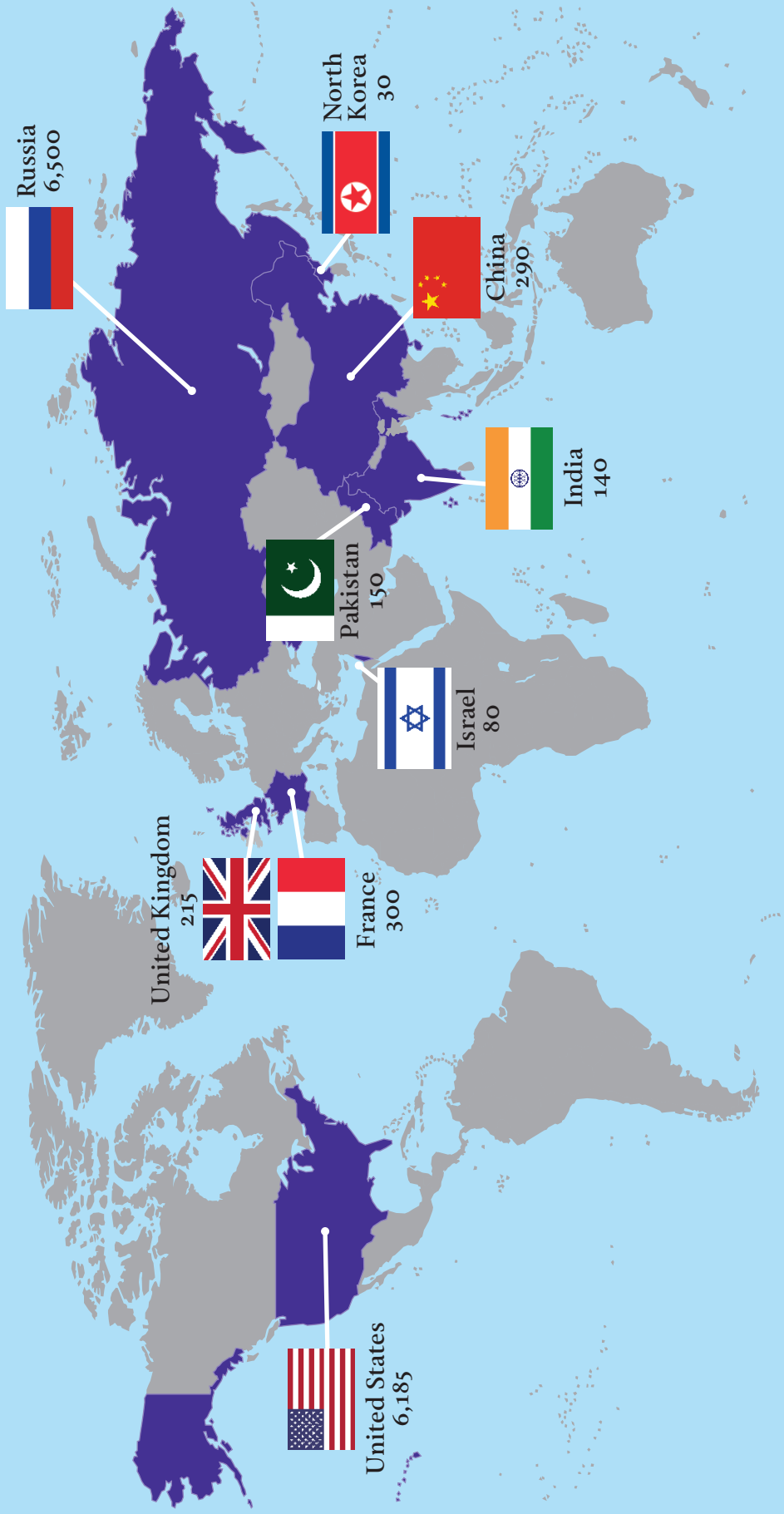


Robert Legvold & Christopher F. Chyba,  
guest editors

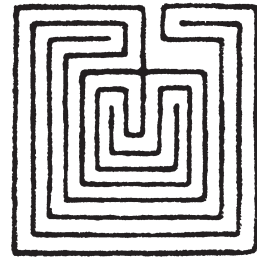
with Steven E. Miller

Anya Loukianova Fink · Olga Oliker  
Li Bin · Brad Roberts · Linton F. Brooks  
Jon Brook Wolfsthal · James Cameron  
James M. Acton · Harald Müller  
Carmen Wunderlich · James Timbie  
Nina Tannenwald

# Estimated Nuclear Warhead Inventories, 2019



# Dædalus



Journal of the American Academy of Arts & Sciences

“Meeting the Challenges of a New Nuclear Age”

Volume 149, Number 2; Spring 2020

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*Inside front cover*: Inventory numbers include deployed warheads, warheads in the military stockpile, and retired but intact warheads waiting for dismantlement. Source: Hans M. Kristensen and Matt Korda, “Status of World Nuclear Forces,” Federation of American Scientists, May 2019 update.

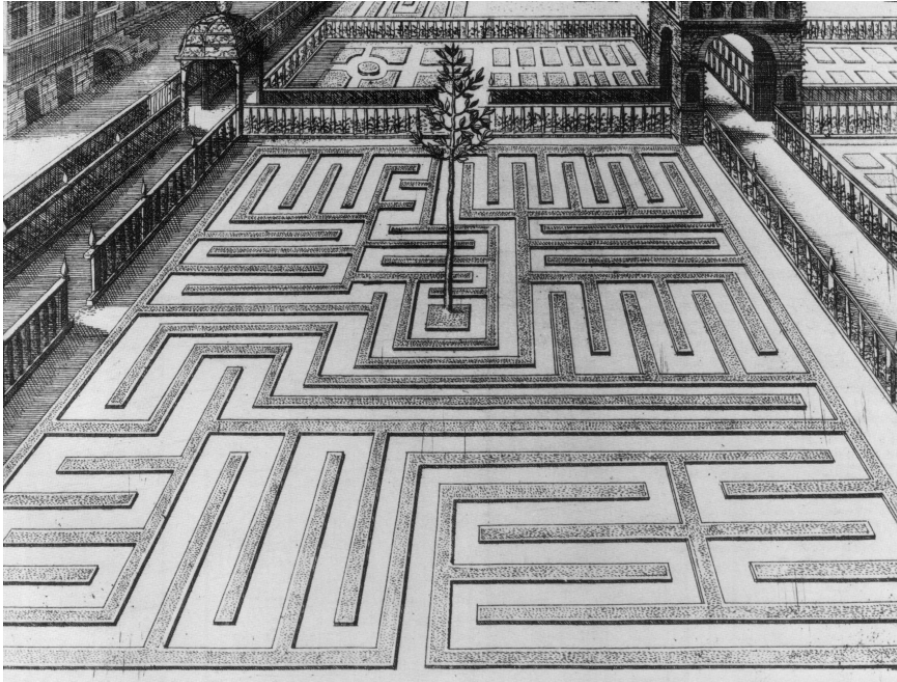
# Contents

- 6    **Introduction:**  
      **The Search for Strategic Stability in a New Nuclear Era**  
      *Robert Legvold & Christopher F. Chyba*
- 17   **A Nuclear World Transformed:**  
      **The Rise of Multilateral Disorder**  
      *Steven E. Miller*
- 37   **Russia's Nuclear Weapons in a Multipolar World:**  
      **Guarantors of Sovereignty, Great Power Status & More**  
      *Anya Loukianova Fink & Olga Olikier*
- 56   **The Revival of Nuclear Competition in an Altered**  
      **Geopolitical Context: A Chinese Perspective**  
      *Li Bin*
- 69   **On Adapting Nuclear Deterrence to Reduce Nuclear Risk**  
      *Brad Roberts*
- 84   **The End of Arms Control?**  
      *Linton F. Brooks*
- 101  **Why Arms Control?**  
      *Jon Brook Wolfsthal*
- 116  **What History Can Teach**  
      *James Cameron*

- 133 **Cyber Warfare & Inadvertent Escalation**  
*James M. Acton*
- 150 **New Technologies & Strategic Stability**  
*Christopher F. Chyba*
- 171 **Nuclear Disarmament without the Nuclear-Weapon States:  
The Nuclear Weapon Ban Treaty**  
*Harald Müller & Carmen Wunderlich*
- 190 **A Way Forward**  
*James Timbie*
- 205 **Life beyond Arms Control: Moving toward a Global Regime  
of Nuclear Restraint & Responsibility**  
*Nina Tannenwald*
- 222 **Conclusion: Strategic Stability & Nuclear War**  
*Christopher F. Chyba & Robert Legvold*

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Journal of the American Academy of Arts & Sciences



Design for the hedge maze is by Johan Vredeman de Vries, from *Hortorum viridariorumque elegantes & multiplices formae: ad architectonicae artis normam affabre delineatae* (Cologne, 1615).

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# Introduction: The Search for Strategic Stability in a New Nuclear Era

*Robert Legvold & Christopher F. Chyba*

The world has entered a new nuclear era whose characteristics and challenges differ markedly from those of the Cold War. No longer dominated by only two nuclear superpowers (even if Russia and the United States still possess the lion's share of nuclear weapons), its dangers are at least as great as those during the Cold War, and made more so by a general unawareness of the multiplying ways a nuclear war could begin. Five nuclear-armed states – China, India, and Pakistan, in addition to Russia and the United States with its allies Britain and France – now set the contours of a multisided matrix, determine whether and when nuclear weapons will be used, and bear the responsibility for deciding whether and by what means the risk of nuclear war can be averted. Other states with nuclear weapons, such as North Korea, further complicate the picture by creating additional pathways to nuclear conflict and generating U.S. responses that stir Russian and Chinese opposition and counteractions. Israel's nuclear arsenal remains recessed and opaque. Beyond this changing geostrategic topography, advances in weapons technology and the opening of new frontiers, such as cyber capabilities and artificial intelligence, make a shifting environment still more complex.

The collapse of the Soviet Union and, with it, the fading fear of nuclear war led to a general disregard of nuclear issues in key relationships, with the exception of the security of nuclear holdings in former Soviet Republics, including Russia. Nuclear states and their defense planners continued to tend to their nuclear forces while adjusting their role to a reality no longer centered on the prospect of a war between two nuclear hegemonies. Aided by the arms control agreements between the superpowers in the last years of the Cold War and the first years after, and by the positive hopes for a new and constructive relationship between the United States and Russia, the world's nuclear states welcomed this less tense reality.



Attention in the United States shifted to threats associated with the nuclear ambitions of countries like Iran and North Korea, and to the possibility of nuclear terrorism. True, by the turn of the century, Russia and China had begun to emphasize what each saw as elements of an ongoing U.S. nuclear threat, and the United States now included both in the scenarios guiding its efforts to refine its extended deterrence commitments in Europe and Asia. But this recrudescence of concern over nuclear trends largely flowed along channels of familiar thought rather than turning national attention to the formidable new challenges of a multipolar nuclear world.

**T**he evolution from what was fundamentally a two-sided order into today's more multifarious setting adds complexity and gives a new dimension to familiar challenges and dangers. We highlight five. Some changes are a matter of multiplication. Originally limited to the United States and the Soviet Union, competitive and potentially adversarial nuclear relationships have expanded to include India and Pakistan, the United States and China, India and China, and in the likely future, the United States and North Korea. In the twentieth century, the United States and Soviet Union developed elaborate triads of nuclear weapons on land, at sea, and in the air. Now, while the United States and Russia are modernizing and enhancing all three legs of their triads, three new countries – China, India, and Pakistan – are fashioning triads of their own. In several of these state pairings, the interactions are not simply bilateral, but are affected by actions directed at third parties. For instance, Pakistan interprets India's nuclear posture toward China as a message meant for itself. China's positioning toward the United States evokes India's apprehensions. When the United States deploys missile defense systems to offset a North Korean nuclear threat, China and Russia react to it as the camel's nose under a tent eventually designed for them. And the competition between offensive and defensive systems reopened between the United States and Russia by the resumption of efforts to develop ballistic missile defense systems is now mirrored by Chinese and Indian moves in the same direction.

Second, technological advancement, a constant driver of change since the dawn of the nuclear age, plays an increasingly diverse and mixed role in today's nuclear setting. Technologies that, as advocates argue, offer more effective deterrence by increasing the usability and therefore the credibility of nuclear weapons, and increase the flexibility and confidence of those with their finger on the nuclear trigger also present novel complications. They raise concern over the survivability of nuclear forces, blur the line between conventional and nuclear war-fighting, risk transforming space warfare into an integral part of nuclear warfare, and, in a crisis, potentially decrease decision-making time. For instance, new conventionally armed hypersonic boost-glide and cruise missiles provide decision-makers

with options for executing extended-range strategic strike missions short of nuclear use, but if they obscure from an opponent whether they are, in fact, nuclear-armed, they also threaten crisis stability. Smaller, lower-yield, and more-accurate nuclear warheads make the threat of their use more credible, but that is because they are also more usable, creating tension between effective deterrence and the risk of lowering the threshold to nuclear war. A variety of remote sensing technologies promise improved information for decision-making in a nuclear crisis and, perhaps, more effective defenses, but simultaneously may render even hard-to-locate mobile missile systems vulnerable to attack. And while emerging cyberspace surveillance capabilities may provide unparalleled real-time information about others' nuclear forces and activities, they may also accentuate others' sense of vulnerability to nuclear-, conventional-, or cyberattack.

Third, concepts key to understanding the original Cold War nuclear era are either under stress or undergoing unpredictable change. Strategic deterrence and its nuclear component take on more complex colorations when nuclear and non-nuclear deterrence are integrated and the task – as has been acknowledged by both U.S. and Russian planners – is to transform nuclear and conventional weapons along with cyber and other hybrid tools into a “comprehensive deterrence” mosaic. Internal to the concept of nuclear deterrence, some countries are again focusing on “limited nuclear options” and thinking through their calibration, while others are struggling with whether their minimum deterrence postures need to be altered: either by developing counterforce options – that is, a capability and strategy for disarming the other side of its nuclear weapons – or by considering a “launch under attack” retaliatory option. Taken together, this whole array of challenges raises the question of whether there can be crisis stability in a cluttered, heterogeneous nuclear environment and, if so, on what basis. Even the standard that came to underpin the notion of crisis stability in the U.S.-Soviet relationship – mutual assured destruction (MAD) based on each side's ability to retaliate massively after a nuclear first strike – seems to some either too narrow or too imperiled.

Fourth, the already-contested realm of nuclear norms – shared principles that shape or have potential in the future to shape the behavior of nuclear actors – is growing increasingly murky and unsettled. The “nuclear taboo” – that is, the questioned ethics of nuclear use – seems further weakened by the attention given to the development of weapons for limited, and therefore more plausible, nuclear use. Flatly rejected by the United States and Russia, the formal “no-first-use” nuclear doctrines of China and India waver as India identifies exceptions to its application and China weighs its feasibility in the face of threats it sees from the United States. Meanwhile, an international movement for a treaty banning nuclear weapons has gathered momentum among the majority of countries that do not have nuclear weapons, and its long-term effects in the parallel universe of public opinion is unclear.

Finally, the dangers of the earlier nuclear era remain: some familiar, some in altered form, and to them are added new ones. The risk of inadvertent nuclear war remains, but now the pathways to it have multiplied across more regions and relationships. The Cold War potential for misreading the other side's nuclear thinking and plans swells when it extends to a larger and diverse set of nuclear actors. The accumulated conceptual refinement and residual understanding on nuclear issues built between the United States and the Soviet Union were the result of fifty years of strategic nuclear arms negotiations and dialogue; this shared understanding has no modern counterpart in any other bilateral or trilateral nuclear relationship. Further, the risk of nuclear conflagration during the Cold War – serious at key crisis moments – arose principally in a single relationship. It is now present in several.

Particularly significant, the original Cold War nuclear competition was gradually moderated by progress in bilateral strategic nuclear arms control arrangements reached from 1969 to 2010. The new era has slowly dismantled this bilateral arms control framework, with no clear prospect that it will be revived and extended. Even more remote is the possibility that a framework or frameworks encompassing other, let alone all, nuclear powers can be achieved.

The authors in this issue of *Daedalus* – a mix of security scholars, physicists, statesmen, and political scientists – address these and other dimensions of this new multipolar nuclear era. Their analyses are sensitive to the challenges and potential dangers posed by a world with nine nuclear players, but also consider developments and measures within their respective spheres that could alter or mitigate these challenges and dangers. The result is not a comprehensive exploration of all facets of a changing nuclear environment. Not all nuclear relationships or the dynamics in all regions are addressed. Rather, the focus is on salient aspects of the change underway among the major nuclear powers, with a primary emphasis on the United States, Russia, and China. The intent is to capture the essential features of the nuclear world we have entered, and to stimulate among policy-makers and the engaged public a recognition of the challenges that it poses. Other dimensions, such as the effects of domestic politics on the choices countries are making, receive limited treatment.

Integral to the creation of this issue of *Daedalus* has been the collaboration among its authors. First in a planning session and then in an authors' review conference, they have been generous in responding to one another's work, raising questions, offering suggestions, and wrestling with areas of disagreement. We are confident they would agree that, as a result, the analyses and arguments the reader will encounter are sharper and more refined than when the exercise began. And the exercise broadly is one, we believe the authors would also agree, that policy-makers in the major nuclear powers, their expert communities, and engaged publics need to replicate.

The analysis is divided into three parts. The essays in part one explore how an evolving world of multiple nuclear powers interacts within a larger international setting that, too, is in motion. A fractured and convulsive international environment now includes multiple tension-laden nuclear pairings, several of which are complicated by nuclear third parties. Steven Miller, in his essay “A Nuclear World Transformed: The Rise of Multilateral Disorder,” considers this altered landscape and assesses its larger implications. He notes that the former overarching bilateral nuclear relationship now coexists with a series of regional nuclear subsystems in South Asia, East Asia, and the Middle East, and ponders the consequences. He assesses what it means that this new, multidimensional nuclear order is “functionally unregulated,” that the gap between the core and lesser nuclear powers has effectively shrunk, and that the kaleidoscope has not stopped turning. It is a world, he argues, in which the key players must direct their nuclear thinking no longer to one but several nuclear adversaries; in which the action flows no longer between two actors, but in a daisy chain among three, even four players; in which the sources of instability are no longer confined to the core U.S.-Russian relationship, but have spread into the new regional nuclear subsystems; and in which the former and now endangered bilateral arms control framework from the earlier era no longer suffices, and an appropriate alternative remains remote.

A topic this complex, freighted with consequences this great, unsurprisingly stimulates controversy and dissonant perspectives both among experts and between countries. That is true of the essays in this collection, with none more so than the three essays assessing the Russian, Chinese, and U.S. approaches to the nuclear challenges these countries face. The authors note, however, where personal judgments differ and make an effort to engage one another.

Anya Loukianova Fink and Olga Oliker, in their essay “Russia’s Nuclear Weapons in a Multipolar World: Guarantors of Sovereignty, Great Power Status & More,” focus on Russia as still one of the two key actors in this more complicated nuclear setting. Starting from an overview of Russia’s assessment of the changing geopolitical context and its implications for national security, they turn their attention to the role Russian defense planners assign to nuclear weapons; their perspectives on how nuclear weapons fit into a broader framework of strategic deterrence; their views on Russia’s evolving nuclear doctrine, the first use of nuclear weapons, and limited nuclear options; the feasibility of escalation control; and the danger of inadvertent nuclear war. From this base, they shift to Russian perspectives on the nuclear programs and postures of the other key players, at the center of which is the United States. How Russian analysts judge the 2018 U.S. Nuclear Posture Review, the nature of the threat they see to Russia’s nuclear deterrent, and the U.S. technological advances that most worry them are discussed and evaluated. They conclude with thoughts about Russian perspectives on the factors

favoring or obstructing “global nuclear (dis)order” and Russian views on non-proliferation and arms control.

Li Bin offers his take in “The Revival of Nuclear Competition in an Altered Geopolitical Context: A Chinese Perspective.” He shares his views first on how U.S. and Russian positioning in the larger international setting has realigned the two countries (to a U.S. advantage and a Russian disadvantage), the power gap between the United States and China that will remain, the obstacles to major powers pursuing spheres of influence, and the fracturing of the nuclear universe as a growing number of states enter the nuclear club. What this means for China constitutes his second theme. He portrays a China whose economic and military power is growing rapidly along with the global reach of its economic and security interests, but that nonetheless has neither the hope nor intent to match either Russia or the United States as a nuclear superpower, and that is struggling to fashion a nuclear deterrent that it trusts measures up to the challenge posed by the United States. In this context, he explores those aspects of U.S. nuclear plans, potential new technologies, and strategy that most concern defense planners in his country. He then returns to the questions he raised at the outset: What aspects of major nuclear actors’ approaches to nuclear weapons are driven by security interests? What aspects are driven by a desire to augment a country’s political influence? And where between the two purposes can there be cooperation among states to enhance nuclear security, reduce the risks of inadvertent nuclear war, and contain the spread of nuclear weapons? The reader will doubtless be struck by how fundamentally different the Chinese perspective conveyed by Li Bin is from, in particular, that of the United States, including official U.S. assessments of the emerging challenge posed by China.

American responses to a changing nuclear security environment are described by Brad Roberts in his essay “On Adapting Nuclear Deterrence to Reduce Nuclear Risk.” He begins with a review of the ways in which U.S. presidential administrations since the end of the Cold War have sought to adapt deterrence to new challenges and reduce nuclear dangers and risks. The net result over more than two decades has been a decreased reliance on nuclear weapons in U.S. defense strategy, an increased reliance on non-nuclear means, including missile defense and non-nuclear strike, and a tailoring of U.S. deterrence strategies to reflect a more multipolar world and the emergence of new technologies of strategic consequence. The core of Roberts’s argument focuses on whether, in the current security environment, the United States can continue altering its approach to deterrence in ways intended to further reduce nuclear risk. He argues against steps favored by many, such as stepping down all U.S. and Russian intercontinental ballistic missiles (ICBMs) and submarine-launched ballistic missiles (SLBMs) from high-alert status, contending that the net effect would actually be to increase nuclear risk. He cautions against other changes that, in his view, would make nuclear deterrence unreliable in dealing with problems for which it remains relevant,

especially the problems of extended deterrence and assurance of U.S. allies. His analysis of these problems helps bring into focus the stark differences of opinion in Washington, Moscow, and Beijing over the actions and perceived intentions of one or both of the other two in the nuclear realm.

Part two of the issue grapples with the second key dimension of a new multipolar nuclear world: the fate of efforts to control nuclear weapons and manage the historically pivotal nuclear relationship between the United States and Russia. Linton Brooks – in “The End of Arms Control?” – weighs the all-too-realistic prospect that the last remaining strategic nuclear arms control treaty between the United States and Russia – New START, signed by President Obama and President Medvedev in 2009 – will not survive, and considers the potential consequences. He examines these from a number of angles: the impact on strategic stability from the loss of transparency and predictability provided by the treaty, the reduced constraint on pressures to keep step with Russia and the arms race tension this generates, the damage done to the nuclear nonproliferation regime by the seeming bad faith of Russia and the United States in their Article VI commitment to nuclear disarmament, and, in the United States, the erosion of political support for the current nuclear modernization program absent a concomitant effort to pursue arms control. He focuses particular attention on what steps the United States and Russia could take to mitigate the effects should New START be lost, grouped into five categories: measures to enhance transparency and predictability in the nuclear programs of the United States and Russia, secondary areas of potential security cooperation that could affect positively the nuclear relationship, joint U.S.-Russian actions to improve the context for nonproliferation efforts, informal bilateral understandings intended to preserve some of the treaty’s benefit, and unilateral U.S. actions that can have an indirect stabilizing effect, including leadership in pursuing strategic dialogue at various levels. Under each heading, Brooks offers specific ideas: some familiar but neglected, some rarely applied to the nuclear context, and others freshly designed for new challenges. In particular, he offers suggestions to prevent inadvertent escalation, an area in which treaty-based arms control has made only limited progress.

Arms control, in contrast to disarmament, should be thought of not as an end, but as a means to an end: a tool. Jon Wolfsthal takes this perspective in his answer to the question “Why Arms Control?” Wolfsthal argues that arms control can reduce the risks of nuclear use, crisis instability, and accidental or deliberate nuclear conflict; control the scope and shape of nuclear arms racing; and generate trust opening the way to security cooperation in other spheres. To support his argument, he points to several agreements reached between the United States and the Soviet Union during the Cold War. The 1972 Anti-Ballistic Missile Treaty, he notes, employed a mutually accepted concept serving as the base for strategic stability

and impeded a potentially dangerous and costly offensive-defensive arms race. The 1987 Intermediate Nuclear Force Treaty eliminated an entire class of nuclear weapons: weapons that posed the threat of a hasty resort to nuclear use because of the short warning they allowed decision-makers. The ill-fated 1993 START II agreement would have blocked the development of multiple independently targetable reentry vehicles (MIRVs), thus avoiding the heightened chance that in a crisis either side possessing these high-value targets would feel pressure to “use ’em or lose ’em.” While Wolfsthal makes the case for nuclear arms control, he is realistic about the scant likelihood of further or even sustained U.S.-Russian nuclear arms control treaties. On the contrary, he laments the loss of a common set of goals in pursuit of strategic stability: the prerequisite for achieving nuclear arms control agreements. Here, he is in accord with Roberts, though where Roberts places most of the blame on Russia, Wolfsthal assigns blame to both sides.

In “What History Can Teach,” James Cameron concludes this portion of the analysis by assessing the role that arms control played during the Cold War nuclear era. He centers his argument on the tension between the idealized goals of arms control held by its original theorists, like Thomas Schelling, and its actual subordination to the geopolitical and national security needs felt by political decision-makers at the time. He explores why, rather than giving priority to the goal of strategic stability based on mutually invulnerable second-strike forces, the arms control enterprise initially focused more on containing the emergence of further nuclear powers and shoring up U.S. extended-deterrence commitments. And then for largely political rather than strategic reasons, how it, in part, did settle on negotiating constraints on elements in each side’s forces that threatened strategic stability. Cameron finishes by reflecting on the extent to which the prospects for arms control and its possible future role in a multidimensional world of rising nuclear powers will echo the complex interplay of narrow nuclear calculations, larger geostrategic considerations, and political pressures characterizing the last century.

**I**n the final section of the volume, the authors turn to three critical dimensions of the challenge posed by the multipolar world. The continuous advance of technology remains a critical dimension of the way the contemporary nuclear setting is shape-shifting. Rather than catalog the specific technologies involved, for which there is an existing literature, Christopher Chyba concentrates on developing a framework for understanding the impact of new technologies on the concept of strategic stability. In his essay “New Technologies & Strategic Stability,” he identifies several factors that determine how disruptive a new technology might be: the pace and ease with which the technology – whether a weapons system or an enabling technology – spreads among nuclear adversaries; the destructive capability of a technology and its implications for deterrence and defense;

and its impact on decision-making time, the accuracy of information available in the event, as well as the prospects for misjudgment and accidents. How each factor favors or inhibits strategic stability, he notes, depends on a constellation of more specific questions to which each factor gives rise. These need to be answered in context, including whether, from a comparative perspective, a technology's effects qualitatively or quantitatively differ from those of existing technology. Employing these metrics, Chyba then explores possible ways by which technological pathways destructive of strategic stability can be identified and possibly mitigated. To illustrate, he focuses this framework on three new technologies: hypersonic delivery vehicles, antisatellite weapons (ASAT) technologies, and artificial intelligence.

Among emerging technologies, none is more salient than the advance of cyberattack capabilities, including the prospect of integrating cyber warfare into the nuclear sphere. In his essay "Cyber Warfare & Inadvertent Escalation," James Acton makes the case that potential cyber threats to nuclear forces and their command, control, communication, and intelligence (C3I) systems create new escalation pathways that are qualitatively different from escalation risks generated by other sources. These pathways, he argues, result from six key differences between sophisticated cyber capabilities and other technologies. Cyber espionage opens a thoroughly more intrusive ability to monitor an opponent's nuclear forces and operations. Cyber tools offer an unprecedented means of manipulating an opponent's ability to accurately assess fast moving events. Cyber operations, however, generate what he characterizes as unanticipated collateral effects. Cyberattacks are easier to conceal and more difficult to trace than attacks by most other means. And in cyberspace, distinguishing between what may be offensive operations and what is simply espionage activity is particularly difficult, creating risks of responding to cyber espionage as if it were an attack. He then draws a distinction between deliberate cyber interference and nondeliberate or inadvertent interference (the result of misperception or accident), detailing the many reasons one or the other could occur. While recognizing that cyber capabilities by their nature are much more difficult to manage or limit through cooperative measures than other capabilities, Acton concludes with suggestions for how states could reduce the unique hazards emerging from increased cyber capabilities.

One of the major trends in this new nuclear age is the growing momentum behind the movement in favor of a treaty banning nuclear weapons, now extending to 122 state signatories. Harald Müller and Carmen Wunderlich, in their contribution "Nuclear Disarmament without the Nuclear-Weapon States: The Nuclear Weapon Ban Treaty," examine this phenomenon as a new normative dimension of efforts to come to terms with the nuclear challenge. They cast the analysis in the broader context of four sets of norms that have figured in the management of nuclear weapons: nonproliferation, disarmament, constraints on use, and political



restraint. They begin with an exploration of the fundamental nature of such norms: their character, their potential effects, and the countervailing impulses they generate. They next trace the impact that each set of norms has had or could have on the behavior of nuclear actors, followed by the kinds of and reasons for resistance to them. They argue that norms do not stand alone but often form a network of intended or unintended interacting effects. At the heart of the agitation surrounding the ban treaty, however, is another dichotomy between ends that meet the concerns of a global community, and means that often reflect the concerns of particular states. Müller and Wunderlich, after weighing the potential impact of the ban treaty, go on to consider what might be done to find common approaches to reduce nuclear dangers that would also soften the divide that separates nuclear-weapon-possessing states from the majority of non-nuclear-weapon states.

**T**he section concludes with two authors tasked with imagining a future without treaty-based arms control and what paths instead could manage an increasingly complex, multidimensional nuclear world. James Timbie, in “A Way Forward,” attacks the challenge by setting out what nuclear-weapon states could do, short of treaties, to enhance the resilience of their societies and military establishments, to strengthen deterrence, and to reduce the risk of unintended conflict through cooperative and unilateral measures. In the first category, he suggests increasing the resilience of space-enabled communications and surveillance and navigations systems, as well as protecting nuclear forces and their command and control systems from cyberattack. On the deterrence front, he explores areas – for example, cyber threats and threats to space assets – in which existing theory is inadequate or requires rethinking. The majority of his essay develops at length a wide spectrum of cooperative measures along multiple dimensions that would add safety and stability to an evolving and uncertain nuclear world. These start with a variety of unilateral and bilateral commitments affecting strategic and nonstrategic nuclear forces, extend to steps preserving transparency and protecting early warning, and conclude with a rich array of measures to better manage the risks associated with missile defense, space, cyber, and long-range conventional systems. He argues that cooperation on such a broad package of measures can be negotiated given a serious effort, since it could address the full range of concerns expressed by the United States and Russia. His final recommendations are for improved mechanisms of communication between nuclear adversaries; a readiness to think longer and harder about the ramifications of new technologies, such as artificial intelligence, when applied to the nuclear realm; and an emphasis on research and education to prepare policy-makers for the complex decisions that they will need to make “in uncharted territory.”

In her essay “Life beyond Arms Control: Moving toward a Global Regime of Nuclear Restraint & Responsibility,” Nina Tannenwald takes a somewhat

different approach to ways and means to reduce nuclear dangers outside the frame of treaty-based reductions. What steps – formal or informal, unilateral, bilateral, or multilateral – might leaders consider? And, in the absence of arms control, what norms might be substituted? She argues that nuclear-armed states should move toward a global regime characterized by the norm of nuclear “restraint and responsibility.” Its objective would be the same as that of traditional arms control: to reduce threats, provide predictability, foster transparency, avoid nuclear use, and strengthen nuclear restraint. How could this global regime be pursued, other than through legally binding, treaty-based efforts? She finds lessons in past nonbinding political agreements, informal arrangements, and reciprocal unilateral commitments arranged between the Soviet Union and the United States. Some were simply parallel or joint declaratory initiatives, others coordinated unilateral actions, and still others forms of practical cooperation, such as the 1987 Nuclear Risk Reduction Centers Agreement. Using these examples, she proposes a range of ideas along the same lines that are nonetheless adapted to a nuclear world that differs considerably from its predecessor. Key to her analysis, she argues that in the present political environment, the pressures generated by civil society and popular movements will be essential if the more difficult recommendations are to stand a chance.

In the conclusion, we draw from the essays’ major themes and highlight the central points made by the authors. We also identify areas of common agreement among them as well as points of divergence. And, in a last step, we draw from each perspective in making our own recommendations for managing the challenges of this complex and unfamiliar multipolar nuclear world.

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# A Nuclear World Transformed: The Rise of Multilateral Disorder

*Steven E. Miller*

*The end of the Cold War produced great hope that the risks and dangers associated with nuclear weapons could be minimized or tamed in a cooperative international environment heavily regulated by arms control. If arsenals could be reduced, nuclear weapons marginalized, destabilizing factors constrained or eliminated, and proliferation prevented in a world increasingly governed by negotiated arms control, the nuclear perils of the Cold War would be left behind. Nearly three decades later, these hopes have been dashed. Instead, relations among the major nuclear powers have grown more contentious, the spread of nuclear weapons to new states has resulted in worrying regional nuclear orders, and technological advances are raising new threats and possibly introducing new instabilities, while arms control is in a state of near total collapse. A new nuclear order, combining traditional concerns with distinctive new dangers, is here. The perils of this new and still evolving nuclear reality must be understood if they are to be safely managed.*

The end of the Cold War inspired hopes that the persistent threat of nuclear war could be left behind with the twentieth century. Instead, in the post-Cold War era, the contours of the global nuclear order have been reshaped, producing a new nuclear environment filled with distinctive risks and additional perils. Nuclear weapons have regained a central place in the difficult and competitive relations among the major powers, but in a framework that is less bilateral and more triangular. The spread of nuclear weapons to additional states has multiplied the sources of nuclear risk and introduced new pathways to the use of nuclear weapons. Unprecedented fears of nuclear terrorism have haunted policy-makers and consequently had a major influence on policy. In addition, the advance of technology is creating new threats and challenges, such as cyberattacks and cyber espionage, while also potentially undermining the survivability of traditional nuclear forces and hence eroding the deterrent stability that has long been thought essential for containing nuclear dangers. All this has unfolded while arms control has been nearly eliminated from the picture, moving toward an unconstrained environment in which the new nuclear dynamics can play out, with arms race pressures and potential instabilities already in view. What has emerged

and is still emerging is a more complex, more difficult, and less regulated nuclear environment whose distinguishing hazards must be safely navigated if we are to avoid the many nightmarish nuclear use scenarios. Understanding how much has changed, and the implications of those changes, leads directly to the conclusion that nuclear risks are dramatically increasing.

During the Cold War, the rivalry between the Soviet Union and the United States dominated the global nuclear order. These two states were preoccupied with one another and amassed vast arsenals of nuclear weapons in efforts to gain advantage and to deter the ambitions and capabilities of the other. Most of the formative theoretical and policy-oriented thinking about nuclear weapons emerged in this bilateral context: conceptions of stability and instability, the logic of arms control, the nature of crisis management, deliberations about deterrence and the adequacy of nuclear force postures, and arguments about how the powerful mutual interest in avoiding nuclear war could best be pursued. This world was not, of course, purely bilateral. On the Western side, the United Kingdom and France acquired small nuclear arsenals, but these states were formal allies of the United States and their nuclear assets were seen as minor supplements to NATO's nuclear capability. On the Communist side of the great East-West competition, China developed nuclear weapons, but its force was very small and limited, China itself was still a weak developing country, China's relationship with the Soviet Union was less stable than that of the NATO allies, and the Chinese threat was massively overshadowed by a Soviet arsenal that peaked at nearly forty thousand nuclear weapons. It was the confrontation between the two great nuclear titans that structured the global nuclear order during the Cold War and dominated the politics, policies, and thinking associated with nuclear weapons. We must now come to grips with the fact that this nuclear order no longer exists, and it is unclear whether the solutions and verities of the bilateral era will be adequate in today's more complex nuclear environment.

During the forty-five years of the Cold War, Moscow and Washington gradually constructed a nuclear relationship that was regarded as reasonably stable (though worries about destabilizing developments persisted), was heavily regulated by negotiated agreement (though doubts about arms control were ever-present), and was jointly managed via an ongoing arms control process (though critics questioned the desirability and effectiveness of this approach). There were risks and dangers, but the bilateral structure had a certain clarity and simplicity: two nuclear behemoths competing diplomatically while seeking to deter one another without sparking a nuclear war. This was a world, in security theorist Thomas Schelling's phrase, that we thought we understood.<sup>1</sup>

The end of the Cold War initially produced new worries and dangers, particularly because the disintegration of the Soviet Union left the vast Soviet nuclear arsenal scattered across the newly independent states that emerged from the Soviet

collapse, raising the possibility of new nuclear-armed states and causing concern that nuclear weapons, materials, or personnel might leak into nuclear black markets and provide options for rogue states or nonstate actors. In the transition from the old world to the new, these risks represented an urgent challenge, and it would take several years and considerable effort to consolidate Soviet nuclear assets into Russia, which was accepted by key actors such as the United States as the sole nuclear successor state to the former Soviet Union.

Meanwhile, however, relations between Moscow and Washington (who between them still possessed – and possess – the overwhelming majority of the world’s nuclear weapons) quickly assumed a much more benign form as they together formally proclaimed “an era of friendship and partnership.”<sup>2</sup> This allowed, as one contemporaneous analysis put it, “serious consideration of international orders predicated on high levels of security cooperation.”<sup>3</sup> The replacement of intense rivalry with congenial relations and cooperation seemed to open up huge vistas for negotiated restraint and joint management of the nuclear order. Reflecting the optimism of the time, another analysis suggested: “The revolutions of 1989 have opened unprecedented opportunities for more sweeping agreements. Arms control can now begin dismantling the East-West military confrontation – not merely moderating its risks – and thereby help shape the security structure of the post–Cold War world.”<sup>4</sup> Indeed, soon after the collapse of the Soviet Union, ambitious new arms control objectives emerged on the bilateral agenda. At the Bush-Yeltsin summit in Washington, D.C., in June 1992, for example, the two presidents announced that they had agreed to make dramatic cuts in strategic nuclear forces, to eliminate destabilizing multiple-warhead (MIRV, or multiple independently targetable reentry vehicle) missiles, and to undertake an array of other cooperative measures: provisions codified in the START II agreement of January 1993. President Bush himself underscored the unprecedented character of this “extraordinary agreement,” noting at his joint press conference with President Yeltsin that “this fundamental agreement which in earlier years could not have been completed even in a decade has been completed in only five months. Our ability to reach this agreement so quickly is a tribute to the new relationship between the United States and Russia.”<sup>5</sup> There seemed to be every reason to be hopeful that the new era would be marked by cooperation and restraint in nuclear affairs.

At the outset of the post–Cold War era, then, a well-elaborated and dominating bilateral nuclear framework inhabited an unprecedentedly harmonious international political context, Russian and American nuclear forces were shrinking dramatically, the balance was regarded as stable, nuclear arms control had real momentum, and it seemed as if nuclear dangers were being substantially tamed. Because the nuclear weapons left behind by the Soviet Union in newly independent states were being relocated to Russia, it also seemed likely that the bilateral structure of the nuclear order would remain intact. Further, there had not been

an open addition to the roster of nuclear armed states since the 1960s, when China acquired nuclear weapons: Israel's program remained opaque and unacknowledged while South Africa's long-hidden nuclear weapons program had been terminated in 1989. While proliferation worries remained (North Korea was already looming as a problem), there were no immediate nonproliferation crises on the international agenda, and it seemed that the central nuclear challenge would be managing the U.S.-Russian nuclear relationship in the context of what President George H. W. Bush called the new world order. These circumstances gave rise to extravagant visions of the nuclear order that might now be possible. A Harvard project on cooperative denuclearization, for example, suggested in 1993 that if this propitious moment were fully exploited, it might be possible to achieve "the elimination of nuclear weapons from the central role they have played in international life for fifty years" and to "establish new international norms that push nuclear weapons to the fringe of international life."<sup>6</sup>

But no such world has come to pass. Instead, over a period of nearly three decades, the benign bilateral nuclear order and the high hopes that accompanied it have disappeared.<sup>7</sup> The optimistic expectations of the early post-Cold War period have been blighted, obviously, by the striking deterioration of U.S.-Russian relations that has revived the rivalry and hostility of the previous era. However, this factor alone does not adequately account for the realities of the current moment in nuclear affairs. Indeed, if the decay of the relationship between Washington and Moscow involved simply the restoration of something like the dominating Cold War nuclear balance, we would be on familiar ground, back on Schelling's well-understood terrain of maintaining bilateral nuclear stability within the confines of a conflictual and sometimes toxic political relationship. What has emerged is something different, something unfamiliar: a nuclear environment whose essential dynamics cannot be captured by a single overweening bilateral relationship at the core of the system. This outcome is the result of at least four major changes in the attributes of the nuclear order, changes that have arrived unevenly and fitfully over a several decade period. Together, however, they have combined to transform the nuclear environment in ways that are likely to make it more difficult to contain the risks and dangers associated with nuclear weapons.

**T**he erosion of the bilateral nuclear order. In contrast to the bipolar Cold War international order, great-power relations are no longer overwhelmingly bilateral. China's stunning rise over the past quarter-century has changed the dynamics among the most powerful states at the heart of the international system. In the United States, China is now widely seen as the greatest challenge to American power and interests for the foreseeable future. Strikingly, the Pentagon believes that Beijing is harnessing its growing power to enormous ambitions: "As China continues its economic and military ascendance, asserting power through

an all-of-nation long-term strategy, it will continue to pursue a military modernization program that seeks Indo-Pacific regional hegemony in the near-term and displacement of the United States to achieve global preeminence in the future.”<sup>8</sup> Beijing’s postulated goal of displacing the United States obviously represents a fundamental threat to America’s role in the world and is certain to elicit vigorous counteraction by Washington.

Simultaneously, Russia has reemerged as a rival. With its contentious policies, aggressive behavior, and thousands of nuclear weapons it will continue to figure centrally in Washington’s perceptions. But no longer does the United States focus in a singular way on Moscow. Increasingly, Russia and China are paired as the largest threats to U.S. security and to American influence in the international order. This can be seen plainly in the 2017 U.S. National Security Strategy, which states that “China and Russia challenge American power, influence, and interests, attempting to erode American security and prosperity.”<sup>9</sup> This theme is echoed and underscored in the Trump administration’s 2018 Nuclear Posture Review (NPR), which highlights “the return of great power competition” as one of the animating forces shaping U.S. nuclear policy and identifies Beijing and Moscow as major sources of American insecurity. According to the NPR, “Global threat conditions have worsened markedly. . . . International relations are volatile. Russia and China are contesting the international norms and order we have worked with our allies, partners, and members of the international community to build and sustain.”<sup>10</sup>

China’s growing status as a serious challenger to the United States will inevitably make the nuclear relationship at the core of the global nuclear order more triangular. Bilateral dynamics will of course remain important, but they will be influenced and sometimes shaped by three-sided considerations. This will not be a symmetrical triangle, because China’s doctrine of minimum deterrence and its restraint in the acquisition of nuclear assets has produced a nuclear force posture considerably smaller and more limited in capability than the arsenals of the United States and Russia. Moscow’s thousands of nuclear weapons will for the foreseeable future constitute the largest nuclear threat. But China’s steady nuclear modernization program is creating a more capable force that is viewed as worrisome by Washington, requiring a “tailored” deterrent response. “Our tailored strategy for China,” the 2018 Nuclear Posture Review states, “is designed to prevent Beijing from mistakenly concluding that it could secure an advantage through the limited use of its theater nuclear capabilities or that any use of nuclear weapons, however limited, is acceptable.”<sup>11</sup>

This three-sided nuclear relationship will produce more complex interactions among and more complicated calculations for the three protagonists. China’s growing impingement on the Russian-American orbit brings into the mix of great-power relations an actor with differing views on the preferred characteristics of the international order and sometimes divergent perspectives on key issues like

nuclear proliferation or on significant players such as North Korea, Iran, and Pakistan.<sup>12</sup> Effective management of this three-sided relationship will be difficult, as can already be seen in the frictions that have arisen in U.S. relations with both China and Russia and in the potential alignment of Beijing and Moscow against Washington.<sup>13</sup>

The nuclear policy reverberations among the three contending powers are already apparent. In the American discussion about the fate of the bilateral U.S.-Russia Intermediate-Range Nuclear Forces (INF) Treaty, for example, Washington's protracted concerns about Russian noncompliance put the issue on the agenda, but the case for terminating the agreement increasingly included the argument that the INF handicapped the United States in its effort to cope with the build-up of Chinese forces in the Western Pacific. China was not a party to the INF agreement and, being unconstrained, made a heavy investment in shore-based missiles that were seen as a serious threat to U.S. allies and U.S. naval forces in the region. The INF agreement prohibited the United States and Russia from deploying land-based missiles with a range between 500 and 5,500 kilometers, which precluded U.S. ground-based deployments in Asia to offset the Chinese missile capability. In terms of the Sino-American competition in the Pacific, the INF came to be widely regarded as a strategic liability.<sup>14</sup> Indeed, when the U.S. withdrawal from the INF took formal effect on August 2, 2019, it was immediately apparent that the China factor had weighed heavily in the American decision. The termination of the treaty coincided with the news that the United States was planning a new missile "intended to counter China," and the U.S. secretary of defense expressed the goal of deploying ground-based missiles in Asia as soon as possible.<sup>15</sup> Moscow was moved by a similar calculation, because Chinese medium-range missiles could hit targets in Russia but Russia was prevented by the INF agreement from deploying a symmetrical capability.<sup>16</sup> Hence, Moscow followed Washington in announcing that it would withdraw from the INF. Mutual American and Russian accusations of noncompliance were the proximate cause of these withdrawals, but undergirding these decisions were strategic calculations that reflected the three-sided nature of the environment.

A similar trilateral dynamic can be seen in the context of ballistic missile defense (BMD). Here we find a round-robin of reciprocal concern, driven by Washington's sustained investment in missile defense over a period of decades. Because the United States withdrew from the Anti-Ballistic Missile (ABM) Treaty in 2002, there are no legal constraints on missile defense deployments, and the United States appears to possess an expansive appetite for such capabilities. Though current deployments and capabilities are quite limited, particularly against offensive forces as large as those possessed by Russia and China, Moscow and Beijing display palpable apprehension that their deterrent postures may eventually be undermined by advances in U.S. missile defense.



The United States has sought to allay such fears by insisting that its missile defense program is aimed at other states with small capabilities, such as North Korea and Iran, and lacks the capability to pose a serious threat to Russian or Chinese nuclear forces. However, explicit displays of interest in the United States in developing national missile defense for the homeland, continued substantial investment in missile defense technology, and occasional unadorned comments by U.S. officials and analysts about more ambitious missile defense goals undermine U.S. attempts to reassure Russia and China about its missile defense plans. In fact, the Trump administration's Missile Defense Review, released in January 2019, makes it clear that one of the goals of the U.S. BMD effort is to deal with challenges from Russia and China.<sup>17</sup> In unveiling the Missile Defense Review, President Trump himself emphasized the expansive and open-ended nature of the U.S. BMD program: "Our goal is simple. To ensure that we can detect and destroy any missile launched against the United States anywhere, anytime, anyplace."<sup>18</sup> China is also likely to have taken note when the national security advisor of the United States said, "China is building its nuclear capacity now. It's one of the reasons why we're looking at strengthening our national missile defense system here in the United States."<sup>19</sup> For Russia, missile defense has been described as "a burning issue."<sup>20</sup> Russian President Vladimir Putin has been repeatedly outspoken about the danger posed by U.S. BMD. In his annual major speech to the Russian Federal Assembly in 2018, he remarked, "The U.S. is permitting constant, uncontrolled growth of the number of anti-ballistic missiles, improving their quality, and creating new missile launching areas. If we do not do something, eventually this will result in the complete devaluation of Russia's nuclear potential." Putin pledged that "we will make the necessary efforts to neutralize the threats posed by the deployment of the U.S. global missile defence system" and outlined an extensive set of nuclear modernization efforts that were justified as reactions to the U.S. BMD program.<sup>21</sup>

Triangular considerations are also making themselves felt in the realm of arms control. Increasingly, the view in Washington is that China will need to be drawn into negotiations and agreements that were once bilateral. China's growing power, the steady modernization of its nuclear forces, concerns about the possible future expansion of its nuclear arsenal, and its status with Russia as a primary challenger to the United States combine to suggest that in the future it will be increasingly difficult both to leave China out and to impose additional constraints on U.S. and Russian nuclear capabilities if China remains unconstrained. It is not a new thought to suggest that future strategic arms agreements should include China, but this calculation is becoming increasingly evident in policy discussions. President Trump, for example, has instructed his team to prepare for possible nuclear negotiations that would include both China and Russia. Including China in future arms control seems understandable, reasonable, and desirable, but at least in the short-to-medium term, it will represent a significant complication that is

more likely to impede progress than to lead to three-sided constraints.<sup>22</sup> Nuclear arms control with China is unprecedented, its force posture is not comparable to those of Russia and the United States, and Beijing shows no interest in participating in negotiations under these circumstances. As Richard Burt, chief negotiator of the Strategic Arms Reduction Treaty, and Jon Wolfsthal, nuclear weapons expert and *Dædalus* author, have written, “Trying to expand nuclear deals to include China now may seem like a good idea, but in practice, it will have little or no chance of being achieved.”<sup>23</sup> And in the longer term, as well, it may prove difficult to find mutually acceptable solutions in three-way negotiations, keeping in mind that even the bilateral strategic arms negotiations were often arduous and painstaking affairs that required years to reach agreement.

In short, the familiar bilateral nuclear order that dominated nuclear affairs for the first six or seven decades of the nuclear age is fading away. In its place stands a triangular relationship whose complexities will only gradually be discovered, whose dynamics are only beginning to be learned.

**T**he emergence of regional nuclear subsystems. In the hopeful days at the beginning of the post-Cold War era, concerns about nuclear relationships in regional settings simply did not exist because outside of the East-West context, nuclear weapons were not a part of the equation. In 1991, Israel was the only state thought to possess nuclear weapons outside of the five nuclear-armed states acknowledged by the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), and Israel’s nuclear capability was opaque, unacknowledged, and had not provoked successful nuclear acquisition by other states in the Middle East.<sup>24</sup>

That began to change in May 1998 when India and, soon thereafter, Pakistan tested nuclear weapons, becoming the first states in several decades to openly transgress the nonproliferation norm and seek a deployed nuclear capability. In the intervening years, both New Delhi and Islamabad have invested steadily in their nuclear programs, have produced nuclear weapons numbering in the hundreds, and have acquired increasingly diverse and capable delivery systems. A regional nuclear order now exists in South Asia – a dramatic change from the world of 1991.

Nuclear-armed South Asia is a source of major concern for several reasons. First, relations between India and Pakistan remain fraught and serious incidents between them occur with some regularity. A string of crises – the 1999 Kargil War, the 2001 terrorist attack on the Indian Parliament in New Delhi, the 2008 bombings in Mumbai, among other incidents and clashes – has highlighted the dangers of acute friction between two nuclear-armed states. In March 2019, an Indian aircraft violated Pakistani airspace, was shot down, and the pilot was captured, creating a potentially incendiary crisis and providing yet another illustration of the fact that South Asia is a dangerous setting for nuclear weapons. Second, it is not clear how stable the nuclear balance in South Asia can be. Far from being separated by

hemispheres, as were the Soviet Union and the United States, India and Pakistan are immediate neighbors with a shared border and a history of war. Distances and flying times are short, warning time will be minimal, nuclear assets and command and control may be vulnerable (possibly producing preemptive or use-them-or-lose-them pressures), and in Pakistan's case, it has adopted a NATO-like doctrine of first use intended to neutralize India's conventional advantages. The Indian and Pakistani governments have shown their ability to manage incidents while avoiding escalation, but it is far from reassuring that this possibly precarious nuclear balance is tested by crisis after crisis. It is this dynamic that leads many to believe that nuclear weapons are more likely to be used in South Asia than anywhere else. Third, India's security policy and nuclear posture are influenced not only by Pakistan but also by China, with whom it has a history of uneven relations, unresolved border issues, concern about Beijing's close relations with Pakistan, and past wars within living memory. Here then we find another triangle, one that intersects with the great-power triangle and raises the prospect of cascading ripple effects. Chinese responses to developments in U.S. nuclear policy can affect India's calculations, which in turn will have implications for Pakistan.

After India and Pakistan came North Korea. As the Cold War receded and as former Soviet weapons were secured in Russia, looming proliferation concerns centered on North Korea's nuclear behavior. However, this crisis was staved off for nearly a decade by the 1994 Agreed Framework, which significantly constrained Pyongyang's nuclear program and put its nuclear assets under IAEA supervision. But this arrangement collapsed in 2002, North Korea withdrew from the NPT in 2003, and by 2006, it had conducted its first test of a nuclear weapon. In the subsequent decade and a half, North Korea has conducted a series of nuclear weapon and missile tests and acquired an estimated few dozen nuclear weapons, has deployed missiles capable of hitting regional targets such as Japan and South Korea, and has tested missiles of intercontinental range that, if deployed, would give Pyongyang the ability to threaten targets in the United States with nuclear attack. Thus, one of the world's most isolated and erratic regimes, led by an extremely authoritarian government that places extraordinary power in the hands of a single eccentric individual, is a nuclear-armed state. This has been one of the most disturbing developments of the past twenty years and has greatly complicated the security dynamics in Northeast Asia.

North Korea is a state, moreover, with a long history of deeply hostile relations with the United States and its regional allies. Indeed, because a formal peace treaty was never reached between North Korea and the coalition of states that fought against it, these states remain technically in a state of war. Pyongyang has given much evidence over a protracted period of time that it feels acutely threatened by the United States and its South Korean ally – who together dwarf North Korea in economic might and military power – so it is likely that it regards its nuclear

weapons as a necessary guarantor of its security, if not survival. Pyongyang's fear of attack appears to be genuine – not surprisingly, since the United States has in fact threatened North Korea in a variety of ways – and is a volatile factor that could prove destabilizing and even escalatory in a crisis.

The North Korean situation impinges on the interests of China and Russia as well as the United States, meaning that in Northeast Asia we find a quadrilateral set of nuclear-armed states involved in attempting to manage the region's security affairs, but with different relationships among the quadrilateral actors, different capabilities to influence the regional situation, and different interests and preferred outcomes. To complicate matters further, two key actors in the region, Japan and South Korea, are American allies and benefit from U.S. nuclear guarantees. Northeast Asia is a heavily nuclearized region: every actor in the region is a part of the regional nuclear order, whether directly or indirectly.

This disturbing picture illustrates several unfortunate consequences of the rise of regional nuclear orders. First, as was the case in South Asia, the situation in Northeast Asia raises nuclear risks in an environment in which bellicose rhetoric has been commonplace and serious incidents – including minor uses of force – have recurred. The unexpected détente in 2018 between President Trump and North Korean leader Kim Jong-un has calmed the situation for the time being, but it is not clear how long that will last or where it is heading. Their failed Hanoi summit suggests that continued progress may not be forthcoming. But the more common mode in North Korean relations with the United States and South Korea has been friction and confrontation. Indeed, the antecedent to the Trump–Kim Jong-un honeymoon was the war scare of 2017. On the American side, this was marked by the movement of naval forces, provocative flights along North Korea's coast, evacuation of some U.S. citizens from South Korea, and harsh threats from President Trump. With a crescendo of inflammatory rhetoric in the late summer of 2017, Trump delivered his most flamboyant and memorable line: “North Korea best not make any more threats to the United States. They will be met with fire and fury like the world has never seen.” This was, as the *New York Times* account commented, “chilling language that evoked the horror of a nuclear exchange.”<sup>25</sup> On the North Korean side, 2017 was a year of multiple missile tests, a nuclear weapon test, and brash rhetoric from Kim Jong-un, including personal insults of President Trump. This was a contest in reciprocal threat and provocative actions that produced genuine fears of war. “Nuclear war seems terrifyingly imaginable,” wrote *New York Times* columnist Nicholas Kristof in the midst of this crisis.<sup>26</sup>

Second, North Korea displays few of the qualities and capabilities that make for effective crisis management.<sup>27</sup> Its military command system is unlikely to promote accurate and truthful reporting while its early-warning systems lack sophistication and redundancy. Mistakes, misperceptions, and errors are unlikely to be reported or corrected because of the fear of punishment in a harsh domestic political

environment. Senior decision-makers are quite likely to be operating on the basis of inadequate or inaccurate information, whether responding to an actual crisis or a false alarm. In addition, Pyongyang combines substantial vulnerability to attack with deep (and possibly warranted) fears of attack, a mix that could prove sharply escalatory in a crisis, especially in view of North Korea's preemptive nuclear doctrine. If Pyongyang believes, rightly or wrongly, that it is under attack or about to be attacked, it could well feel pressured to use nuclear weapons preemptively early in a crisis. The existence of such incentives in a region prone to tension and confrontational incidents is extremely dangerous. There is little reason to be confident that the North Korean system would be inclined or able to behave in a careful, cautious, restrained, or disciplined way under the pressure of a nuclear crisis. The traditional remedy to such nuclear risks is to promote strategic stability, which would imply accepting, if not facilitating, the emergence of a mutual deterrence relationship between Pyongyang and the United States. Because of North Korea's limited nuclear capabilities and Washington's massive advantage in military power, it is not clear whether it is possible for Pyongyang to develop a credible deterrent posture. But the problem is exacerbated by American policies aimed at preserving coercive and preemptive options against North Korea: U.S. policy prolongs and reinforces the instabilities that raise frightening nuclear risks on the Korean peninsula. For the foreseeable future, a crisis, an incident, or even a false alarm in this region represents a distressingly plausible path to the use of nuclear weapons.

Third, the North Korean case displays as well the interconnectedness of regional nuclear orders with the wider global environment. To provide protection from the North Korean missile threat in Northeast Asia, for example, the United States is deploying its Theater High Altitude Area Defense (THAAD) system in South Korea. To American eyes, this is a limited and purely regional deployment, aimed at North Korea, which should have no significant implications for China. Perhaps not surprisingly, Beijing does not see it that way and has reacted very negatively, criticizing the move and pressuring South Korea to change its policy. China appears to believe that the radar associated with the THAAD deployment in South Korea will augment existing American capabilities in ways that increase the U.S. ability to precisely track and target Chinese missiles, thereby degrading its deterrent force.<sup>28</sup> As Li Bin, one of China's leading strategic experts and a contributor to this volume, has explained, "China has to worry that the THAAD radar in the ROK would undermine China's nuclear deterrence by collecting important data on Chinese nuclear warheads that the United States could not acquire from other sources."<sup>29</sup> Thus, Washington's effort to address the challenge posed by North Korea's nuclear arsenal is having a direct impact on its relationship with China. If China responds vigorously to this perceived threat to its deterrent force, this will almost surely have implications for other nuclear actors (particularly India) in the triangles that involve China.

With the emergence of regional nuclear balances, there are new nuclear players, new risks, new sources of potential nuclear use, multiplying worries about nuclear stability, and new sets of intersecting policy concerns and calculations. Moreover, these regional dynamics are playing out in the context of an international system that is more complex and a core nuclear order among the major powers that is more triangular than bilateral. As political scientist and coeditor of this volume Robert Legvold has written of this challenge,

Over the forty years of the Cold War, leaders, defense planners, and pundits slowly came to understand the dynamics of a two-sided nuclear competition in a two-sided global setting – even if that setting began to lose its cohesion in its later years. But how were the dynamics of a many-sided nuclear world, with pairings and triangles multiplying, in a fractured international political setting to be understood?<sup>30</sup>

This question poses a new challenge and represents an enormous change from the world of 1991.

**N**uclear terrorism climbs the agenda of worries. It is simply impossible to understand American security policy in the post-Cold War era without recognizing the centrality of nuclear terrorism in Washington's threat perceptions. To be sure, nuclear terrorism was a concern even during the Cold War, but it was not prominent in the policy discourse and it was not a major influence on nuclear policy.<sup>31</sup> Since the end of the Cold War, however, it has leapt up the agenda of nuclear worries: indeed, for a number of years, nuclear terrorism was widely regarded as the gravest danger to American security.<sup>32</sup> This elevation occurred in two phases. In the first, starting in the early 1990s, the driving consideration was fear that the massive but shattered and impoverished Soviet nuclear complex might leak weapons-relevant materials and expertise and thereby provide a potentially large supply of nuclear assets for an international black market. This could fuel the proliferation of weapons to states but could also provide an opportunity for extremist terrorist groups to gain access to nuclear weapons or the materials and expertise to make them. In the chaotic aftermath of the collapse of the former Soviet Union, with political and social instability widespread, budgets plummeting, and zero demand for the services of the nuclear weapons complex, there was no confidence that the Soviet Union's nuclear assets would be properly secured. This was understood as a crisis and became an abiding priority during the 1990s. The United States launched the Cooperative Threat Reduction program (also known as the Nunn-Lugar program, after the two senators who sponsored the original legislation) in 1991, aimed at working with Russia to ensure that all nuclear weapons and materials were safely and securely stored. Years of effort and billions of dollars were invested in this effort, with considerable success in improving the security at Russian nuclear facilities. This experience also produced

an urgent long-term concern about the security of all nuclear materials on a global basis, a problem that remained a high priority at least until the advent of the Trump administration. President Obama, in fact, made the security of weapons-usable nuclear materials one of his signature issues and presided over four Nuclear Security Summits intended to promote higher standards of nuclear security for all holdings of nuclear materials.

The second phase in the elevation of the nuclear terrorism threat commenced with the shock of September 11, 2001. The terrorist attacks on the United States made it inescapably clear that terrorists were capable of mounting sophisticated operations on the U.S. mainland, were willing and able to kill large numbers of people, and harbored beliefs deeply hostile to the United States. Immediately and for some years to come, the so-called war on terrorism became a central element – arguably the central element – of America’s external policy. The specter of a nuclear 9/11 haunted this effort. As President George W. Bush warned on a number of occasions, it would be a nightmare if the world’s most dangerous weapons fell into the most dangerous hands. A bipartisan group of prominent political figures proclaimed nuclear terrorism to be the number one threat to American security.

Thus, for nearly two decades, Washington has viewed terrorists as another potential source of serious and worrisome nuclear risk, to be combatted where necessary, to be deterred if possible, and to be regarded always as a central concern of U.S. policy. Efforts to address this threat have, in various forms, had a huge impact on U.S. policy, including such major preoccupations as the Cooperative Threat Reduction Program with Russia, the 2003 invasion of Iraq, and the Nuclear Security Summits, all of which were justified at least in part by the imperative to reduce the threat of nuclear terrorism. This is a striking change in the nuclear agenda and a destabilizing influence on the international order compared to the familiar bilateral world that existed in 1991.

*E*volving technology raises new concerns. A fourth development changing the nuclear environment – and another that has progressed unevenly, and sometimes with unsettling rapidity – has been the evolution of technology. The accumulation of improvements and innovations is having a large effect on the character and stability of nuclear relationships. Three overlapping broad trends are notable.

First, advanced conventional weapons are increasingly capable of performing strategic missions, either through direct attack on an adversary’s nuclear assets or by attacking dual-use facilities (such as warning systems or command and control) whose destruction would degrade the other side’s ability to conduct nuclear operations.<sup>33</sup> Such attacks blur the line between conventional and nuclear conflict and create scenarios in which conventional operations can produce pressures to

escalate to nuclear use. This problem is compounded by the fact that some delivery platforms, including aircraft and missiles of various types, are being deployed in a dual-capability mode, meaning that an opponent will not be sure whether an incoming attack is conventional or nuclear.

Second, advances in surveillance, precision, and lethality are making it more difficult to retain confidence in the survivability of nuclear forces that are the foundation of stable nuclear relationships.<sup>34</sup> Land-based forces can be targeted, mobile forces can be surveilled and struck, sea-based forces may be increasingly vulnerable, and command and control of nuclear forces may be susceptible to disruption by conventional-, nuclear-, or cyberattack. The assured destruction that is, in the canons of nuclear strategy, the source of mutual stability may be increasingly difficult to assure. This is especially worrisome in the context of regional nuclear balances, with more limited forces and difficult security environments. But in the future, even the bigger nuclear powers may feel a need to take refuge in larger numbers and more diversified force postures.

Third, we have witnessed in the several decades since the end of the Cold War the emergence of new domains of technological competition, whether through the arrival of new systems such as cyber, advanced drones, and hypersonic delivery systems or through the extension of advanced military technologies into new environments such as space. In 1991, for example, no one worried about cyber threats to nuclear forces, but today, it is a growing concern.<sup>35</sup> Cyber interference in the command and control systems for nuclear weapons have the potential to very effectively disrupt an opponent's capabilities. Moreover, new technologies can widen the array of actors who are able to pose serious disruptive threats and have the potential to level the playing field between larger and smaller players. States like North Korea or Iran cannot possibly hope to match the nuclear force postures of the larger nuclear-weapon states, but they are capable of developing effective cyber capabilities, using drones, or putting military assets in space. For example, North Korea's nuclear weapons are of course worrisome, but there is a parallel concern about its cyber capabilities, which, unlike nuclear weapons, North Korea has appeared to employ regularly.<sup>36</sup> Technological advances are producing a wider array of threats from a wider array of actors.

Taken together, these trends are producing a military environment that is more complex and less stable. Technological advancement has been normal in the nuclear context, but the pace and extent of technological innovation in recent years is raising unprecedented issues and introducing new sources of threat, worry, and instability. The extensive nuclear modernization programs being undertaken by almost all of the nuclear armed states mean that the situation is very dynamic, with new technologies continually being absorbed into the postures, doctrines, and operations of states, creating a nuclear order that is markedly different from that which existed at the end of the Cold War.



**I**mplications. What is different about the current nuclear order? First, the great-power rivalry at the heart of the order has become less bilateral, more triangular. Second, fraught regional nuclear orders did not exist before about 2000, but now have become a major factor and a major concern. Third, the threat of nuclear terrorism looms much larger for the United States than was true during the Cold War. And finally, this extensive geopolitical change is unfolding in a fluid and fast-moving technological environment that may make it more difficult to create and preserve stable nuclear relationships. What are the implications of these changes?

- *Multiple audiences.* From Washington's perspective, it has become increasingly evident that its nuclear deterrent policies must be aimed at multiple audiences. Where the overwhelming preoccupation was once with Moscow (and China included as a lesser player), now the focus is on devising specific strategies for different targets, ranging from nonstate actors to great powers. This concept of "tailored deterrence" has become a prominent theme in U.S. nuclear policy, from George W. Bush to Donald Trump. As one analysis of the concept explains, tailored deterrence seeks

to address the distinctive challenges posed by advanced military competitors, regional powers armed with weapons of mass destruction (WMD), and non-state terrorist networks. . . . Given the wider variety of actors that could inflict mass casualties upon the United States, its allies, or its interests, it makes sense to explore whether and how deterrence could be adapted, adjusted, and made to fit 21st-century challenges.<sup>37</sup>

- *More complex patterns of interaction.* The new nuclear order can be viewed as comprising a core nuclear triangle (China, Russia, and the United States) plus two multilateral regional nuclear subsystems. Two other regional arenas – Europe and the Middle East – can also be regarded as regional nuclear subsystems: Europe because of the American nuclear guarantees to its NATO allies and because the United Kingdom and France possess nuclear weapons; the Middle East because Israel has long been presumed to have a nuclear weapons capability and because concerns about Iran's appetite for nuclear weapons have been an overwhelmingly important factor in regional and international politics. The multiplicity of players in the nuclear order that now exists make possible reverberating chains of interaction, as nuclear relationships among some ripple through the perceptions and behavior of others. Thus, for example, China aided Pakistan, discomfiting India, while Pakistan in turn provided assistance to Iran's nuclear program, producing strong reactions in Washington, Jerusalem, and Riyadh. Nuclear relationships are not only bilateral or multilateral, but can cascade through multiple

actors in the system. In short, these multiple nuclear subsystems, each with its own characteristics and dynamics, intersect and interact. There are multiple points within these structures that can initiate moves that produce cascading reactions. China appears to occupy a particularly pivotal role because it is a major player in nearly all the multilateral components of the global nuclear order. Whether it persists with its relatively restrained nuclear policy – relying on a small deterrent force accompanied by a no-first-use doctrine – will be one of the crucial influences shaping the order in the years ahead. If China comes to adopt a more ambitious nuclear policy that expands its nuclear forces and makes it more competitive with Russia and the United States, Washington and New Delhi will surely react in some significant way, Russia will respond to whatever changes Washington makes to its policy, Pakistan will adjust to whatever New Delhi has done, and China's changed policy will have rippled through much of the system. But this is only one possible chain of interactions in a world of multiple multilateral nuclear subsystems. The arms race implications are obvious, especially as constraints on nuclear capabilities are waning. In the event that the only remaining limits – those in the New START agreement – are allowed to lapse, then, as journalist Fred Kaplan has written, “The Russians could build more weapons, the United States (and perhaps other nuclear powers) would probably respond, and off we go, once more, into the wild blue yonder.”<sup>38</sup>

- *Multiple sources of instability.* The specter that haunted the Cold War was the large-scale nuclear war between the United States and the Soviet Union, and smaller or inadvertent variations of that catastrophic scenario. Today, there are multiple flash points. Relations between the big three powers are unsettled and Russian-American relations have become distressingly toxic. Given the evolving technological context, it is unclear how stable the great-power nuclear relationships will be, but there is no question that the combination of intense rivalry and worryingly vulnerable forces is a dangerous mix. However, the regional nuclear balances are even more likely to cause the use of nuclear weapons, given the troubled security environments in those regions and the factors that make conflict an imaginable outcome. There is even more doubt in regional contexts that the nuclear-armed states will be able to develop confidence-inspiring deterrent postures: the conditions that facilitated stability in the superpower setting are not easily replicable in regional settings and the regional nuclear powers must contend with the same technological challenges to stability as the bigger powers. Finally, there is the diffuse threat of nuclear terrorism, which provides yet another potential nuclear flash point, a risk of unknown proportions that, at least in Washington, is taken very seriously. In short, politics and technology have combined to produce an unfortunate number of sources of instability. As arms control

and nonproliferation scholar Steven Pifer has written, “Strategic stability appears increasingly a multilateral and multi-domain construct. This is a much more complex model than during the Cold War.”<sup>39</sup>

- *More difficult environment for arms control.* Technology is evolving in ways that can make past agreements obsolete and new agreements difficult or impossible to achieve. Cyber threats, for example, may represent an urgent problem, but it is hard to see how they can be constrained by arms control. If technology is making arms control more difficult, politics seems to be making it less likely. The frayed relations between Moscow and Washington have led to a substantial erosion of the Cold War arms control architecture and there appears to be little will to move forward with new initiatives. China is now a major player but appears to be still unready to join trilateral or multilateral strategic arms control negotiations. The regional nuclear balances are almost completely untouched by any negotiated constraints. Prominent multilateral arms control efforts, such as the Comprehensive Nuclear-Test-Ban Treaty and the Fissile Material Cutoff negotiations, have been stymied for years, with no indications of progress anywhere in sight. Ideally, it would be possible to constrain and manage the new nuclear order using the kinds of arms control processes and mechanisms that helped to regulate the nuclear rivalry in the Cold War. In time and with concerted effort, perhaps it will prove possible to recreate a negotiated regulatory infrastructure that will moderate the risks and dangers of this new age. For the moment, however, conditions are not propitious and the current picture is bleak: bilateral arms control is collapsing but seems in any case insufficient; trilateral arms control seems necessary but so far remains impossible; multilateral arms control is comatose; and regional arms control is desirable but is as yet nonexistent.

Thus, the great challenge for nuclear policy today: finding a safe path through a nuclear environment that will for the foreseeable future be considerably more complex, filled with sources of risk, and considerably less regulated than what we have known. The perils are likely to be at least as great as those confronted in earlier eras of the nuclear age. That we have survived three quarters of a century without nuclear catastrophe is no guarantee that we will successfully manage the nuclear danger in the coming phase. Rather, what we urgently need is a deep understanding of the risks that now exist and that may yet emerge, and hard thinking about the steps that can be taken to minimize those risks. This volume hopes to serve that cause.

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# Russia's Nuclear Weapons in a Multipolar World: Guarantors of Sovereignty, Great Power Status & More

*Anya Loukianova Fink & Olga Olikier*

*At a time of technological and political change in the international security environment, Russia continues to view nuclear weapons as guarantors of peace and security among great powers. Nuclear weapons also assure Russia's own great-power status and mitigate uncertainty in an emerging multipolar order. In a world where the United States pursues improved missile defense capabilities and appears to reject mutual vulnerability as a stabilizing factor, Moscow views its modernized nuclear arsenal as essential to deter Washington from a possible attack on Russia or coercive threats against it. Some elites in Russia would like to preserve existing arms control arrangements or negotiate new ones to mitigate a weakening infrastructure of strategic stability. At the same time, however, they seem skeptical that the United States is willing to compromise or deal with Russia as an equal. Meanwhile, multilateral arms control appears to be too complex a proposition for the time being.*

The world may be changing, but Russia's leaders see nuclear weapons much as their Soviet predecessors did: as guarantors of peace and security among great powers. A modernized nuclear arsenal is critical to Moscow's effort to maintain strategic deterrence, which relies as well on capable conventional weapons to ensure potential adversaries eschew aggression. Russia also views its nuclear arsenal as a source of continuing power and influence. As the geostrategic context evolves, Russia wants to protect and grow its global standing and its ability to respond to emerging threats. As global power balances shift and new technologies emerge, the ways that nuclear weapons fulfill these tasks may change as well. But Russians expect that, one way or another, nuclear weapons will remain important.

For the time being, Moscow sees deterrence of the United States as a primary national security challenge. The Kremlin believes that Washington is unwilling to accommodate a politically, economically, and militarily strong Russia as a fellow great power. It also views the United States as a rule-breaker that has destabilized countries around the world. Moscow fears a potential future conflict in which the

West seeks to coerce or destroy Russia, using all tools of national power, including its military.

Military threats, including from U.S. strategic conventional and nuclear capabilities, mean that nuclear weapons remain central to Russia's deterrence considerations, and that America is at the core of Russian nuclear planning. Russian concerns focus on the U.S. forces' ability to carry out a disarming or a decapitating strike. They also extend to the possibility of U.S. and/or NATO air strikes on critically important Russian targets, which could leave Russia with no option but to resort to nuclear use. Meanwhile, U.S. planners' worst-case scenarios are of a Russian preemptive limited nuclear strike undertaken for military advantage. The combination of these competing perceptions in Moscow and Washington may create dangerous escalatory dynamics in a crisis.

This danger is heightened because long-standing U.S.-Russian cooperation to manage nuclear threats has all but collapsed. If New START (Strategic Arms Reduction Treaty) is not extended before its expiration in 2021, and the United States remains dismissive of a substantive dialogue on a broad set of strategic stability issues with Russia, prospects for future bilateral agreements are dim. While the emerging multipolar system may have the potential for new cooperative structures, it also holds even greater threats to international security.

Like many of their counterparts around the world, Russian foreign policy elites believe that a unipolar system centered on the United States is evolving into a multipolar or polycentric configuration. For now, the United States remains the most powerful pole, but its relative power is declining, and that of others is growing. But if experts and laypeople around the world now talk of multipolarity, it has been a thread in Russian writing and rhetoric for at least the last twenty-five years. A decade ago, multipolarity was what Russia hoped for. Today, those hopes appear to be coming true.<sup>1</sup>

According to Russian analysts and officials, the emerging order is unstable because it lacks new "rules of the game," while the old rules are being broken or discarded. But if Western analysts see the old rules as those of a "liberal international order," Russian analysts and officials appear to be harkening back to the rules of the post-World War II era or even the Concert of Europe. They portray the United States as a serial violator of those rules through the use of political, economic, and military power to "pressure" states and impinge on their sovereignty. In President Vladimir Putin's words, "violating rules is becoming a rule."<sup>2</sup>

The global shift away from unipolarity has created space for Russia to reassert itself on the world stage. Moscow has emerged as a selective defender of sovereignty from the Middle East to South America (albeit not when it comes to Georgia or Ukraine, or presumably other countries whose sovereignty may conflict with Russia's perceived interests). Russia's willingness to agree to disagree with



partners has ensured that it is able to enjoy good relations with Iran, Israel, and Saudi Arabia, as well as with India and Pakistan. It has sought to increase its links to Asia and strengthen and deepen cooperation with China.<sup>3</sup> Russian public opinion surveys suggest that Russians believe that their country's use of military force in Ukraine and Syria and its assertiveness abroad have increased Russia's importance in the world.<sup>4</sup>

Many Western analysts would argue that Russia openly violates rules or even "raids" the international system.<sup>5</sup> But even if some Russians might privately agree, much of the political-military establishment in Russia believes that because the United States is the worst offender, anything that Russia does is turn-about, and thus fair play. As Russia's Chief of the General Staff Valeriy Gerasimov has stated, U.S. policies have caused Russia to "create a threat in response to threats."<sup>6</sup>

This negative view of American foreign policy combined with U.S. rhetoric regarding Russia has persuaded Moscow that Washington intends to weaken or even destroy Russia's sovereignty and statehood. Relations with the United States and European Union countries have spiraled downward since Russia's 2014 annexation of Crimea and military actions in Eastern Ukraine, and the resulting U.S. and EU economic sanctions. Tensions have been further exacerbated by accusations of Russian meddling in Western elections, including the 2016 U.S. presidential election.

From a Russian perspective, all of this is treated as part and parcel of a concerted effort to undermine Moscow. Russia's Foreign Minister Sergey Lavrov has argued that U.S. political and economic pressure has pushed Russia "to the periphery of the process" in Europe, resulting in a disruption of the "European balance."<sup>7</sup> NATO, in turn, is viewed as "nothing more than an instrument of U.S. military policy" and an obstacle to improving Russia's relations with Europe.<sup>8</sup>

The Russian public agrees. According to Levada Center's independent public opinion polling in early 2019, around 56 percent of Russian respondents had negative views of the United States. While these numbers had dropped to 40 percent by November of that year, Russians are anxious about a potential conflict with the West and express concern about their country's international isolation.<sup>9</sup> In focus groups, some have reportedly argued that Russia was already in the "cold, preliminary phase" of a third world war.<sup>10</sup>

**I**n this environment of global change and heightened threats, nuclear weapons play an important role in preserving Russian sovereignty and statehood, while deterring regional and large-scale conflict. At the strategic level, Russia's nuclear triad, which consists of nuclear-tipped road-mobile and silo-based intercontinental ballistic missiles (ICBMs) as well as missiles delivered by submarines and long-range bombers, maintains mutual deterrence with the United States. These

forces have undergone extensive modernization over the last two decades in what Russian officials argue is an effort to maintain parity with the U.S. nuclear arsenal and to shed Soviet legacy systems. Both U.S. and Russian forces are bound by numerical limits and tracked by both sides through an intrusive reciprocal verification and transparency arrangement under New START. They are also observable through national technical means, with which both sides have pledged not to interfere. This verifiable balance is the cornerstone of present-day “strategic stability” between the United States and Russia.

According to Russia’s declaratory policy, strategic nuclear forces are intended for a second strike that would inflict unacceptable damage on an aggressor. Russia would launch this retaliatory strike when its early-warning systems have detected an incoming strategic nuclear missile attack (*otvetno-vstrechnyi udar*) or an adversary’s nuclear strikes have already taken place on Russian territory (*otvetnyi udar*). As Putin articulated the Russian strategic posture in October 2018:

Only when we know for certain – and this takes a few seconds to understand – that Russia is being attacked we will deliver a counter strike. This would be a reciprocal counter strike. Why do I say “counter”? Because we will counter missiles flying towards us by sending a missile in the direction of an aggressor. Of course, this amounts to a global catastrophe but I would like to repeat that we cannot be the initiators of such a catastrophe because we have no provision for a pre-emptive strike.<sup>11</sup>

Russia nurtures long-standing concerns about the vulnerability of its ability to engage in nuclear retaliation in the face of evolving U.S. capabilities and Washington’s deployment of strategic assets worldwide. Officials and experts in Moscow fear that the combination of U.S. nuclear, conventional counterforce, prompt-global-strike, and missile defense, as well as space, intelligence, surveillance, and reconnaissance capabilities that would track Russia’s mobile ICBMs, could eventually enable the United States to carry out a disarming or decapitating first strike on Russia, with Russia’s retaliatory strike prospectively absorbed by U.S. missile defenses. They read U.S. policy and planning as seeking nuclear superiority or, worse, conventional superiority that obviates the need for the United States to rely on nuclear weapons to defeat Russia. In this regard, Putin has argued that the United States is pursuing a “unilateral military advantage.”<sup>12</sup>

The U.S. decision to withdraw from the 1972 Anti-Ballistic Missile (ABM) Treaty in 2002, coupled with the inability of the United States, NATO, and Russia to agree on missile defense cooperation or transparency, has impacted Russian nuclear force requirements. While Western analysts have often discounted Russia’s fears about U.S. missile defense, Putin’s March 2018 speech illustrated the extent to which Russia has factored these evolutionary U.S. and allied capabilities into its nuclear modernization. Every single one of Russia’s new ICBM systems – the Yars,

the Sarmat, and the Avangard hypersonic glide vehicle currently placed on the SS-19 ICBM – are touted by officials for their ability to overcome U.S. missile defense.<sup>13</sup> Other “exotic” systems like the nuclear-powered and nuclear-armed Burevestnik cruise missile also suggest pervasive Russian concerns about the ability to retaliate, as do continued rumors that the automated-control nuclear retaliatory Perimetr system, created by the Soviet Union, still exists.

Over the last decade, Russia has focused on pursuing “strategic deterrence” (*strategicheskoe sderzhivanie*): a comprehensive political-military approach to countering external threats and defending national security interests. Strategic deterrence is meant to operate in peacetime and wartime. It relies on a spectrum of capabilities including nuclear weapons, conventional forces, and nonmilitary tools, such as information.

The “non-nuclear deterrence” portion of Russian strategic deterrence, which includes, among others, general purpose forces and precision-strike systems, is a point of pride for the Russian military. The 1990s saw persistent underinvestment in conventional capabilities as Russia was dealing with economic instability, pulling back (formerly Soviet) forces stationed abroad, and engaging in extensive arms control cuts and demobilization, while also responding to post-Soviet conflicts. But as funds flowed back into military coffers, a brief period of doctrinal reliance on the nuclear arsenal to deter all threats ended in the early 2000s, falling to arguments that threats of nuclear escalation were disproportionate and thus incredible in crisis and conflict situations that Russia was more likely to encounter. And while military reform was fitful, the performance of Russian armed forces during the 2008 Russo-Georgian war served as a wake-up call. Although Russia won, it was embarrassed by how its forces fought, and finally took steps to make investments count.

Today, Russia is able to bring its potent precision-strike, air/missile defense, electronic warfare, and cyber capabilities to bear against any would-be adversary. Conventional precision-strike weapons, especially the Kalibr family of cruise missiles extensively used in Russian military operations in Syria, have provided Russian military planners with previously unavailable – but long-desired – options. They believe that these systems make it possible to use threats or inflict limited damage to an opponent’s critically important military targets and economic and other infrastructure, including for escalation management. Some analysts discuss the possibility of similar kinetic signaling in the space domain.<sup>14</sup> Additionally, Russia’s air/missile defense, electronic warfare, and cyber systems are intended to disorganize and deny a would-be adversary superiority in the air and information domains, especially in the critical “initial period of war.” Most of these capabilities have been battle-tested, demonstrated, and thus arguably made credible as a deterrent.

Russian emphasis on advanced conventional systems, initially driven by fears of U.S. and NATO capabilities, has evolved over the last three decades. The Russian military closely watched the performance of U.S. precision-strike systems during the U.S. offensive against Iraq during the 1991 Gulf War, and saw in it the future of war. The U.S. and NATO air strikes during the conflict in the former Yugoslavia in 1999 led Russian planners and officials to conclude that a potential “aerospace war” could be conducted against them as well. Since then, airpower has played key roles in several interventions by the United States and its allies. This, combined with the fact that these interventions resulted in state collapse and/or ongoing civil wars, have led Russian political and military leaders to describe both the tactics and the results as America’s *modus operandi*, and a prospective threat to Russia. The experience of the Arab Spring has added fears of local social media manipulation to heightened internal instability and make a target country more vulnerable to attack. Meanwhile, the continued expansion of NATO infrastructure closer to Russian borders has seemingly fed into historical Russian insecurities about a lack of strategic depth.

As evident in Russian military doctrine, “regional” and “large-scale” conflict scenarios in which Russia is a victim of Western aggression form a problem set that has bedeviled Russian military planners since 1999. When planners define their scenarios for these wars, they expect that U.S. and/or NATO forces will carry out conventional cruise-missile strikes on critically important Russian targets, potentially with little advance warning. Among the critical targets Russia expects to be hit are those that form its nuclear deterrent: that is, its ability to strike back at the United States. It is not that Russia’s military analytical establishment believes that Russian strategic nuclear forces are at present truly vulnerable to a disarming U.S. conventional strike. Russia’s military modelers know that such a strike would be neither quick nor easy.<sup>15</sup> At the same time, however, any Western strikes on Russian military targets expected as part of a conventional fight would threaten Russian strategic assets, including radar, early warning, and command and control infrastructure, and weaken Russia’s ability to carry out strategic nuclear missions.<sup>16</sup> They could also hit Russian population centers as well as proximate hazardous facilities, with effects comparable to the use of weapons of mass destruction.

These scenarios create the context for Vladimir Putin’s comments, cited above, that Russia will launch its nuclear forces as soon as it is confident that it is under attack. Russian written declaratory nuclear policy, as outlined in the 2010 and 2014 military doctrines, states that Russia will use nuclear weapons “in response to the use of nuclear and other types of weapons of mass destruction against it and/or its allies, as well as in the event of aggression against the Russian Federation with the use of conventional weapons when the very existence of the state is in jeopardy.”<sup>17</sup>

In the context of an escalating conflict, U.S. strikes on Russia, whether with nuclear or conventional weapons, would almost certainly be perceived as threatening the very existence of the state.

Are there scenarios for Russian nuclear use short of a large-scale strategic exchange? Russia, after all, maintains a significant arsenal of non-strategic nuclear weapons. It includes a number of dual-capable systems, such as the aforementioned precision-strike cruise missiles and air/missile defense systems that could perform nonstrategic nuclear missions. In the wake of the Ukraine crisis, Western analysts have pointed out statements made by Russian officials that seem to highlight the dangers presented by Russian nuclear weapons, and noted increased Russian exercises, potentially with nonstrategic nuclear weapons.<sup>18</sup>

Russian nonstrategic nuclear weapons are a topic of extensive debate among the Western analytical community, and even the authors of this essay diverge on this issue. A number of prominent Western analysts, including Brad Roberts in this volume of *Daedalus*, argue that Russia envisions a fruitful first-and-limited-use of nuclear weapons, an approach they describe as an “escalate to de-escalate” or “escalate to win” doctrine. These analysts are especially concerned about the prospect of Russian territorial aggression against a NATO ally, followed by a limited nuclear strike to prevent the United States and its NATO allies from coming to the ally’s rescue. They argue that the United States currently does not have limited nuclear options that are sufficiently flexible, tailored, or survivable to deter Russia from engaging in this behavior.<sup>19</sup>

Offensive use of nuclear weapons seems misaligned with Russia’s formal doctrine, which paints nuclear use as primarily a deterrent or defensive. Putin has taken pains to rebut the first-use argument, including when he said in 2016: “nuclear weapons are a deterrent and a factor of ensuring peace and security worldwide. They should not be considered as a factor in any potential aggression, because it is impossible, and it would probably mean the end of our civilization.”<sup>20</sup> Some analysts have argued that open-source analysis of exercises with dual-capable systems offers only ambiguous evidence, because they could be performing in conventional or nuclear roles.<sup>21</sup> There is also little evidence that Russia views NATO’s collective defense guarantees to its members as in any way incredible or that it is willing to risk the wrath of U.S./NATO conventional and nuclear capabilities to test these guarantees. If anything, Russia’s fear of NATO membership for Ukraine suggests it places real faith in the alliance and its security commitments.

The prospect of Russian nonstrategic nuclear use, or nuclear use in regional deterrence, is deliberately shrouded in ambiguity. To make sense of it, some analysts point to Russian military journals, where Russian analysts have debated the use of nonstrategic nuclear weapons during a conflict. Some of those arguments are very

similar to the “escalate to de-escalate” strategies described by Western authors, although they posit Russia as responding to aggression, not initiating it.

There is clearly a diversity of opinions across the Russian military-analytical community on this issue, and there has been for some time. Russia dropped the Soviet Union’s pledge not to use nuclear weapons first in 1993, hoping to leverage nuclear deterrence against a broader range of threats. In the decade that followed, although some advocated for a greater nuclear role, other experts and officials cautioned that nuclear weapons alone could not solve all of Russia’s problems and that excessive reliance upon them was dangerous.<sup>22</sup> The discussion of nuclear use in Russia’s 2000 military doctrine looked a bit more like “escalate to de-escalate”: Russia might use nuclear weapons in the event of “large-scale aggression by conventional weapons in situations deemed critical to the national security of the Russian Federation.”<sup>23</sup> Just before the 2010 doctrine was issued, Russia’s Security Council Secretary Nikolai Patrushev promised that Russia would not rule out preemptive nuclear strikes, including in local conflict.<sup>24</sup> Because the final text of the 2010 doctrine, cited above, raised rather than lowered the bar for nuclear use, this may suggest that those arguments failed to hold sway with senior civilian leaders.<sup>25</sup> The 2014 doctrine, which added references to non-nuclear deterrence, reflected Russia’s desire, long championed by some experts, to have something more credible and effective at hand than nuclear threats alone.<sup>26</sup>

A 2017 doctrinal document from the Russian Navy, *Fundamentals of the State Policy of the Russian Federation in the Field of Naval Operations for the Period Until 2030*, is the only recent official publication that explicitly addresses nonstrategic nuclear weapons. It seems to fall somewhere in between notions of preemption and the hard line drawn in the military doctrine. It states that “during the escalation of military conflict, demonstration of readiness and determination to employ nonstrategic nuclear weapons capabilities is an effective deterrent” and notes that indicators of the effectiveness of state naval policy include, among others, “the capability of the Navy to damage an enemy’s fleet at a level not lower than critical with the use of nonstrategic nuclear weapons; [and] the capability of the Navy to apply naval strategic nuclear forces in any situation.”<sup>27</sup> Arguably, critical damage to an entire enemy fleet could imply something far greater than de-escalation.

It is also plausible that nonstrategic nuclear weapons could play an important role in signaling in crisis. In peacetime, Russia’s nonstrategic nuclear warheads, with the exception of some naval systems, are located in central storage.<sup>28</sup> If Moscow thinks conflict is imminent, it may signal determination by moving nonstrategic nuclear warheads from central storage, as well as go through other nuclear alerting sequences, including of its strategic forces (something that Russia did not do during the Ukraine conflict). Such actions should be expected as an integral part of Russian efforts to communicate the stakes and prevent a conflict from

breaking out or to curtail its progression, even as they might in themselves threaten crisis stability.

In short, the Russian military-analytical community may not be in agreement on what their nonstrategic nuclear weapons should be for. Formal doctrine, however, is not “escalate to de-escalate.” The emphasis in the naval doctrine on “demonstration of readiness and determination” may be telling, particularly in a signaling context. It seems plausible that the main purpose of Russian nonstrategic nuclear weapons is to provide the Russian political leadership with a range of flexible options and to help them maintain an environment of ambiguity that can buttress overall Russian deterrence.

**T**he Trump administration’s 2018 Nuclear Posture Review signaled to Russia that Washington still puts a premium on nuclear weapons. Russians also read it as the United States lowering its own nuclear threshold. In Putin’s March 2018 speech, he cited a reduced U.S. nuclear threshold and explicit discussion of limited nuclear use, contrasting that to Russian military doctrine. He also noted that even a limited nuclear attack is a nuclear attack.

We are greatly concerned by certain provisions of the revised nuclear posture review, which expand the opportunities for reducing and reduce the threshold for the use of nuclear arms.... What is written is that this strategy can be put into action in response to conventional arms attacks and even to a cyber-threat. I should note that our military doctrine says Russia reserves the right to use nuclear weapons solely in response to a nuclear attack, or an attack with other weapons of mass destruction against the country or its allies, or an act of aggression against us with the use of conventional weapons that threaten the very existence of the state. This all is very clear and specific. As such, I see it is my duty to announce the following. Any use of nuclear weapons against Russia or its allies, weapons of short, medium or any range at all, will be considered as a nuclear attack on this country. Retaliation will be immediate, with all the attendant consequences. There should be no doubt about this whatsoever.<sup>29</sup>

It is, therefore, plausible that Russia seeks a credible capability to threaten the use of nonstrategic nuclear weapons in an escalating regional or large-scale conflict because it sees the prospective escalation of that conflict as endangering Russia’s very existence. That is, if Russia thinks war with the United States is imminent, it might signal possible nonstrategic use – not to win, but to avoid losing a war for its survival.

However, Russia’s capacity to signal effectively is hampered by its own past efforts to use its nuclear arsenal coercively. Statements by various Russian officials reminding the world of Russia’s nuclear status have several times sounded like threats, not against the United States, but against a variety of non-nuclear countries.<sup>30</sup> Taken together, they suggest, if not an interest in preemption, then a

willingness to use the threat of preemption to coerce. If threats such as these are taken either too seriously or not seriously enough, they further heighten the risks of escalation.

Does Moscow believe that it can manage nuclear escalation? Vladimir Putin has consistently communicated that he believes escalation – horizontal or vertical – in a military conflict with the United States and NATO could not be easily limited. Russian military planners, some of the authors in Russian military journals, and perhaps those of the naval strategy might disagree.

Based on her readings of the military journals, one of the authors of this essay, Fink, thinks that the Russian military may have options to engage in limited use of nonstrategic nuclear weapons in regional and large-scale conflicts. These options would be integral to the credibility and flexibility of Russia's strategic deterrence. The other author of this essay, Olikier, agrees that this is possible but sees use of nonstrategic nuclear weapons in the scenarios described by Western analysts as divergent from overall Russian doctrine and Vladimir Putin's own repeated statements. She therefore believes that the conditions for such use would likely be very limited, for example, to cases of actual or expected attacks on Russia itself.

Back in 1994, Makhmut Gareev, former deputy chief of the general staff and the *éminence grise* of Russian military thought, argued that even if politicians see nuclear weapons as purely existing to deter, planners plan for conflict and, thus, potentially increase the prospect of use.<sup>31</sup> Moreover, Russian expectations that war with the United States will soon enough be existential could be self-fulfilling. If U.S./NATO forces are expected to threaten Russia's nuclear deterrent, Russia must act while it still has one. At this point, the question becomes whether those who believe it is worth trying to manage escalation can convince the leadership that, in the event of a crisis, limited nuclear use is worth attempting, or if those who believe this will mean the end of Russia are the ones whose arguments carry more weight. In either case, if U.S./NATO forces are intent on demonstrating resolve in what they see as regional conflict, while Russians fear an existential attack and try to signal its repercussions, Putin's nightmare scenarios become increasingly likely.

**T**he 2019 death of the Intermediate-Range Nuclear Forces (INF) Treaty may increase the danger even further. Two experienced Russian analysts, Sergey Rogov and retired general and former Chief of Staff of the Soviet Strategic Rocket Forces Viktor Esin, both of the Institute for USA and Canada Studies, have argued that the U.S. deployment of intermediate-range weapons in Europe would force Russia to shift its nuclear posture to preemption, for fear of a U.S. missile attack from European soil.<sup>32</sup>

Indeed, the demise of the INF Treaty has served as an unfortunate backdrop for the collapse of the extensive architecture built by Moscow and Washington to



reduce nuclear dangers. In the Russian military establishment, the treaty was long unpopular: Mikhail Gorbachev agreed to it against the recommendations of his military advisers. Since then, Russian complaints have centered on the fact that other states, such as China, were not bound by the treaty, although proposals to include China in a revised treaty are recognized as unrealistic. Reportedly, Russia even proposed to the United States mutual withdrawal from the INF in 2007.<sup>33</sup> More recently, in the face of U.S. accusations that Russia was violating the treaty, Russian officials and scholars have spoken in favor of it.

Today, with the INF Treaty dead, Moscow is skeptical about the prospects for, if not the value of, arms control. To be sure, Russia's foreign policy establishment still sees it as a critical mechanism for attaining strategic stability and limiting U.S. strategic capabilities. In fact, Putin's speech in March 2018 could be understood as an invitation to arms control, even if it was not interpreted thus in the West. But Russians do not think the U.S. commitment to the process, in question since the U.S. withdrawal from the ABM Treaty, exists any longer. At the same time, the United States' choice to withdraw from the INF Treaty has allowed Russia to claim the high ground and point to Washington as the rule-breaker, compounding its "original sin" of ABM Treaty withdrawal. If talks were to occur, the Russians do not expect that the United States will listen to their concerns or treat them as equals.<sup>34</sup> Thus, Moscow pays lip service to Russia's implementation of existing agreements, while blaming the United States for a lack of progress.

This suits some quarters well. Russia's military establishment has been skeptical over the last decade about new agreements that would result in further cuts to Russian strategic or nonstrategic nuclear weapons. Some hold that the deeper cuts on both sides sought by the Obama administration were intended to undermine Russia's geopolitical status or to make the world safe for U.S. conventional superiority. The inability to resolve Russia's concerns about U.S. missile defense – through either U.S./NATO-Russian cooperation or a U.S.-Russian legal agreement – has only served to retrench these beliefs.

Russia thus does not support additional cuts to its nuclear forces or limits on Russian force structure. It is also not interested in deeper transparency, such as U.S.-Russian military cooperation on nuclear warhead security, for transparency's sake. According to experts, Moscow is willing to discuss limits on new and emerging technologies, including the weapons Vladimir Putin described in March 2018, of which the Sarmat and Avangard missiles would be covered by New START once deployed. There may also be room for maneuver on other issues, if Moscow is able to negotiate gains of its own. But this would require that the topics Russia has long sought to have on the table are also subject to negotiations. These include missile defense; prompt global strike; the inclusion of "third countries," such as the United Kingdom and France, especially if the

United States seeks further nuclear cuts; and the impact of these issues on strategic stability. Some creative approaches to address Russia's concerns are discussed in the essay by Linton Brooks in this volume.<sup>35</sup> As of now, the United States rejects such a model for talks.

If an opening for negotiations were to emerge, there would be no shortage of ideas for how to move forward. Experts have proposed deeper nuclear cuts, ways to integrate precision conventional weapons systems into the bilateral notions of strategic stability, further improvement in nuclear transparency among the P5 (United States, Russia, China, Great Britain, and France), and efforts to expand confidence- and security-building and accident-prevention measures to mitigate the risks of an accident between U.S./NATO and Russian forces. However, none of these ideas has been taken up in earnest by the Russian (or the U.S.) government during the last several years.

For now, Moscow's preference is to maintain existing limits on strategic nuclear weapons as well as the transparency and predictability arrangements under New START. Despite the preference to keep New START, Russian officials had long expressed reservations about doing a "clean extension." Rather, they sought formal discussion of U.S. conversion procedures for bombers and launch tubes on submarines, fearing that the Pentagon's plans allow the United States substantial latitude to reload nuclear weapons onto platforms "converted" for conventional use. While most Russian officials have been careful to say that U.S. conversion plans do not constitute a violation, some have intimated that they might be.<sup>36</sup> In December 2019, however, Putin stated that Russia was open to a "clean extension." While Moscow may believe that the treaty will continue to provide for mutual stability, Russia's ability to upload additional warheads on the Sarmat ICBM also serves as a hedge if New START, too, goes away.

**H**istorically, the United States and Russia have been interested in limiting the proliferation of nuclear weapons as well as the missiles that could carry them. Russia has supported diplomatic efforts to reverse and prevent proliferation, particularly those that highlighted its own role. In this context, Russia has generally opposed North Korea's development of nuclear weapons and supported multilateral efforts to contain its program. Russian analysts and authorities view the DPRK's nuclear doctrine as defensive, but some worry that the country's overall weakness could also mean that its nuclear weapons, once developed, might actually be used.<sup>37</sup>

Moscow has also played an important role in discussions of a WMD-free zone in the Middle East and has maintained relationships with all relevant parties in that process. Presumably, it views the prospect of a collapse of the Joint Comprehensive Plan of Action (JCPOA), to which it is also a party, and efforts by other countries in the Middle East to acquire nuclear weapons with some concern.

As with North Korea, Moscow tends to accept that proliferators seek nuclear capability in order to attain understandable strategic and tactical goals. Thus, preventing proliferation means addressing their insecurities. Russian leadership and elites have been frustrated but not surprised by the Trump administration's position toward Iran as well as its efforts to destroy the JCPOA. Indeed, these U.S. policies have lent credence to the notions that Washington cannot be trusted and that its signature on international agreements is not ironclad.

U.S.-Russian cooperation on issues that used to be above politics for both countries, such as countering nuclear terrorism, is also moribund. The U.S. attitude toward political-technical cooperation with Russia in the wake of the Ukraine crisis is one factor. But the U.S.-Russian nuclear security relationship was already in trouble, with Russia expressing consistent concerns about equality and reciprocity.<sup>38</sup> Russia's ultimate opposition to the U.S.-initiated Nuclear Security Summit process and Russian hostility toward U.S. positions in the International Atomic Energy Agency have also negatively shaped the political environment.

Other institutions of arms control and nonproliferation created by the United States and the Soviet Union decades ago are also under threat. U.S. unwillingness to ratify the Comprehensive Nuclear-Test-Ban Treaty (CTBT) has become a Russian talking point, with Lavrov and others arguing that the United States is getting ready to resume nuclear testing.<sup>39</sup> In turn, recent U.S. claims that Russia may itself be in violation of the CTBT because it has engaged in prohibited testing activities are concerning.

However, perhaps the one issue on which the United States and Russia agree is their opposition to the Treaty on the Prohibition of Nuclear Weapons, the so-called nuclear weapon ban treaty, as discussed in this volume by Harald Müller and Carmen Wunderlich.<sup>40</sup> Russia maintains that the agreement fails to account for all issues impacting strategic stability and could damage the Treaty on the Non-Proliferation of Nuclear Weapons.<sup>41</sup>

With arms control weakened if not dead, how great is the risk of an arms race? Mindful of Cold War history, Russian political and military officials, including Putin, Gerasimov, and Defense Minister Sergey Shoigu have emphasized to domestic audiences that Russia is not engaged in an arms race, and that it is not pursuing unaffordable military capabilities.<sup>42</sup> But as Russian experts have argued, Russia's shopping list of modernized strategic nuclear weapons and dual-use systems; its long-range precision, hypersonic, and boost-glide systems; and Russia's own development of air/missile defense is expensive, especially given Russia's critical need to continue to strengthen its general purpose forces.<sup>43</sup> This issue deserves closer attention, especially as the United States considers deploying missiles in Asia that were previously banned by the INF Treaty, and as it implements elements of its new strategy of great power competition and addresses

requirements set out in its 2019 Missile Defense Review. As discussed in the essay by Christopher Chyba in this volume, these emerging technologies have the potential to threaten strategic stability.<sup>44</sup>

As a multipolar world emerges, one can envision that unilateral or mutual commitments in specific theaters may become a primary arms control mechanism, rather than treaties that limit numbers. And Russia may come to favor new bans or limits on new and emerging capabilities in time. But bilateral approaches to such questions will not be sufficient, and multilateral arrangements, such as ones proposed in the essay by James Timbie in this volume, are notoriously harder to negotiate than bilateral ones.<sup>45</sup> However, it's not likely that Russia would be ready for a norms-based "restraint and responsibility" regime, as proposed by Nina Tannenwald in this volume.<sup>46</sup>

Russian security experts have talked about the importance of initiating dialogue with China, or perhaps dialogue that involves both the United States and China. This could cover strategic stability issues generally or hypersonic systems and their impact on strategic stability. Lavrov has recently stated that "the crisis around the INF Treaty clearly shows that progress in nuclear arms reductions can no longer be sustained in the bilateral Russia-U.S. format. It is time that we seriously reflect on how to launch a multilateral process on nuclear arms control based on the principle of common and indivisible security."<sup>47</sup> Of course, this statement echoes past Russian comments on multilateralizing an INF Treaty follow on. And all of the problems inherent in such an effort remain.

**W**hile the Russian government and its more prominent experts continue to reassess the country's role in the changing global order, Russian perspectives on nuclear weapons remain largely in line with those of the past. Russia continues to view its nuclear weapons as primarily intended to deter the United States. While the relationship between the United States and Russia remains openly antagonistic, there is no question that Russian officials and experts will continue to publicly discuss nuclear weapons from that perspective, and this will be reflected in Russian strategy.

As the international system evolves and new alignments take shape, Russian priorities may as well. To be sure, Russia's status and its ability to defend its sovereignty will almost certainly continue to be based in its position as a nuclear-weapon state. However, other capabilities in its statecraft toolkit – from economic to "soft" and political – are bound to grow in importance. Meanwhile, nuclear threats from new sources may shift whom Russia seeks to deter, and how. Important factors could include the evolution of more independent European nuclear policies as the United States steps back from the region. Russia's relationship with China, whose arsenal it currently insists is not a threat, could also shift.

Ultimately, Russian foreign policy experts note that, given the history of controlling weapons after World War I, arms control in a multipolar world is a complicated proposition.<sup>48</sup> Russia, like all those great powers, is in a position to seek and build constructive pathways and solutions that help regulate the global nuclear (dis)order. Or it can choose to do the opposite.

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# The Revival of Nuclear Competition in an Altered Geopolitical Context: A Chinese Perspective

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*The U.S. government considers “power competition” to be the nature of the relations among big powers, and that it will have an impact on the evolving nuclear order in the near future. When big powers worry about power challenges from their rivals, they may use the influence of nuclear weapons to defend their own power and therefore intensify the danger of nuclear confrontation. We need to manage the nuclear relations among nuclear-weapon states and nuclear-armed states to avoid the risk of nuclear escalation. The fact is that big powers including the United States have neither the interest nor the capability to expand their power, and understanding this might cause big powers to lose their interest in power competition. If we promote dialogue among nuclear-weapon states and nuclear-armed states on their strategic objectives, it is possible to reduce the power competition that results from misperceptions and overreactions. Some other factors, for example, non-nuclear technologies and multinuclear players, could complicate the future nuclear order. We therefore need to manage these factors as well and develop international cooperation to mitigate nuclear competition.*

A central element of the Cold War was the nuclear arms race between the United States and the Soviet Union, both superpowers seeking nuclear quantitative superiority and the ability to offer nuclear umbrellas to their allies, vying for leading influence in the world. Among states and observers today, there is a growing concern that nuclear competition will once again shape the global order.

In its 2017 National Security Strategy (NSS), the United States accused Russia and China of challenging American power, influence, and interests and of expanding their own influence. According to this report, “great power competition returned. China and Russia began to reassert their influence regionally and globally.”<sup>1</sup> The position of the United States was that China and Russia were expanding their power (and influence) and the United States had to respond.

To understand the future of nuclear competition, this essay considers the evolution of the pattern of power in the world since the end of the Cold War. If the United States, Russia, and China plan to expand their power as indicated in the NSS, nuclear weapons and other strategic capabilities would become tools for power expansion and a Cold War–type nuclear arms race would return.

Even if the United States, Russia, and China do not plan to expand their power, misperceptions could still cause a power competition: worrying or assuming the others are seeking to expand their power and reacting accordingly. In this case, nuclear-armed states may have new nuclear competition, but it would not be directly associated with power expansion. The patterns of nuclear competition would be qualitatively more complicated while quantitatively less intensive than the Cold War nuclear arms race.

**T**he end of the Cold War three decades ago brought enormous and immediate changes to the world, including shifts in the global conventional military force structure and the geopolitical landscape. The changes came so unpredictably, the international community spent years absorbing the end of the war's long-term effects, some of which extend into today: for instance, a struggle between a unipolar U.S. dominance on general political and economic issues and bipolar nuclear arrangements between the United States and Russia.

In this period, the global power distribution experienced significant changes, including: 1) Russia's dramatic drop in military resources; 2) the United States' emergence as the only superpower; and 3) the growth of the number of nuclear-armed countries. Still more elements of the power distribution are changing now or may change in the coming decade. These changes necessitate different approaches than before or during the Cold War.

First and most important, Russia's dramatic loss of its military resources at the end of the Cold War caused significant declination of Russia's military capability, forcing them to withdraw most of their military deployments from Eastern Europe and other parts of the world. Many of Russia's former allies left or even became its rivals. Most of Russia's international influence was lost. Its nuclear force, however, fared differently than its conventional force. In the last three decades, Russia has labored to keep at least a symbolic nuclear parity with the United States. The Strategic Arms Reduction Treaty (START I) signed by the United States and Russia in 1991 set limits on the comparable numbers of operationally deployed nuclear warheads in the two countries.<sup>2</sup> But Russia does not have the resources to compete against the United States in other nuclear aspects, for example, keeping a backup strategic nuclear arsenal.

Second, the end of the Cold War left the United States as the only superpower in the world. The U.S. military machine had been built mostly to counter Soviet military capability; after the disintegration of the Soviet Union, the United

States suddenly gained a huge military surplus over all other countries. As a consequence, the United States began its three-decade expansion of power.

Some of the expansion was conducted through peaceful military means, for example, absorbing former Soviet allies into the North Atlantic Treaty Organization (NATO). The U.S. power expansion in this way has been quite successful and sustainable. The United States also attempted to use war as a way to expand its power, for example, in the former Yugoslavia and the Middle East, but most of these efforts failed. The major resistance to U.S. power expansion by war, as noted in the 2017 NSS, came from the social instabilities of targeted countries, rather than a counterbalance by other big powers, with the exception of Syria. There is no evidence that China ever supported any proxy war against the United States during this time.<sup>3</sup> The United States has spent trillions of dollars prosecuting those wars, with civilian casualty estimates in the hundreds of thousands, but has little to show for it in terms of expansion of power.

Third, three more countries, namely, India, Pakistan, and North Korea, have publicly announced their nuclear weapon capabilities by detonating nuclear devices in tests, adding new nuclear relationships and concerns to the world.

**M**ore recently, and continuing into today, three other major developments have cast influence over behaviors in and perceptions of global power structures. The first is the significant growth of political and economic costs of power expansion. With more clearly defined national identities and political structures, many societies would not want to become long-term allies of any big power or join its spheres of economic or military influence. And as the United States has shown, it is not so simple to prop up and sustain friendly governments, even after you have invaded and militarily defeated its predecessor.

The growing costs are changing the attitudes of big players toward the expansion of their power. Even if some national decision-makers have ambitions of power expansion, the huge costs should eventually discourage and constrain them from doing so. The consequence is that big powers are losing interest in expanding their influence.

The second changing element is that the United States now has adopted a policy on power competition with two faces. One is that the U.S. government defines its relations with China and Russia as a power competition, meaning that these countries try to undermine the United States' influence, which prompts the United States to respond. The United States has issued various documents planning for power competition; nuclear weapons and other strategic military capabilities are considered tools of power competition; and power competition has once again become a major paradigm in security studies in the United States. The second face of the U.S. policy is that the United States has become much more reluctant to pay the costs of expanding its sphere of influence: it is withdrawing from

some important nuclear arms control, disarmament, and nonproliferation institutions; it has been considering withdrawing from some military deployments abroad; and it threatens its allies with the removal of military protections if they do not pay higher prices for them. This double-faced policy shows that the United States is losing interest in expanding its power, but is also allergic to any sign that other countries may actively challenge the U.S. hegemonic position.

The two faces of U.S. policy on power competition may lead to two different paths. If the United States, Russia, and China each believe the others are challenging their power and thus engage in a power competition, the world situation in the coming decade would become more confrontational and dangerous and the role of nuclear weapons may grow. If they come to understand that power expansion is not a major problem among them, the shadow and the paradigm of power competition would recede from the center of big-power relations. Before taking one of these divergent paths, we need to manage carefully these nuclear weapon relations to avoid nuclear confrontation and conflict.

The third changing element is that various non-nuclear technologies – including space and cyber technologies and artificial intelligence – are becoming more important at the strategic level and complicate the nuclear calculation.

China began to experience quick changes in 1978, one decade before the end of the Cold War. China's policy of reform and openness unleashed its economic vigor, and its economy has expanded quickly ever since. Its GDP grew from \$149.5 billion (USD) in 1978 to \$12.23 trillion (USD) in 2017.<sup>4</sup> In the last forty years, China's GDP has surpassed many industrial countries and is now second in the world, after the United States.

Besides the size of its economy, the contents of its economy have also changed dramatically. China has made big progress in machinery, electronics, telecommunications, and other sophisticated high-tech industries. Technology-intensive exports have gradually replaced a significant number of labor-intensive ones. China's economic performance has made it one of the most active economic drivers in the world.

China also began in 1978 to engage substantially with the international society at various multilateral forums. In the 1980s, China entered a peak period of participation with international institutions on nuclear and other security subjects. It sent representatives and technical experts to international organizations and they brought international standards back to China. For example, China joined the International Atomic Energy Agency (IAEA) in 1984 and signed important documents in the following years on nuclear security and safety. In 1992, China participated in the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and worked with other countries to extend this treaty indefinitely without any conditions. From 1993 to 1996, China was involved fully in the negotiation of the

Comprehensive Nuclear-Test-Ban Treaty (CTBT) and signed it after the treaty was concluded. During the Obama administration, China was an active participant and supporter of the four nuclear security summits led by the United States.

The NATO bombing of the Chinese embassy in the former Yugoslavia in 1999 significantly changed the debates in China, which for the first twenty years of reform had undoubtedly prioritized economic development over security.<sup>5</sup> China began to invest more in its military after the incident. In the twenty years since the bombing, the People's Liberation Army (PLA) has made great efforts to deploy new technologies in its conventional force so it can shift away from its reliance on manpower alone. The ongoing reform and reorganization of the PLA is part of the same efforts. China's growing conventional military strength is a changing element although it still lags behind that of the United States.

Another changing element in China is its growing overseas interests. Originally, China's openness policy was largely about hosting investments from abroad, but eventually covered import and export of goods, international services and investments, and technology cooperation. China has since become an integrated part of the international economic system and relies on international resources, markets, investments, and technologies.

Yet China's growing overseas interests do not necessarily lead to a revisionist policy. China has made great contributions to and has received tremendous benefits from the international system, and has no reason to change it. China fully understands that its economic interests are very relevant to the performances of other economies. China's Belt and Road Initiative, for example, seeks more opportunities for openness in a larger area of the world. There is no evidence that China is using its military capability to control any other country or has a plan to do so. At a conference organized by Tsinghua University in Beijing in 2019, Chinese Vice President Wang Qishan reaffirmed that "China has constantly adhered to the path of peaceful development and will never seek hegemony, expansion or a sphere of influence."<sup>6</sup>

China has also invested in its nuclear arsenal, but its nuclear weapon policy and capability are unchanged. According to Stockholm International Peace Research Institute (SIPRI) statistics, China has zero deployed nuclear weapons, while the United States has 1,750; China has 280 nuclear weapons in total, the United States has 6,450.<sup>7</sup> While the total number of Chinese nuclear weapons has increased in the last few decades, compared with the United States, the number is still very small. There is no chance that China will increase the size of its nuclear force to the level of either the United States or Russia.

The small number of Chinese nuclear weapons in total is derived from a criterion developed by the first-generation leaders of the People's Republic of China. They believed that if China had a small number of nuclear weapons for retaliation, it would be enough to deter a nuclear attack from nuclear superpowers.<sup>8</sup> The

calculation behind this number is that most Chinese nuclear weapons would likely be destroyed by a preemptive nuclear strike or stopped by rival missile defense, but the few surviving nuclear weapons would be sufficient for deterrence. The criterion is much smaller than the criterion for deterrence set by then-U.S. Secretary of Defense Robert McNamara, which requires a few hundred surviving retaliatory nuclear weapons to threaten unacceptable damages. The Chinese criterion of a few retaliatory nuclear warheads is accepted by most Chinese strategists and has been a guiding principle in China's nuclear weapons policy.

A problem with this criterion, however, is that it does not have any redundancy or hedge. Damages caused by a few detonated nuclear warheads may be unacceptable, but it is possible that an adversary could believe it had the power to contain the threat. The situation could encourage China's rivals to think about undermining the few Chinese retaliatory nuclear weapons: that if China only had a few surviving nuclear weapons following an attack, then with a bit more effort, that number could effectively be reduced to zero. In the United States, some nuclear experts believe that damage limitation vis-à-vis China is a feasible and desirable strategy.<sup>9</sup> Some Chinese strategists therefore worry about the possibility that China's very thin nuclear retaliatory capability would be denied by some U.S. damage limitation approaches, such as missile defense or conventional strikes.

In the United States, China's nuclear parity is not an important topic of debate. The real lasting point is whether the United States should recognize that China has nuclear deterrence capability against it. The Obama administration tried to use the language of "strategic stability" to end the debate, but the effort failed: American strategists continue to suggest that China has some nuclear deterrence vis-à-vis the United States, but the deterrence is not obvious or reliable.

China has struggled to build creditable nuclear deterrence, in which a few Chinese retaliatory nuclear weapons could survive a U.S. first strike and penetrate U.S. missile defense. China also needs to add some redundancy so its few retaliatory nuclear warheads would not be denied by new U.S. countermeasure efforts. With its nuclear force at its current level, it would be impossible for China to seek nuclear parity with the United States or use its nuclear weapons for power expansion.

China's no-first-use policy not only stops some of its choices in nuclear weapon development and deployment, it also constrains itself from using the coercive influences of its nuclear weapons. In a no-first-use framework, China cannot exercise the influence of its nuclear weapons unless it first receives a threat of nuclear attack.

**T**he existing nuclear order was developed largely in the latter part of the Cold War and early years after its end. Now the order may be changed due to four factors: 1) a country using its nuclear weapons for power

expansion; 2) big powers seeking to expand their power; 3) the importance and use of non-nuclear factors, such as space and cyber technologies; and 4) the presence of multiple players in the new nuclear order.

If big powers want to use their nuclear weapons to expand their power, there will be an intensive nuclear arms race as we saw in the Cold War. If nuclear weapons are treated only for security purposes, the world nuclear order would be very different. However, there is no explicit demarcation between nuclear weapon policies for power and those for security because the two policies have some overlap. But it is still possible to find useful characteristics for one of the two policies. The Cold War gives us a lot of experience and lessons on this issue.

The number of nuclear weapons in a country is an important indicator of the weapons' purpose. Nuclear weapons have nonlinear effects of destruction, so the security meaning of the total number of nuclear weapons is not important when the number of retaliatory warheads is larger than the McNamara criterion. If a country regards its nuclear weapons as tools for a hegemonic purpose, it would not tolerate other countries (whether allies or rivals) having more nuclear weapons than it does. This was the situation between the United States and the Soviet Union during the Cold War: neither wanted the other to have quantitative nuclear superiority, resulting in an intensive nuclear arms race. After the United States and the Soviet Union began their strategic limitation and reduction process in 1972, a parity has always been a number-one requirement in their negotiations. If nuclear-weapon states – the five states officially recognized as possessing nuclear weapons by the NPT, including the United States, Russia, the United Kingdom, France, and China – or other nuclear-armed states do not have the ambition to expand their power and to seek a hegemonic status in the world, they would not have the ambition to increase the size of their nuclear arsenal to such a level.

Another way to expand power over a country's sphere of influence is by offering nuclear umbrellas to allies. During the Cold War, both the United States and the Soviet Union provided extended nuclear deterrence to their allies and therefore strengthened their own influence. After the Cold War, under its expansionist policy, the United States continued to develop more military alliances and to offer more extended nuclear deterrence to new allies. This trend seemed to end recently, however. If any nuclear-weapon state or nuclear-armed state offers nuclear umbrellas to more allies, it is an indicator that the state may want to expand power.

Today, the United States maintains a hegemonic position; it does not have to increase the number of its nuclear weapons. But a concern that other countries might challenge its hegemonic position keeps the United States sensitive to the numbers of nuclear weapons in other countries. Russia is a declining former superpower. It is difficult for Russia to wield the influence of its nuclear weapons to expand its power because it does not have the necessary conventional military or economic resources to support such an expansion. Russia may consider a large



number of nuclear weapons as a way to protect its shrinking sphere of influence, but that has not stopped NATO growth eastward.

China has repeatedly stated that it would not engage in a nuclear arms race with any country. The number of Chinese nuclear weapons is far below the numbers in the United States and Russia, and there is no possibility for China to reach a nuclear parity in the coming decades, even if it had the ambition to do so. The interpretation is that China will not seek a large number of nuclear weapons for hegemonic purposes.<sup>10</sup>

After the end of the Cold War, the United States offered a nuclear umbrella to its new allies and expanded its power. In recent years, the United States has not developed any new military alliances or offered any new nuclear umbrellas. Its extended nuclear deterrence is now more about maintaining its power than expanding it. Conversely, Russia lost most of its allies after the end of the Cold War. Its nuclear umbrellas cover very few countries and are only useful in maintaining Russia's influence over a very small region. China does not offer a nuclear umbrella to any foreign country. It does not have any intention to do so in the future. This suggests that China has no interest in power expansion via the influence of its nuclear weapons.

Nuclear weapons may naturally have some deterrent influences useful to maintaining the status quo, but they do not necessarily generate influence to change the status quo. If a country wants to use the influence of its nuclear weapons for compelling purposes, it must develop a strategy to link its nuclear weapon use to conventional conflicts. The idea is to use its conventional military force to compel the enemy and use its nuclear weapons to deter possible conventional responses from the enemy. The United States formally issued its 2018 Nuclear Posture Review to threaten the use of low-yield nuclear warheads in conventional conflicts.<sup>11</sup> The same document accuses Russia of taking an escalation and de-escalation strategy that would have similar compelling effects for other countries. The U.S. and Russian nuclear strategies suggest that they may use their nuclear weapons for compelling purposes in regional situations. China's no-first-use strategy constrains itself from linking its nuclear weapon use to conventional conflicts. Therefore, it cannot make use of the compelling effects of nuclear weapons.

The United States is becoming reluctant to further its power expansion; Russia and China do not have such ambitions either. If these countries understand one another, they would not seek competition for power. Yet they may worry about power challenges from their rivals and perceive some behaviors of their rivals as power expansion, whether accurate or not. They may take defensive measures to resist perceived power challenges. As a consequence, their competition may escalate, following the pattern of power competition. This is similar to a security dilemma: a country takes a measure to defend its power while other countries see it as power expansion and respond to it with countermeasures.

The evolution of power competition in the future may proceed in the following two stages: In the first stage, big powers worry their rivals will challenge their power and react to misperceptions. In the second stage, big powers understand that no one has either the ambition or capability to expand its power. They either maintain or withdraw the scope of their influence. There would be different nuclear dangers in the two stages. In the first, big powers may create roles for their nuclear weapons to counter the perceived challenges to their power, as expressed in the U.S. 2018 Nuclear Posture Review. Some nuclear confrontations and crises may develop when countries rely heavily on nuclear weapons for power competition. In the second stage, big powers withdraw their power, leaving a power vacuum for regional actors. This would increase the risk of regional nuclear proliferation.

**N**on-nuclear factors can also shape future nuclear calculations. China began to worry about missile defense and space weapons in the 1980s. The primary concern was that the U.S. Strategic Defense Initiative would promote the revolution of new military sciences and technologies. This concern was not so much relevant to the nuclear weapons issue. China worried that it would either fall much more behind the developed countries on military technology or would have to exhaust its resources to deal with a new arms race. For this reason, China has repeatedly criticized missile defense and proposed to prevent space weaponization, while working to better understand these technologies.<sup>12</sup>

Another Chinese concern that developed in the later 1990s was that a nationwide missile defense would undermine China's nuclear retaliatory capability. This concern also applied to precision conventional strikes. These two technologies do not directly involve nuclear weapons, but they change calculations on nuclear stability. Chinese and American scholars have had many dialogues at different levels on this issue, and have not yet found a solution. The 2019 Missile Defense Review explains that the U.S. homeland missile defense system is not designed to counter missile threats from China or Russia but would be used in an event of nuclear conflict, yet this is little reassurance to China.<sup>13</sup>

Space technologies are also relevant to nuclear weapon issues in three ways. First, some space technologies may be used as tools to change strategic nuclear stability: intelligence satellites may be used to locate mobile missiles or space-based interceptors may be deployed to stop them.<sup>14</sup> Second, space-based early-warning systems are important in nuclear decision-making processes and are vulnerable to attacks.<sup>15</sup> Third, some space assets are considered as important as nuclear weapons in the theory of cross-domain deterrence. According to the theory, an attack against space assets may trigger nuclear retaliation.<sup>16</sup>

Cyber weapons could also be used to attack nuclear weapons, nuclear command and control systems, and other elements in the nuclear force structure. The United States is developing the Left of Launch Operation, for example, which may

involve cyber weapons.<sup>17</sup> On the one hand, cyberattacks may disable some or all nuclear weapons and therefore change calculations about strategic stability; on the other hand, the effects of cyber weapons are uncertain, so cyberattacks may create misunderstandings and encourage early or accidental use of nuclear weapons.

Some vehicles under development may become new delivery systems for nuclear weapons. One example is the hypersonic vehicle. The performance and uses of these new vehicles are not yet clear, but their potential to fly great distances at low altitude, beneath traditional radar, and maneuver to avoid interception would certainly complicate calculations on strategic stability.

Artificial intelligence (AI) will also complicate future nuclear calculations. AI technologies may help locate nuclear targets and help improve the stealth of nuclear weapons. The result of competition between offense and defense might be very complicated. The technologies could also contribute to nuclear decision-making in stabilizing or destabilizing ways, depending on how people use the technologies.

As the number of nuclear players has grown, the new nuclear multipolarity has changed the nuclear order. After the end of the Cold War, Russia lost significant military resources, but has since made efforts to maintain a nuclear parity with the United States. Previous U.S. administrations at least acknowledged nuclear parity with Russia in their bilateral nuclear reductions, but the Trump administration may not have an interest in maintaining parity with Russia. No other nuclear-weapon state or nuclear-armed state has the capability to increase the size of its nuclear force to the level of the United States or Russia. The bipolar nuclear order will be abated. The new nuclear order will be a hierarchy: the first level is the United States; the second level is Russia; the third level is China, the United Kingdom, and France; and the fourth level is India, Pakistan, and Israel. The position of North Korea will depend on efforts to halt its nuclear weapons program. Nuclear threshold countries – countries that possess the technology to build nuclear weapons but have not yet done so – and nonstate actors could also cause proliferation dangers.

This all suggests that the global nuclear order may experience two future stages. In the first stage, the risks of nuclear confrontations and crises will mostly come from nuclear competition due to misperceptions and overreactions about power competition; in the second stage, the risks of nuclear dangers will mostly come from new non-nuclear technologies and new nuclear players.

**I**nternational cooperation is necessary to stabilize the current and future nuclear order. Nuclear-weapon states and other members of the international community need to develop dialogues to explore possible cooperation on their strategic objectives and on concrete arrangements about nuclear issues.

The most important topic would be the strategic objectives of different countries. Strategic experts and governmental officials from nuclear-weapon states and other international members should meet to explain the strategic objectives

of their countries, to express their concerns over power challenges from other countries, and to clarify misunderstandings. This would help explain the nature of competition among countries. If power competition is not a central element in the relations among nuclear-weapon states and nuclear-armed states, they would have a better chance to develop cooperation on nuclear issues.

The nuclear-weapon states and nuclear-armed states may develop or revive their cooperation in the following four categories. The first category of cooperation would be on nuclear security against nuclear terrorism. President Obama proposed and developed international cooperation on this issue, and it is far from gone. The nuclear-weapon states and other international members should continue to make joint efforts to secure nuclear materials and facilities around the world to prevent nuclear terrorism. China would be happy to join the cooperation if it can be maintained or revived.

The second category of cooperation would be the prevention of accidental nuclear war. Various new technologies may add difficulties in nuclear decision-making and increase the risks of accidental nuclear war. For example, a cyber operation that aims to disable an enemy's nuclear weapons could mistakenly trigger the launch of the enemy's nuclear weapons instead. Cyber operations could also create false alerts in the rival's decision-making process and the rival may mistakenly launch a nuclear attack in retaliation. Nuclear-weapon states should have discussions at governmental or nongovernmental levels to understand the risks and thereby develop mutual understanding and a code of conduct to avoid accidental nuclear war.

A variety of non-nuclear activities run the risk of causing accidents. For example, some space activities may be identified as nuclear attacks; some AI technologies may misdiagnose signals as nuclear threats. Thus, multidisciplinary experts are needed to explore and fix potential problems. The efforts are in the interests of all nuclear-weapon states, and all of them, including China, should encourage their experts to join such discussions. The P5 states, which include China, France, Russia, the United Kingdom, and the United States, should share useful codes of conduct they develop with other countries, especially nuclear-armed ones, so they can become more careful and aware of participants in the nuclear community.

The third category of cooperation would be on nuclear nonproliferation. This includes general nonproliferation arrangements, for example, the strengthening of the NPT and other nuclear nonproliferation regimes. This class of cooperation includes joint efforts on specific nonproliferation cases, such as in Iran and North Korea. The United States should consider returning to the Joint Comprehensive Plan of Action. We also need more efforts in designing a road map of denuclearization and peace-building in North Korea. Nuclear-weapon states may have some difficulties in reaching a consensus on some of the nonproliferation issues, but they need to exchange views and positions. China should continue to play an important role in all these efforts.

The fourth category of cooperation would be on strategic stability. This includes many topics, such as strategic reductions and missile defense. The P5 had some good cooperation in this category. For example, the P5 states have a working group on nuclear disarmament terminology and one on the verification of deep nuclear reductions. The two working groups had good cooperation and produced some important products.<sup>18</sup> China should work with other nuclear-weapon states to explore new solutions on possible limits on missile defense and on deep strategic nuclear reduction. The limits on missile defense could be about the number of interceptors or about the size of the protection of the missile defense systems.<sup>19</sup> So far, the counting rules in the U.S.-Russia strategic reduction treaties cannot apply to China. The Chinese experts should work with their counterparts in other nuclear-weapon states to explore new counting rules that are universally useful.

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# On Adapting Nuclear Deterrence to Reduce Nuclear Risk

*Brad Roberts*

*Since the end of the Cold War, changes to the practice of nuclear deterrence by the United States have been pursued as part of a comprehensive approach aimed at reducing nuclear risks. These changes have included steps to reduce reliance on nuclear weapons in U.S. defense and deterrence strategies. Looking to the future, the United States can do more, but only if the conditions are right. Policy-makers must avoid steps that have superficial appeal but would actually result in a net increase in nuclear risk. These include steps that make U.S. nuclear deterrence unreliable for the problems for which it remains relevant.*

In a strategy to reduce nuclear risks, there are many building blocks: formal and informal arms control, cooperative threat-reduction activities, and controls on sensitive materials, technologies, and facilities, for example. The focus of this essay is one single building block: the practice of nuclear deterrence by the United States. In one of their seminal op-eds in *The Wall Street Journal*, George Shultz, William Perry, Henry Kissinger, and Sam Nunn made the case in 2011 that reliance on nuclear weapons for deterrence “is becoming increasingly hazardous and decreasingly effective” and called for “a joint enterprise among nations” to work toward “a safer and more stable form of deterrence.”<sup>1</sup> Nearly a decade later, there is little evidence of that “joint enterprise,” as Russia, China, and others proved reluctant to join any such effort.<sup>2</sup> But what about the United States? How far has it gone toward the envisioned goal? What has the United States done to modify its practice of nuclear deterrence to reduce nuclear risks and dangers, while ensuring that deterrence remains stable and effective for the problems for which it remains relevant? How has it accounted for the failure of the “joint enterprise?” What more should be done? What more can be done in current circumstances?

The effort to move away from Cold War approaches in U.S. deterrence strategy and to adapt deterrence to a changing security environment began well before the 2011 op-ed and has continued since. Changes to U.S. nuclear policy and posture have been driven by many factors: the end of Cold

War confrontation and the desire to consolidate a new political relationship with Russia, the emergence of new challenges such as nuclear-arming regional powers and an emergent China, the ambitions of individual leaders to push in certain directions, and the advocacy of influential individuals and organizations outside government. Presidents Bill Clinton, George W. Bush, and Barack Obama all arrived in office having campaigned in part on the argument that more could and should be done to move away from Cold War thinking and forces. Each administration took its own set of steps toward these goals, each with its own framing context: Clinton's "lead but hedge" strategy, Bush's "new strategic framework," and Obama's "Prague vision."<sup>3</sup> Each also made decisions to maintain certain nuclear forces in the name of strategic stability: that is, to ensure that no adversary might be tempted to strike first in a time of war.

This focus on deterrence adaptation spanned the period from the end of the Cold War in 1990 to the Russian armed annexation of Crimea in 2014. In this period, three key developments in the practice of U.S. nuclear deterrence stand out from a risk-reduction perspective.<sup>4</sup>

First, nuclear deterrence lost its central place in U.S. defense strategy. This is well illustrated by U.S. defense strategy documents. During the Cold War, U.S. secretaries of defense published annual reports to Congress on defense strategy, in which nuclear issues featured prominently and consistently. In the post-Cold War era, it is difficult to find even a mention of nuclear issues in the Quadrennial Defense Reviews. This follows the shift in focus away from the possibility of an Armageddon-like war with the Soviet Union and onto new contingencies with no or at most limited nuclear aspects. As the Obama administration's Nuclear Posture Review (NPR) put it, nuclear employment might be considered only in "a narrow range of circumstances" when the vital interests of the United States or an ally are at risk. The world of 2009 seemed to present no such flash points or pathways to wars touching on such vital interests.

Second, reliance on non-nuclear means of deterrence increased significantly. In the 1990s, there was growing recognition of the rising value of missile defenses for reinforcing deterrence of regional challengers armed with weapons of mass destruction (WMD) and long-range missiles. U.S. defense planners came to see reliance on nuclear deterrence for this problem as unreliable and thus dangerous. Complementary measures were needed. With the continued maturation of missile defense technologies, the Congress passed the National Missile Defense Act of 1999, which established that the United States would "deploy as soon as is technologically possible an effective National Missile Defense system capable of defending the territory of the United States against limited ballistic missile attack (whether accidental, unauthorized, or deliberate)."<sup>5</sup> President Clinton's successors went even further in developing non-nuclear means. The 2001 George W. Bush administration's NPR expressed a commitment to move toward a "new triad" of



offensive strike forces (including nuclear, non-nuclear, and nonkinetic means), ballistic missile defense, and a responsive infrastructure. The Obama administration continued the effort to rebalance the deterrence portfolio by strengthening regional deterrence architectures comprehensively, in a manner that embedded a “tailored nuclear component” in an approach encompassing an intended “favorable balance” of conventional forces, regional missile defenses, limited homeland missile defenses, plus resilience in cyberspace and outer space.

Third, the practice of U.S. nuclear deterrence adapted to the more multipolar character of the present international system by becoming more flexible and “tailored.” In the bipolar context of the Cold War, the United States developed an approach to nuclear deterrence aimed at being able, in times of crisis and war, to put at risk what Soviet leaders valued. A deterrence strategy premised on being able to threaten what enemy leaders value must be sufficiently flexible to contend with a changing cast of such leaders with a changing constellation of values and interests. Accordingly, each post-Cold War administration has praised the virtues of a more “tailored approach” to deterrence for a more complex security environment. The George W. Bush administration formally abandoned the long-standing Single Integrated Operational Plan in 2003 in favor of a more flexible approach. That new approach gives the president a wider set of options for the employment of both nuclear and non-nuclear weapons, a wider set of potential objectives, and the ability to adapt plans quickly to cope with rapidly changing circumstances.<sup>6</sup> The Obama administration continued this focus on tailoring deterrence for the range of challenges present in the security environment. In its employment guidance, it focused on “more likely 21st century contingencies,” as opposed to a major bolt-out-of-the-blue attack by a nuclear peer or near peer.<sup>7</sup> Each administration has also relied on the enduring strategy of ensuring that any country capable of posing an existential threat to the United States never comes to a point of seriously contemplating such an attack.

These three changes were aimed at “a safer and more stable form of deterrence.”<sup>8</sup> They did so by reducing the risk that the United States might rely on nuclear deterrence even when its nuclear threats might not be credible. In parallel, the post-Cold War administrations have made decisions to maintain some elements of continuity with prior practice. Three such continuities stand out in the debate about risk reduction.

The first was the preservation of what the Obama administration called “the fundamentals of deterrence.” In a June 2013 report to Congress on its nuclear deterrence strategy, the administration described these as:

- “The fundamental role of nuclear weapons is to deter nuclear attack on the United States and its allies and partners.”

- “The United States will only consider the use of nuclear weapons in extreme circumstances to defend the vital interests of the United States or its allies and partners.”
- “The United States will maintain a credible nuclear deterrent capable of convincing any potential adversary that the adverse consequences of attacking the United States or our allies and partners far outweighs any potential benefit they may seek to gain from such an attack.”
- “U.S. policy is to achieve a credible deterrent, with the lowest possible number of nuclear weapons, consistent with our current and future security requirements and those of our allies and partners.”
- “All plans must also be consistent with the fundamental principles of the Law of Armed Conflict. Accordingly, plans will, for example, apply the principles of distinction and proportionality and seek to minimize collateral damage to civilian populations and civilian objects. The United States will not intentionally target civilian populations or civilian objects.”<sup>9</sup>

A second element of continuity was the commitment to prepare for the possibility that deterrence might fail. Even in a security environment in which the prospects of nuclear conflict seem extremely remote, the potential costs of being unprepared for a failure of deterrence were deemed too high. Each president in the post–Cold War period has faced the unhappy facts that 1) there exists a small but troubling set of foreign leaders deeply hostile to U.S. interests and to the regional orders and allies the United States seeks to protect; 2) such leaders are armed with, or are pursuing, nuclear or other weapons of mass destruction and the means to deliver them at long range; and 3) even tailored deterrence may prove unreliable in deterring nuclear aggression by leaders whose values and interests are fundamentally different from those of the United States and its allies.<sup>10</sup>

Such preparations include ready forces capable of operating at both the regional and strategic level, forces capable of operating under attack and reaching their target, the development of employment options for the president, and exercises of the forces, the planning process, and the deliberative process. Such readiness lends credibility to the threat of U.S. nuclear retaliation. It has the additional value of helping to negate the potential coercive value of enemy nuclear threats by robbing them of their credibility.

This commitment to prepare for deterrence failures implies a rejection of minimum deterrence, the third major element of continuity. Minimum deterrence is a mode of deterrence that does not particularly concern itself with the necessary and appropriate responses if deterrence fails. The advocates of minimum deterrence for the United States have argued that “deterrence today would remain stable even if retaliation against only ten cities were assured.”<sup>11</sup> This might be so. But

it might not, if a vital national interest were at risk. Minimum deterrence makes no effective accommodation for the principles of discrimination and proportionality or for a theory of deterrence that depends on putting at risk only those things most valued by an enemy leadership. It promises simple, crude punishment of an enemy society.<sup>12</sup>

These continuities reflect the fact that nuclear deterrence itself is a form of risk reduction. It reduces the risk of nuclear-backed aggression and nuclear employment in war and thus helps preserve the nuclear taboo. It also reduces the coercive value of nuclear threats. Until such time as humankind discovers the means to safely eliminate nuclear weapons, nuclear deterrence must remain effective for the problems for which it remains relevant. This requires leadership focus on deterrence strategy, a commitment to excellence in the practice of deterrence, clear signals of resolve to defend vital interests, and the associated capabilities.

**I**t is useful also to recall the risk-reduction policy options that were considered but rejected in this period. In the Obama administration, at least, there was a sustained and thorough exploration of options. Policy-makers were interested in three main questions: Would the proposed measure reduce real risk in a material way? Would it have unintended effects that might increase risk? What would be the net impact on nuclear risk? This risk framework was familiar to senior policy-makers; as the administration argued in 2010, “defense strategy requires making choices: accepting and managing risk is inherent in everything the Department [of Defense] does.”<sup>13</sup>

De-alerting, for example, had many advocates outside the administration. Whether to take additional steps to reduce the alert status of U.S. nuclear forces is an obvious first-order question for nuclear risk reduction. The case for doing so is that it would reduce the risk of accidental and unauthorized use because it reduces the ability to rush a decision in the context of imperfect information. But most officials were not persuaded that that risk is significant. There is also no reason to think that current Russian leadership would join such an effort, not least because it would disproportionately affect the Russian force (given the higher percentage of its deterrent associated with land-based systems). Whatever the benefit might prove to be in practice, this must be weighed against the risk of a competitive re-alerting in time of crisis. A nuclear variant of August 1914 looks especially unappealing to senior policy-makers. Thus, further de-alerting was rejected in the 2010 NPR. But a rushed and imperfect decision on nuclear employment is also unappealing, so the Obama administration put its emphasis on improving support to the president in preparing for and making such decisions.

Another risk reduction option advocated by nongovernmental experts was nuclear no-first-use (NFU). The case for adopting a policy of NFU is that it would reduce the instability in crisis generated by concerns about the need to use-or-lose

nuclear forces. The potential unintended consequence is that a WMD-armed aggressor might be emboldened to challenge by non-nuclear means a vital interest of the United States or, more likely, a U.S. ally. The administration saw this risk as material and thus rejected NFU (and the closely related “sole purpose” formulation).<sup>14</sup> But to help underscore the last-resort character of possible U.S. nuclear employment, the Obama administration emphasized that such employment would be considered only in “extreme circumstances.”

The Obama administration also considered changes to the U.S. nuclear posture in the name of risk reduction. These included, for example, the possible retirement of forward-based nuclear-capable fighter-bombers in Europe (deployed there in support of NATO’s unique nuclear sharing arrangements). The case for retirement is that it would reduce the risk of theft or accidents. Again, there seems little prospect that Russia would join in such an effort (having rejected it consistently for many years). The case against it is that it might embolden Russian challenges to NATO and encourage Russian nuclear escalation in conflict. At a time of uncertainty and rising concern about Russian military ambitions in Europe, the Obama administration concluded that the case for retaining the fighter-bombers outweighed the case for retirement. The administration viewed these capabilities as essential to the demonstration of the alliance’s promise that an attack on any NATO ally will be treated as an attack on all and, in particular, that any nuclear attack on a NATO ally will implicate all those participating in NATO’s sharing arrangements. These NATO sharing arrangements also serve as a unique link between the United States and its allies in both Europe and Asia by demonstrating for all the nuclear risks it is willing to run to safeguard allied vital interests. These effects, too, are good for deterrence.

Retirement of the ICBM (intercontinental ballistic missile) force was also oft debated. The risk-reduction case for retirement is that it would reduce the risk of accidental launch.<sup>15</sup> The case against it is that retirement would erode the credibility of U.S. nuclear threats. The ICBM force lends credibility to U.S. nuclear threats in two ways. A successful strike on four-hundred-plus nuclear targets must look vastly more challenging to a leader contemplating nuclear war with the United States than a preemptive strike on the relatively few critical aim points that would remain if the ICBM silos were gone. With a large U.S. target base, only one country can contemplate a possibly successful disarming strike; without that base, more countries could do so. Moreover, a massive strike at targets spread across the American heartland would seem to ensure retaliation by a deeply wounded nation. These effects are good for deterrence. Accordingly, the Obama administration committed to the modernization of all three legs of the nuclear triad, as has the Trump administration.

In sum, the period from 1990 to 2014 was marked by a few key developments in the U.S. practice of nuclear deterrence that helped to reduce nuclear risk. But the “fundamentals of deterrence” remained because deterrence itself remained

relevant in this period, albeit in a reduced and different role. In addition, U.S. planners considered and rejected various new forms of risk reduction as, on balance, contributing more risk than they might eliminate.

Then came the revelations of 2014. President Vladimir Putin proved willing to use military force to change international borders. He promised to “snap back hard” against a European security order he deemed unjust and dangerous. And he called for “new rules or no rules” for a global order he saw as dominated by a United States seeking “absolute security” (that is, security for the United States at everyone else’s expense). These revelations cast a bright light on his nuclear strategy: Putin had given nuclear weapons a central place in his strategy for Russian renewal, nuclear threats a central place in his political strategy for coercing NATO, and limited nuclear war a central place in his military strategy. This raised basic policy questions for the United States and its allies about whether and how to further pursue nuclear risk-reduction strategies.

In retrospect, it is clear that the world should not have been surprised in 2014.<sup>16</sup> Already in the 1990s, the Russian military began to debate how to respond to the emerging American way of waging war. In the early 2000s, Putin, as the new Russian president, supported investments in Russian nuclear forces, in part as compensation for weaknesses in Russian general purpose forces. But his incentives and objectives appear to have shifted over time. His worldview evolved substantially from 2001 to 2014: from his effort to “reset” relations with the United States after 9/11, to his plaintive call in 2007 for renewed cooperation amidst frustration with American “hyper use of force,” to his 2014 watershed decisions and declarations.

In line with this shift in President Putin’s perspective, the Russian military enacted dramatic changes in policy, posture, and behavior. For example:

- Following Putin’s February 2007 speech to the Munich security conference, Russia launched a campaign of harassment against its neighbors that included crippling cyberattacks (against Estonia, for example) and renewed long-range bomber patrols and mock nuclear strikes on Western capitals.<sup>17</sup>
- In this period, Russia also suspended compliance with the Treaty on Conventional Forces in Europe and violated the Treaty on Intermediate-Range Nuclear Forces. Selective compliance with the Open Skies Treaty followed, along with Russian violations of multiple other arms control and military transparency agreements.<sup>18</sup>
- In 2008, Russia intervened militarily in Georgia. Shortcomings in Russian military performance galvanized a major effort finally to reform and modernize fully the Russian military institution and its capabilities. In 2009, it restarted its ZAPAD exercise series to test and demonstrate its ability to

conduct large-scale military campaigns, including using strategic forces, in a major regional war on its western flank.

- In 2012, Russia announced a major adjustment to its force modernization, aimed at ramping up a diverse set of new capabilities, both strategic and nonstrategic.<sup>19</sup> Somewhere in this period, President Putin also initiated the development of the novel strategic weapons that would be revealed in 2018. Some of the results were publicized in spring 2019 by Defense Minister Sergei Shoigu, who reported an increase from 2013 in the number of carriers of high-precision long-range weapons on land, sea, and in the air by a factor of twelve and in the number of high-precision cruise missiles (all of which are dual-capable) by a factor of thirty.<sup>20</sup> The Russian military also made qualitative and quantitative improvements to its tactical nuclear forces and increased the role for low-yield options.<sup>21</sup>
- Apparently also in this time frame, Putin made the decision to interfere directly and illicitly in the domestic politics of Western countries, including the 2016 U.S. presidential election.<sup>22</sup>
- Russia published updates to its foreign policy concept and military doctrine in 2013 and 2014, respectively, setting out the principles of a more confrontational approach to the U.S.-led world order and the strategy of “active defense.”<sup>23</sup>
- In 2014, Putin authorized the military to invade Ukraine and, later through referendum, annexed Crimea, using force to alter international borders in Europe and violating a central norm of international behavior.
- By 2015, Putin had taken steps to demonstrate what he meant by “no rules” (or perhaps demonstrate the new rules themselves) with direct interference in the political affairs of other states, targeted extraterritorial killings, direct military assistance to a thuggish Syrian regime, and multiple other efforts to undermine Western institutions, values, and leaders.

One result of this string of developments is a new Russian approach to regional war involving rapid power projection, integrated defensive and offensive operations in aerospace, and the use of all means available to influence the strategic calculus of the enemy, including kinetic and nonkinetic weapons as well as nuclear and non-nuclear strategic options. It is a strategy intended to present the enemy with unacceptable risks of escalation by any of these means and thus to drive the costs of conflict with Russia (or continued conflict) beyond the enemy’s stake. It is a strategy of deterrence built on the foundations of coercion through blackmail and brinkmanship backed up by a credible threat to employ all these means.

Surveying this history, some Western analysts have concluded that there has been little or no change in the nuclear threat posed by Russia and that President

Putin conceives a “predominantly defensive” role for nuclear weapons aimed at deterrence, not coercion or war-fighting.<sup>24</sup> Some argue further that the U.S. policy-makers have misunderstood and/or misrepresented the “escalate to de-escalate” strategy and that Russian leaders are not prepared to employ nuclear weapons early in a conflict to seek prompt war termination on their terms.<sup>25</sup>

Already in the Obama era, NATO leaders had come to different conclusions about these risks. At NATO summits in Wales and Warsaw, they made it clear that they see these developments as dangerous and destabilizing and as requiring enhancements to the alliance’s overall deterrence and defense posture, to its nuclear readiness, and to its nuclear forces. These enhancements are aimed at “addressing potential adversaries’ doctrine and capabilities” in order to ensure that NATO’s deterrence posture remains “credible, flexible, resilient, and adaptable.”<sup>26</sup>

In the United States, the renewal of focus on Russia as an object of U.S. deterrence strategy began in 2015 with Secretary of Defense Ash Carter’s call for “a new playbook for Russia.”<sup>27</sup> In its final year, the Obama administration rejected any further unilateral changes to U.S. nuclear policy and posture in support of the Prague vision in part because of the need for deterrence confidence vis-à-vis a more dangerous Russia (and a more assertive China). But it fell to the newly elected Trump administration to put together that new playbook.

**T**o what extent is the nuclear deterrence strategy of the Trump administration a departure from past practice? Like its predecessors, the Trump administration has embraced “the fundamentals of deterrence,” planned for the possibility that deterrence might fail, and rejected minimum deterrence. Also like its predecessors, it has sought to increase the role in deterrence of non-nuclear means such as missile defense and hypersonic non-nuclear strike capabilities, to tailor deterrence to diverse challengers, and to strengthen extended deterrence. On the central issue of the role of nuclear weapons, the Trump administration has been more ambiguous. On the one hand, its NPR reiterates the limited roles set out in the 2010 NPR; on the other, it explicitly opens the door to nuclear deterrence of catastrophic cyberattacks.

To deal more directly with the new Russian challenge, the Trump administration might have changed deterrence strategies or sought new nuclear weapons with new military purposes. Instead, it chose to focus on supplementing the deterrence toolkit with additional reduced-yield options. It also sought to ensure an enduring ability to deliver reduced-yield weapons past steadily improving Russian air defenses. In this way, the administration hopes to redress any doubts leaders in Moscow might have about the capability and resolve of the United States and NATO to defend their interests by all necessary means. This is intended to buttress deterrence and negate nuclear coercion by Russia and thereby raise the nuclear threshold.

But some critics see a substantial change in deterrence strategy: a shift to nuclear war-fighting that necessarily lowers the nuclear threshold. To assess this argument, a Cold War context is needed. What did it mean to the nuclear planners of that era to be prepared to fight a nuclear war successfully? In NATO's flexible response doctrine, it meant being prepared to employ nuclear weapons in significant numbers at the tactical level of war to enable the defeat of numerically superior Warsaw Pact ground and air forces. Thus, the United States and NATO deployed thousands of nuclear artillery shells and land mines. Deterrence was supported by preparations to fight at any level of nuclear scope and intensity that the Soviet leadership might choose. To prevail meant to achieve military objectives at the tactical and operational levels and to survive the war with some objectives achieved and interests intact despite the employment of nuclear weapons by both sides in support of their military operational objectives.

This is not how U.S. military planners have thought about potential nuclear conflict in the post-Cold War era. They have not prepared for the employment of nuclear weapons for tactical benefit. In fact, the United States brought home and destroyed its tactical nuclear weapons (the remaining reduced-yield capability – the nuclear bomb – can be used to support tactical, theater, or strategic goals). Rather, it has prepared for the possible employment of nuclear weapons at the strategic and theater levels of war, including, on a very limited basis, to shape the enemy's intent and capability to sustain war. The purpose of such employment would be to terminate rapidly the nuclear phase of war or otherwise negate a threat to a vital interest.

To achieve this effect, the enemy must be compelled to reassess the assumptions that led to their decision to employ nuclear weapons or otherwise jeopardize a vital interest. Such a decision would likely only be made by the enemy on the assumption that the United States would not respond to nuclear attack, especially if limited in nature, or would not respond in a manner as to impose significant cost or new risk for the attacker. To alter the enemy's calculus of benefits, costs, and risks, the United States must be capable (and must be seen as capable) of limited nuclear retaliation to achieve effects the enemy would see as costly, whether militarily or politically. It must also be seen as capable of further nuclear employment in more damaging ways. It need not be seen as capable of engaging in extended and large-scale nuclear exchanges at the tactical, operational, and strategic levels of a regional war. Thus, each administration since the end of the Cold War has chosen to maintain the capability to forward-deploy a limited number of nuclear bombs with forward-based fighter-bombers, as opposed to strategic delivery systems.

The Trump administration's pursuit of supplemental low-yield capabilities is consistent with this approach to deterrence as it has evolved since the Cold War. Deployment of these capabilities would help to reinforce NATO's message that it has the means and resolve to defend its interests by all means necessary – at a time when these appear to be in some doubt in Moscow.



**I**n an era when the hoped-for “joint enterprise” with Russia and China has proven beyond our reach, what more can and should the United States do to adapt its practice of nuclear deterrence to reduce nuclear risks?

Part of the answer is to continue working on that joint enterprise while accepting that the near-term payoffs may be few and the long-term payoffs uncertain. Administrations should focus on the ongoing dialogue among the five permanent members of the UN Security Council, who bring shared interests to this process.<sup>28</sup> Such a joint enterprise should also include a renewal of bilateral, trilateral, and multilateral arms control for new purposes.

Part of the answer is to update the menu of potential options for reducing risk in light of the risk net assessment framework described above.<sup>29</sup> The advocacy community on risk reduction loses credibility every time it readvocates in a one-sided way for an approach rejected by even sympathetic policy-makers.

And part of the answer is to focus on emerging nuclear risks. In both Europe and Northeast Asia, the strategic balance has shifted in ways unfavorable to deterrence at the conventional level of war and in the new domains of cyberspace and outer space. This increases crisis instability. In the strategic postures of Russia, China, and the United States, capabilities in the new domains are increasingly salient, as is competition in these domains and in the more familiar offense-defense realm (with new competition for hypersonic delivery systems, for example). This increases strategic unpredictability and arms race instability. These new instabilities bring new forms of nuclear risk. From a U.S. policy perspective, there are important questions about the possibility of reducing the risks of both crisis and arms race instability by encouraging restraint. Some of those questions relate to what might be accomplished cooperatively with Russia and/or China; others relate to what must be accomplished cooperatively with U.S. allies and partners. In defining these new risks and developing strategies to mitigate them, the United States must continue to balance the need to minimize risk with the need to ensure that deterrence remains a viable risk-reduction strategy.

**F**or most of the period since the Cold War, changes to the U.S. practice of nuclear deterrence have contributed to a comprehensive strategy to reduce nuclear risks by reducing reliance on nuclear threats where they may lack credibility. Current prospects for more such adaptations, however, are not good. Most of the advances were harvested in the period from 1991 to 2014. In an eroding security environment, the most likely gains in nuclear risk reduction will be in deterring threats rather than reducing or eliminating them. In current circumstances, there appears to be no immediate prospect that Russia and China (or North Korea and other nuclear-weapon states) will join in a collective effort to remake the deterrence framework on a fundamental level. Their embrace of nuclear weapons to protect themselves, in large measure against the exercise of U.S. power, appear deep and enduring.

In this context, the only fundamental adaptations to the practice of deterrence that are possible for the United States are unilateral in character. These have sometimes had value. But many such measures have been rejected – repeatedly – as contributing to a net increase, as opposed to a net decrease or elimination, of nuclear risk. At the same time, there may be more limited opportunities to address the crisis and arms race instabilities of today’s deterrence relationships. But even while exploring new possible threat reduction measures, the United States and its allies must ensure that deterrence remains effective for the problems for which it is relevant, albeit with a posture of restraint so as not to stimulate unwanted responses by others.

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#### AUTHOR’S NOTE

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#### ENDNOTES

- <sup>1</sup> George P. Shultz, William J. Perry, Henry A. Kissinger, and Sam Nunn, “Deterrence in the Age of Nuclear Proliferation,” *The Wall Street Journal*, March 7, 2011.
- <sup>2</sup> For a discussion of the Obama administration’s effort to engage Russia and China in a remaking of the nuclear deterrence framework, see Brad Roberts, “On Creating the Conditions for Nuclear Disarmament: Past Lessons, Future Prospects,” *The Washington Quarterly* 42 (2) (2019): 7–30.
- <sup>3</sup> For a detailed discussion of these frameworks and their nuclear policy implications, see Brad Roberts, “The Evolution of U.S. Nuclear Policy and Posture,” in *The Case for U.S. Nuclear Weapons in the 21st Century* (Stanford, Calif.: Stanford University Press, 2015), chap. 1, 11–50.

<sup>4</sup> Except as noted, all references in this section are from the Nuclear Posture Reviews conducted by the Clinton, Bush, and Obama administrations. Note that the George H. W. Bush administration did not conduct an NPR as such, though it did review and make extensive changes to U.S. nuclear policy and posture. Note also that the Obama administration was the first to release an actual NPR report. The Clinton administration reported out the results of the inaugural NPR (conducted in 1994) as a chapter in the then-annual Report of the Secretary of Defense to the President and the Congress. See “Nuclear Posture Review,” in William J. Perry, *Report of the Secretary of Defense to the President and the Congress* (Washington, D.C.: U.S. Government Printing Office, 1995). The George W. Bush administration conducted an NPR in 2001 and prepared both classified and unclassified versions, though the former leaked and thus the latter could not be approved for release. The record therefore consists of “United States Department of Defense Briefing Slides,” January 9, 2002; Donald H. Rumsfeld, “Foreword,” *Nuclear Posture Review* (Washington, D.C.: U.S. Department of Defense, 2002); Donald H. Rumsfeld, *Annual Report to the President and the Congress* (Washington, D.C.: Office of the Secretary of Defense, 2003); and Douglas J. Feith, “Statement before the Senate Armed Services Committee Hearing on the Nuclear Posture Review,” February 14, 2002. See also Keith B. Payne, “The Nuclear Posture Review: Setting the Record Straight,” *The Washington Quarterly* 28 (3) (2005): 135–151; and Keith B. Payne, “The Nuclear Posture Review and Deterrence for a New Age,” *Comparative Strategy* 23 (4/5) (2004). In addition, late in the George W. Bush administration, the secretaries of defense and energy attempted to renew momentum around the main objectives of the 2001 NPR with an unclassified report on nuclear deterrence (the Gates-Bodman Report). See *National Security and Nuclear Weapons in the 21st Century* (Washington, D.C.: U.S. Department of Defense and U.S. Department of Energy, 2008). The Obama administration released not only its NPR report, but also an unclassified report to Congress characterizing the new nuclear employment guidance issued by President Obama to the U.S. military at the same time. See *Report on Nuclear Employment Strategy of the United States, Specified in Section 491 of 10 U.S.C.* (Washington, D.C.: The White House, 2013). The Trump administration’s NPR was issued in 2018, but at the time of writing, there has been no detailed elaboration of the internal debates underpinning the policies chosen.

<sup>5</sup> Greg Thielman, “The National Missile Defense Act of 1999,” *Arms Control Today*, July 8, 2009.

<sup>6</sup> Paul I. Bernstein, “Post-Cold War U.S. Nuclear Strategy,” in *On Limited Nuclear War in the 21st Century*, ed. Jeffrey A. Larsen and Kerry M. Kartchner (Stanford, Calif.: Stanford University Press, 2014), 89.

<sup>7</sup> *Report on Nuclear Employment Strategy of the United States*.

<sup>8</sup> Recalling Schultz et al., “Deterrence in the Age of Nuclear Proliferation.”

<sup>9</sup> *Ibid.*, 3–4.

<sup>10</sup> See, for example, *ibid.*, 2.

<sup>11</sup> Bruce Blair, Victor Esin, Matthew McKinzie, et al., “Smaller and Safer: A New Plan for Nuclear Postures,” *Foreign Affairs* 89 (5) (2010): 10.

<sup>12</sup> Keith B. Payne and James Schlesinger, *Minimum Deterrence: Examining the Evidence* (Fairfax, Va.: National Institute for Public Policy, 2013).

<sup>13</sup> U.S. Department of Defense, *Quadrennial Defense Review Report, 2010* (Washington, D.C.: U.S. Department of Defense, 2010), 89.

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- <sup>15</sup> William J. Perry, “Why It’s Safe to Scrap America’s ICBMs,” *The New York Times*, September 20, 2016.
- <sup>16</sup> This summary is drawn from “The Second New Problem: Relations with Putin’s Russia,” in Roberts, *The Case for U.S. Nuclear Weapons in the 21st Century*, chap. 4, 106–140. See also Angela Stent, *Putin’s World: Russia against the West and with the Rest* (New York: Twelve, 2019).
- <sup>17</sup> Matthew Bodner, “Russia’s Strategic Bomber Fleet on Global Intimidation Drive,” *The Moscow Times*, March 19, 2015. These flights violated a 1991 signed agreement with the United States and the United Kingdom.
- <sup>18</sup> See the U.S. Department of State annual reports on *Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Undertakings* (Washington, D.C.: U.S. Department of State, various years).
- <sup>19</sup> See the May 2012 announcement of President Putin’s decision to develop and implement a force development Plan of Action by 2020 on a year-by-year basis.
- <sup>20</sup> “Pivotal Changes in Russian Forces,” *Red Star* online, March 16, 2019.
- <sup>21</sup> See Defense Intelligence Agency, *Russian Military Power: Building a Military to Support Great Power Aspirations* (Washington, D.C.: Defense Intelligence Agency, 2017), 29–31; “Evidence of Russian Development of New Subkiloton Nuclear Warheads [Redacted],” Intelligence Memorandum, Office of Transnational Issues, Central Intelligence Agency, August 30, 2000, approved for release October 2005, [https://www.cia.gov/library/readingroom/docs/Doc\\_0001260463.pdf](https://www.cia.gov/library/readingroom/docs/Doc_0001260463.pdf); and Jacob W. Kipp, “Russia’s Nonstrategic Nuclear Weapons,” *Military Review*, May–June 2001, <https://www.hsdl.org/?abstract&did=3693>.
- <sup>22</sup> Central Intelligence Agency, Federal Bureau of Investigation, National Security Agency, *Assessing Russian Intentions and Activities in Recent U.S. Elections* (Washington, D.C.: Office of the Director of National Intelligence, 2017).
- <sup>23</sup> See Dave Johnson, *Russia’s Conventional Precision Strike Capabilities, Regional Crises, and Nuclear Thresholds* (Livermore, Calif.: Lawrence Livermore National Laboratory, 2017); Stephen R. Covington, *The Culture of Strategic Thought Behind Russia’s Modern Approaches to Warfare* (Cambridge, Mass.: The Belfer Center for Science and International Affairs, Harvard Kennedy School, 2016); Andrei Kokoshin, *Ensuring Strategic Stability in the Past and Present: Theoretical and Applied Questions* (Cambridge, Mass.: The Belfer Center for Science and International Affairs, Harvard Kennedy School, 2015); and Kristin Ven Bruusgaard, “Russian Strategic Deterrence,” *Survival* 58 (4) (2016): 7–26.
- <sup>24</sup> See, for example, Anya Loukianova Fink and Olga Olikier, “Russia’s Nuclear Weapons in a Multipolar World: Guarantors of Sovereignty, Great Power Status & More,” *Dædalus* 149 (2) (Spring 2020).
- <sup>25</sup> Olga Olikier, “Moscow’s Nuclear Enigma: What is the Russian Arsenal Really For?” *Foreign Affairs* 97 (6) (2018). For the opposing case, see Katarzyna Zysk, “Escalation and De-Escalation in Russian Military Strategy,” *RUSI Journal* 163 (2) (2018): 4–22.
- <sup>26</sup> North Atlantic Treaty Organization, “Warsaw Summit Communiqué,” July 9, 2016, para. 52, [https://www.nato.int/cps/en/natohq/official\\_texts\\_133169.htm](https://www.nato.int/cps/en/natohq/official_texts_133169.htm).
- <sup>27</sup> Ash Carter, “A Strong and Balanced Approach to Russia,” *Survival* 58 (6) (2016): 51–62.

<sup>28</sup> See Christopher Ford, *The P-5 Process and Approaches to Nuclear Disarmament: A New Structured Dialogue* (Washington, D.C.: U.S. Department of State, 2018).

<sup>29</sup> A good starting point would be a menu of options assembled by the United Nations Institute for Disarmament Research. See Wilfred Wan, *Nuclear Risk Reduction: The State of Ideas* (Geneva: United Nations Institute for Disarmament Research, 2019).

# The End of Arms Control?

*Linton F. Brooks*

*For almost half a century, the United States and the Soviet Union/Russian Federation have used arms control treaties to help regulate their nuclear relationship. The current such agreement, the 2011 New START treaty, expires in 2021, although the signatories can extend it until 2026. Because of mutual mistrust and incompatible positions on what to include in a follow-on agreement, New START will probably expire without a replacement. This essay examines the reasons for the demise of treaty-based arms control, reviews what will actually be lost by such a demise, and suggests some mitigation measures. It argues for a broader conception of arms control to include all forms of cooperative risk reduction and proposes new measures to prevent inadvertent escalation in crises.*

U.S.-Russian bilateral nuclear arms control is about to collapse. For decades, these two countries have used formal treaties to regulate the nuclear balance between them. The current such treaty is New START (Strategic Arms Reduction Treaty) – Russians often call it START III – which limits deployed strategic warheads to 1,550 on each side.<sup>1</sup> New START was signed in 2010, entered into force in February 2011, and will expire in February 2021. Its implementation has gone smoothly and New START is often considered a bright spot in the relationship between the United States and Russia. Unfortunately, that is about to change. This essay explores the reasons for the probable demise of legally binding arms control treaties, the consequences of such an outcome, and what might be done to mitigate those consequences. Because all judgments about the future are inherently suspect, the essay suggests what a follow-on treaty might consist of if – contrary to current expectations – such a treaty became feasible. Finally, it suggests a new, broader model for redefining what we mean by arms control, a model that may allow some benefits that formal treaties have not provided.

The commonest form of stupidity is forgetting what one is trying to accomplish. Why has the United States sought arms control in the first place? Many people assume arms control is an obvious good, but it is not. Instead it is one possible tool to improve national security and enhance strategic stability. Modern arms control theory starts with Thomas Schelling and Morton Halperin's seminal work, *Strategy and Arms Control*. Writing in 1961, they "use the term

‘arms control’... to mean all the forms of military cooperation between potential enemies in the interest of reducing the likelihood of war, its scope and violence if it occurs, and the political and economic costs of being prepared for it.”<sup>2</sup>

Many practitioners (including the present author) are dissatisfied with the goals implied by this definition. They doubt arms control reduces the likelihood of deliberately initiating war, which depends on political considerations. (Arms control can, however, reduce the risk of conflict based on erroneous perceptions that an attack is imminent.) Further, they question whether we know how to reduce the scope and violence of war once the nuclear threshold has been crossed. These practitioners keep a somewhat different list of what bilateral arms control can do:

1. Provide public recognition that the two sides regard one another as important equals.
2. Provide communication in difficult times.
3. Provide transparency that leads to predictability that in turn enhances stability.
4. Avoid an action-reaction arms race in which each side builds new systems in anticipation of similar moves by the other. In some cases, it may be possible to close off militarization of a specific technology.
5. Reduce incentives to preempt in times of crisis (provide first-strike stability) by shaping the structure of forces (such as by stressing bombers over missiles, or reducing the role of fixed – and thus vulnerable – intercontinental ballistic missiles [ICBMs] with multiple warheads).
6. Save money by capping expenditures on new systems.
7. Reduce the chance of inadvertent escalation caused by mismanagement during crises.

The most important use of arms control is as a means of achieving strategic stability, which in turn is a way of dealing with the terrifying reality that in the time it takes to read this essay, the United States and the Russian Federation can destroy one another as functioning societies. Neither is likely to do so because each side maintains forces that could survive a first strike and inflict devastating retaliation. As a result, nuclear war has become irrational. Because neither side can be certain of controlling escalation (especially once the nuclear threshold is crossed), conventional war between nuclear states is also – or at least should be – too risky to contemplate. This reality, called mutual assured destruction, is a frightening and unsatisfactory concept. Many experts have sought a way to move beyond it. They have not found one because mutual assured destruction is not a policy to be embraced or rejected but a fact to be accepted and managed.

In a relationship characterized by the reciprocal ability to inflict devastation, Russia and the United States have historically found the concept of strategic

stability to be helpful and perhaps even central to preventing war. By the end of the Cold War, analysts in both the Soviet Union and the United States had a similar understanding of the basic premises of strategic stability and of the importance of those principles in avoiding catastrophe. They understood that the concept was primarily bilateral and was primarily about preventing *nuclear* war. To foster such stability, the two superpowers sought policies, forces, and postures that met three criteria:

- In times of great crisis, there is no incentive to be the first to use military force of any type, nuclear or otherwise (“crisis stability”).
- In crisis or conventional conflict, there is no incentive to be the first to use nuclear weapons (“first strike stability”).
- Neither side believes it can improve its relative position by building more weapons (“arms race stability”).

Recent years have seen varying interpretations of the term “strategic stability.”<sup>3</sup> The Russian government often uses a very expansive definition that sometimes seems to be a synonym for national security policy. As a result, some authors in this volume eschew the use of the term. But strategic stability, narrowly defined, remains the most useful concept for assessing the contributions of arms control to the prevention of nuclear war.

In addition to stability benefits, arms control treaties can help improve the overall political relationship between states. Finally, those who believe that nuclear abolition is a feasible goal want to negotiate lower numbers to move closer to zero.<sup>4</sup> New START is the latest attempt to achieve at least some of these goals.

**W**hy is a replacement for New START unlikely? The most probable reason is that the United States may conclude Russia is not a reliable negotiating partner. Russia’s cheating not only has military implications but has poisoned the political well. Besides Russian violations of the Intermediate Range Nuclear Forces Treaty (INF Treaty), the United States has formally determined that Russia is violating the Chemical Weapons Convention, Open Skies Treaty, and Conventional Forces in Europe Treaty and is not adhering to the politically binding 2011 Vienna Document.<sup>5</sup> In addition to these formal determinations, the United States’ 2018 Nuclear Posture Review states that “Russia is either rejecting or avoiding its obligations and commitments under numerous agreements, including . . . the Budapest Memorandum, the Helsinki Accords, and the Presidential Nuclear Initiatives.”<sup>6</sup> While Russia has thus far complied with New START, it would not be unreasonable for the United States to conclude that if New START or its replacement becomes inconvenient, Russia will violate that too.

Russians, in turn, may be skeptical that agreements with the United States will outlast the administration that made them. They could point to a series of agreed



measures taken during review conferences of the Nuclear Non-Proliferation Treaty that were ignored by subsequent administrations, to the U.S. repudiation of the Joint Comprehensive Plan of Action (JCPOA) on Iran, to the U.S. “un-signing” the Arms Trade Treaty, and to persistent rumors that the United States is considering similar action with respect to the Comprehensive Nuclear-Test-Ban Treaty.<sup>7</sup> Both countries will have to overcome suspicions for future negotiations to succeed, a task made more difficult by the current tensions between them.

Even if the two sides want to negotiate a follow-on to New START, doing so may prove too difficult. There are several important issues on which the states have irreconcilable positions that one or the other side asserts must be resolved in their favor before a new strategic arms treaty would be acceptable. These issues include:

*National ballistic missile defense.* The United States has concluded that it must defend its homeland against a potential ballistic missile attack from North Korea or Iran. It believes that effective defense against the relatively crude, first generation missiles of these two states is technically feasible and that the United States’ limited understanding of the decision-making processes of these two governments makes it imprudent to depend entirely on deterring attack by threat of retaliation. As a result, the George W. Bush administration withdrew from the Anti-Ballistic Missile Treaty of 1972 (ABM Treaty) to deploy a national ballistic missile defense based in California and Alaska. The small size of the defenses (currently forty-four interceptors but the number is planned to increase to sixty-four) would be consistent with the ABM Treaty, but the national defense coverage would not.

The Bush administration also planned a third national defense site in Poland. The Obama administration canceled the planned site and instead deployed regional ballistic missile defenses in Europe to counter a potential Iranian nuclear missile threat to NATO allies.

Russians interpret this European deployment as aimed at them. Although the United States asserts such defenses will have no real capability against Russian strategic forces, Russian analysts and officials fear that such defenses threaten (and may be intended to threaten) its strategic deterrent. Many Russian experts accept that the current system has no real capability against Russian ICBMs, but fear that it will sooner or later be improved to gain such a capability. Russia insists that legally binding limits on the performance of European defenses are a prerequisite for any new arms control discussions. Both the previous and the current administration found such limits unacceptable. Any treaty limiting ballistic missile defenses could not be ratified by the current or any plausible future Senate. This dispute is the most serious obstacle to any future arms control agreement.

*Nonstrategic nuclear weapons (NSNW).* Russia has a significant advantage in so-called nonstrategic nuclear weapons (those designed for use at less than intercontinental ranges). This poses a significant threat to American allies. Russian weapons include air defense, shorter range missiles, tactical bombs, and anti-ship and

anti-submarine weapons, while the United States has only a relatively small number of tactical bombs, some of which are stored in Europe for potential delivery by NATO allies. The Resolutions of Ratification for both the 2002 Treaty of Moscow and the 2010 New START mandate including such weapons in any future arms control treaty. One approach advocated within the United States has been to agree on a single limit on all warheads, thus balancing U.S. advantages in spare weapons and upload potential against Russian NSNW advantages. Russia has rejected the concept of verifying such a limit as too intrusive, called for removal of the U.S. tactical bombs from Europe as a precondition for any discussions, and has given no indication it is willing to consider even modest data exchanges on NSNW, let alone limits.

*Space-strike forces.* Russia fears the United States will deploy space-based weapons capable of striking strategic targets with virtually no warning. If this were true, the threat to strategic stability would be significant. There is, however, no evidence that either side is currently pursuing such a capability, although there are individual advocates for doing so. Despite this, Russian experts routinely raise resolving the issue as a prerequisite for further arms control agreements. The proposed Russian solution is a sweeping treaty on preventing an arms race in outer space tabled in the Conference on Disarmament (a United Nations consensus-based multilateral negotiating forum that has been effectively moribund for years). The United States regards Russian proposals as unverifiable and unworkable.

*Conventional strategic strike.* In recent years, Russian experts have expressed concern with U.S. long-range precision strike capabilities. Their most common assertion is that such weapons, especially conventionally armed sea-launched cruise missiles, could preemptively destroy Russian ICBM silos and other strategic nuclear forces, thus limiting Russia's ability to retaliate. It is not clear how seriously the Russian government (as opposed to Russian nongovernmental nuclear security experts) takes this issue. Most U.S. experts regard the threat as fanciful and the United States has, therefore, given very little thought to how it might respond if this became a serious negotiating issue.<sup>8</sup>

In each of these cases, one side has demands that the other cannot (or will not) meet. If both sides maintain their current positions, no agreement is possible. In addition, there are areas in which both sides acknowledge complicating factors, but there is no obvious way to deal with them. This is a particular concern for space control and cyberspace.

The biggest challenge, however, may be political, not technical, and arises from mutual mistrust. Some senior Russian leaders (probably including President Putin) believe that the United States seeks a first-strike capability in order to coerce Russia into accepting American hegemony, and that the United States is actively seeking to change the current Russian government. In turn, many Americans are convinced that Russia is systematically interfering in U.S. and European elections to undermine faith in democracy and that its aggressive actions in

annexing Crimea and destabilizing Ukraine are threats to international peace and order. If these beliefs remain, nothing approaching stability, let alone partnership, will be sustainable over the long term, and even cooperation that is in both countries' interest will be challenging. (Because of this hostility, President Putin has prepared Russia to out-compete the United States in the nuclear domain. The United States has not taken similar steps, suggesting that the common assumption that the United States can prevail in an unconstrained arms race may be wrong.)

These issues could prevent negotiation of a replacement treaty when New START expires in February 2021. If it expires with no plans for replacement, we will face a situation in which, for the first time in half a century, no treaty regulating the nuclear balance between Russia and the United States will be either in force or under negotiation. In theory, the two sides could delay this outcome. New START allows for a single extension of up to five years without the need for ratification. Taking this option and extending the treaty to 2026 may be the only way to preserve strategic arms control after 2021. Such an extension would be no panacea. Without a solution to the problems described above, an extension only postpones the demise of bilateral arms control. But an extension would buy time to plan for a future with no formal bilateral arms control agreements. The Trump administration has made no decision on extension and does not plan to do so until sometime in 2020.<sup>9</sup> In a June 18, 2019, interview, then-National Security Advisor John Bolton (widely assumed to be one of several administration officials opposed to extension and skeptical of the value of arms control in general) said of extending New START: "There's no decision, but I think it's unlikely." His primary objection was that the treaty has no limitations on tactical or nonstrategic nuclear weapons. "That flaw remains today," he said, "so simply extending it, extends the basic flaw."<sup>10</sup>

International agreements are only impossible until they aren't. As I explore below, it is clearly feasible to deal with at least some of these issues and to defer others. It is in the interests of both countries to make the attempt. But the complexity of the issues and the poor state of relations between the United States and Russia demand that, in parallel with this effort, the two states should consider how they will manage their nuclear relationship if formal arms control treaties are no longer available.

**H**ow would we deal with such a future? Because arms control is not an end in itself, but a means to ensure national security and international stability, we should start by examining the specific problems resulting from the treaty's demise. For the United States, one problem is the loss of transparency and predictability, both of which enhance stability. While most information the two sides exchange can be discerned through intelligence gathering, this process requires additional collection and analytic resources at a time of increasing demands

on the intelligence community. Some of the information New START provides cannot be obtained any other way. New START transparency benefits the United States more than it does Russia because U.S. society is inherently more open.

For Russia, bilateral arms control symbolizes the respect and equality that the country expects and believes it deserves. Strategic nuclear capability is one area where Russia is clearly an equal of the United States. Respect appears important to President Putin and most other influential Russians. It is not in the U.S. interest to foster a sense of inferiority and disrespect within a country that retains the ability to destroy the United States as a functioning society. The risk of Russia taking irresponsible action to demonstrate its power and importance is too great.

For both states, New START is one way to assert compliance with Article VI of the Nuclear Non-Proliferation Treaty and help to preserve the international non-proliferation regime.<sup>11</sup> It would be an error to overestimate the benefits of New START in demonstrating compliance with Article VI. The strong opposition from many non-nuclear states to the lack of progress on disarmament will not be assuaged by retaining New START. Still, bilateral arms control (which has been portrayed as part of a step-by-step process of disarmament) at least provides a limited counter to charges that Russia and the United States (who between them possess 90 percent of all existing nuclear weapons) are ignoring their Article VI obligations.

More generally, arms control is seen by some as demonstrating a commitment to an international order based on the rule of law, rather than the use of force. Those who believe this to be the case will equate the termination of formal arms control agreements with a shift toward more militaristic policy. Public opinion in both Russia and the United States will almost certainly assume that the demise of New START will result in the other country increasing strategic forces and that an arms race will follow.

A problem unique to the United States is the variable of congressional support for nuclear modernization. Historically, it has been necessary for administrations to demonstrate some commitment to arms control in order to gain such support.<sup>12</sup>

Both countries have a *de facto* policy of maintaining rough strategic parity with the other. In particular, the United States' policy of maintaining strategic nuclear forces that are "second to none" helps reassure U.S. allies that extended deterrence remains credible. Strategic arms control allows maintaining approximate parity without reigniting an arms race. There are doubtless other benefits that further thought and discussion will reveal.

**A**fter understanding the specific benefits of New START, Russia and the United States should jointly consider how, if at all, they can mitigate the consequences of its lapse. Thomas Schelling and Mort Halperin's arms control theory endorsed "all the forms of military cooperation between potential

enemies.” Over the subsequent decades, the term “arms control” has been narrowed to mean formal, legally binding, ratified treaties. It is time to reclaim the earlier, broader meaning. To do so, the United States and Russia might consider the following steps if/when New START lapses.

*Increase transparency and predictability.* The two countries could continue exchanging periodic data on strategic forces as a confidence-building measure and expand such exchanges to include modernization plans. They could even conduct de facto inspections as a confidence-building measure. Russian law requires some formal agreement to legitimize such inspections, but it need only be an executive agreement (as was done for the Department of Defense’s Cooperative Threat Reduction efforts). Russian agreement to such reciprocal inspections is unlikely but not impossible. Another option would be to conduct “virtual” inspections using national technical means.<sup>13</sup>

*Avoid reciprocal increases (a “slow arms race”) as each side seeks to maintain rough parity.* Russia and the United States could reach an informal agreement to exchange modernization plans routinely and not to expand nuclear arsenals above New START levels, provided the other side showed comparable restraint. Each president could codify this agreement simply by giving a speech, perhaps at the United Nations.

*Engage with public opinion and inspire public confidence, both international and domestic.* To counter any belief that terminating formal arms control agreements implies a shift to a more militaristic policy, senior officials of both states (including both presidents) should jointly and individually reiterate the formulation: “A nuclear war cannot be won and must never be fought.” The absence of this phrase from U.S. and Russian policy documents and speeches is an error. Russia and the United States should engage in (and publicize) serious strategic stability discussions, both official and at the Track 1.5/Track 2 level, where outside experts and (sometimes) government officials acting in their “personal” capacity conduct an unofficial dialogue with their foreign counterparts. Finally, both states should avoid inflammatory rhetoric and nuclear saber-rattling.

The best way to maintain enough visible arms control to foster congressional support for modernization would be to extend New START. If this does not happen, then to demonstrate that it has no objections to arms control as a concept, the administration could urge Senate ratification of protocols to the South Pacific Nuclear Free Zone Treaty, African Nuclear-Weapon-Free Zone Treaty, and the Treaty on a Nuclear-Weapon-Free Zone in Central Asia. These protocols provide for negative security assurances for states within a particular nuclear-weapon-free zone and agreement that the United States will not station weapons within the zone (transit is allowed). The protocols appear noncontentious within the Senate and could be ratified with administration support.

*Deal with concerns over U.S. support for Article VI of the Nuclear Non-Proliferation Treaty.* Because concern over Article VI among non-nuclear-weapon states is far

broader than what is covered by New START, extending New START will bring only modest political benefits and thus any actions in response to its demise will have limited impact. Russia and the United States should adopt the rhetoric that the enemy is not nuclear weapons but nuclear use and should stress provisions for risk reduction that survive New START, such as the Ballistic Missile Launch Notification Agreement of May 31, 1988, which requires the Soviet Union (now Russia) and the United States to notify one another twenty-four hours in advance of launches of ICBMs or submarine launched ballistic missiles. They should also stress the initiatives suggested below. Finally, they should support dialogue between supporters of the 2017 Treaty on the Prohibition of Nuclear Weapons (Ban Treaty) and the nuclear-weapon states, as proposed by Japan.<sup>14</sup>

*Demonstrate cooperation and mutual respect.* To show they can cooperate on a basis of respect and equality, Russia and the United States should maximize bilateral efforts that can be jointly led. They might intensify cooperation under the Global Initiative to Counter Nuclear Terrorism, which they cochair together. They might also consider a joint initiative to help states comply with UN Security Council Resolution 1540, a 2004 resolution that bans states from supporting nonstate actors seeking weapons of mass destruction (WMD), requires that states adopt laws outlawing possession of WMD, and mandates domestic controls over WMD in order to prevent their proliferation.<sup>15</sup> They could sponsor a parallel initiative to revitalize discussions on controlling fissile material (including existing stockpiles as well as new production). Finally, they might cochair a series of meetings among the five nuclear-weapon states under the Nonproliferation Treaty plus India and Pakistan to discuss physical security standards for weapons protection as well as opportunities for improvements in global strategic stability.<sup>16</sup>

**T**hus far, this essay has assumed that New START will expire without replacement, either in 2021 or 2026. That remains the most likely outcome given the apparently intractable problems described above. It is not, however, the only possible outcome. The two sides could conclude that the benefits to each side are sufficiently compelling that a legally binding replacement treaty is in their mutual interest. The quickest way to accomplish this is to limit the replacement treaty to the scope of New START, relegating consideration of nonstrategic nuclear weapons, ballistic missile defense, and all of the other issues listed above to a separate, longer-term negotiation (perhaps under the rubric of a strategic stability dialogue) whose conclusion is not a prerequisite for ratification and entry into force of the replacement treaty. Because of the importance to NATO of constraining Russian nonstrategic nuclear weapons, the United States should seek Russian agreement on the general approach to dealing with U.S. concerns in this area as a prerequisite for ratifying the replacement treaty. The United States should be prepared to deal with Russian calls for a similar commitment on ballistic missile defense.

Under this approach, the replacement treaty would extend most provisions of New START with only modest updating. It would be necessary to deal with Russian concerns over the adequacy of the U.S. procedures for reducing the number of accountable launchers on ballistic missile submarines and for verifying the non-nuclear status of converted B-52H bombers. Procedures would also need to be included to cover novel Russian delivery systems like the Skyfall intercontinental nuclear-powered cruise missile and the Poseidon high-speed intercontinental nuclear-armed torpedo.<sup>17</sup> Given political will, dealing with these issues should be straightforward technically, although probably time consuming. Potentially more difficult would be reaching agreement on Russian hypersonic boost-glide vehicles such as the Avangard. At a minimum, those vehicles with nuclear payloads launched from silos and having intercontinental range should count against New START limits even though they do not follow a ballistic trajectory over most of their flight range (the current definition of silo-launched missiles that count toward the treaty's limits). Aircraft capable of carrying hypersonic weapons of greater than six hundred kilometer range (an accepted delimitation range from past agreements) should count as heavy bombers.<sup>18</sup>

The replacement treaty could provide for further reductions in strategic forces, but that should not be a major objective. Stability is more important than reductions.

It may be, however, that one or both sides has a domestic political imperative to be able to claim that their issues have been addressed, at least in part. Possible solutions to this imperative could be side agreements that might include the following:<sup>19</sup>

- Although the best solution to concerns with so-called nonstrategic nuclear weapons would be an aggregate limit on all warheads, if this proved infeasible, Russia and the United States could agree to exchange information annually on the total numbers of NSNWs each side possesses, on the types of those weapons (bombs, air defense, cruise missiles, and so on), and on where such weapons were normally deployed (in general, not specific terms).<sup>20</sup>
- For ballistic missile defense, the two sides could conclude a legally binding agreement to exchange plans for the numbers and locations for future deployments of ballistic missile defense interceptors over, for example, the next ten years. These plans would be updated annually and there would be a commitment not to change them without, for example, three years' notice.<sup>21</sup>
- To address Russian concerns about attacks from space on the surface of the Earth, the two sides could agree to ban the testing of such weapons, to be verified by national technical means. While deorbiting might be done without detection, for "space strike" weapons to destroy strategic targets with

no notice they would need to be highly accurate. Developing such accuracy implies a testing range that would be detectable.

- Because the Russian concern with “conventional strategic strike” appears primarily focused on deployed sea-launched cruise missiles, the two sides could exchange annual declarations of the planned number of such missiles with ranges above six hundred kilometers to be deployed, as well as the types of ships and submarines capable of carrying such weapons. Russian surprise attack concerns are only relevant to submarines. Drawing on the 1991 START precedent, the United States could make a unilateral political commitment not to exceed some total number of deployed sea-launched cruise missiles on general purpose submarines, setting the level high enough not to constrain U.S. operations.

With the exception of banning the testing of weapons designed for striking objects on the surface of the Earth from space – which can be effectively verified by national technical means – and, perhaps, the obligation to notify of changes in ballistic missile deployment and development plans, none of these proposals would be subject to verification. They would thus be only appropriate for political, rather than legal, commitments.

**R**eturning to the broader definition of arms control espoused by Schelling and Halperin may facilitate new accomplishments that have thus far been elusive, especially reducing risks during crises. Formal, legally binding treaties (when complied with by both parties) have a good record of first regulating and ultimately reversing the insatiable build-up of strategic forces that characterized the early Cold War, thus providing arms race stability. Such agreements, however, have been less effective in ensuring crisis stability.<sup>22</sup> As noted earlier, because each side maintains forces that could survive a first strike and inflict devastating retaliation, deliberate nuclear war is irrational. Further, the fact that neither side can be certain of controlling escalation (especially once the nuclear threshold is crossed) should make conventional war between nuclear states too risky to contemplate.

Unfortunately, this comforting conclusion may be wrong for two related reasons. The first is that all states possessing nuclear weapons, including Russia and the United States, are almost certainly overconfident in their ability to manage crises and prevent their escalation. Each side may take actions intended to show both resolve and restraint but that may be misinterpreted as preparations for an attack. Both Russian and U.S. military modernization and doctrinal innovations, along with the current deep suspicion between the two states, increase this risk.

For American analysts, a particular concern is what the December 2014 revision of Russian Military Doctrine calls “non-nuclear deterrence” but others have



called “prenuclear deterrence.” Although the Russians have not defined their term, some unofficial writings hint at the possibility of major misjudgment about American reactions.<sup>23</sup>

Similarly, actions U.S. leaders might consider as showing resolve coupled with restraint during a crisis may be seen by Russia as escalatory. For example, in a Baltic crisis, sending an armored brigade into either Poland or one of the Baltic states would be intended by the United States as a deterrent to Russia and a reassurance of NATO allies, but in Russian eyes would be hard to distinguish from plans to seize Kaliningrad.

The second reason crisis management may be more difficult than expected is the nature of the new war-fighting domains of space and cyberspace. The risk is that routine acts in these two domains can be misinterpreted as precursors to an attack. Fearing that attack is imminent, a state may then take countermeasures that are in turn perceived as escalatory.<sup>24</sup>

These two factors lead to a strong possibility that each side will misjudge the actions of the other in a crisis. The greatest danger is not a deliberate nuclear attack; deterrence will continue to prevent such a step. The risk of nuclear war arises almost entirely from ineffective crisis management. Here deterrence will be of limited value. As former Senator Sam Nunn stated at the 2018 Carnegie International Nonproliferation Conference, “You can’t deter a blunder.”

In an ideal world, senior military officers on both sides would routinely discuss the risks of inadvertent escalation due to miscalculation in crisis. But if Russia and the United States had the kind of relationship in which such robust discussions were possible, they would be less critical. Because it is probably infeasible to get serving military officers to have a candid discussion of inadvertent escalation, it will be necessary to conduct such a dialogue in unofficial channels using retired senior military officers. Ideally, participants would include individuals with senior leadership experience in overall strategy, European regional strategy (including the role of NATO), and strategic nuclear forces management. The selection of the right people on both sides will be crucial, as will keeping the discussions private.

Such talks should help avoid misinterpretation of conventional military actions. But that alone may not be sufficient. During a crisis, one side might believe the other was seeking to facilitate a first strike through degrading crucial space assets such as early warning or communication satellites related to nuclear command and control. To avoid this risk, each side should prepare a list of space assets for which it would regard indications of a possible attack as potentially implying preparation for a first strike. These lists should be exchanged and discussed annually. As part of this exchange, the sides should individually identify what the relevant orbital dynamics of another space body (such as a servicing satellite) would need to be in order to cause concern.

To avoid false assumption of imminent cyberattack, the sides should establish a standing group of cyber experts that meets at six-month intervals to discuss possible intrusions by third parties and how such intrusions might be detected. Using this group, the sides should identify what each believes would be indications of a possible preparation for first strike, including both systems and actions. Since both have an interest in preventing escalation in crises, they have no incentive to be disingenuous in such an exchange. If one side becomes concerned, this group should be convened in parallel with high-level diplomatic or military discussions and seek to clarify the situation. (The purpose of the routine meetings is, in large part, so the experts will be familiar with each other's thinking and approach and will thus be more effective in preventing misinterpretation.)

Making progress in improving crisis stability will probably require a combination of sustained government-level strategic stability talks (modeled after those begun in Helsinki in September 2017) and the informal efforts just described. The prerequisite for any discussion is sound and creative internal analysis. The chances of success are relatively low, but because miscalculation in a crisis is the most plausible path to nuclear war, the effort is worth making, whether New START is replaced by a follow-on treaty, by less formal arrangements, or by nothing.

This new focus will almost certainly require new forms of agreement. The JCPOA model used with Iran, whatever its substantive merits, provides a useful approach to a collection of specific commitments in different domains.<sup>25</sup> To provide confidence that the agreement will endure between administrations, it should acquire some form of congressional approval. At the same time, the agreement will need to evolve to meet technical, political, and military realities. There should therefore be a formal review and updating, perhaps every five years.

Formal, treaty-based arms control is likely coming to an end. But the need to prevent nuclear war will remain. The United States should:

- Adopt a broader concept of arms control as including all forms of cooperative effort to prevent nuclear war.
- Extend New START to preserve the transparency benefits and provide time to determine what comes next. Make the extension contingent on Russian agreement to deal with U.S. concerns on nonstrategic nuclear weapons and incorporation of new, novel Russian strategic systems. Be prepared to withdraw if Russia fails to follow through. Use the time until New START expires to explore the possibility of resolving the issues that stand in the way of a replacement agreement. Conduct an internal analysis of the form such an agreement should take and of whether the resulting treaty would be a net benefit to the United States when compared with the termination of bilateral treaty-based arms control.

- In parallel with this effort, conduct a formal assessment of the actual consequences of the demise of treaty-based arms control and how those consequences might be mitigated, drawing in part on the ideas presented above. Follow this internal examination with dialogue with Russia on mitigation of such consequences.
- Whether or not the United States elects to continue formal treaties, seek a separate dialogue with Russia on crisis management and the prevention of escalation, considering actions in all war-fighting domains including space and cyberspace.

Success in any of these efforts will not be easy. It will demand creative thinking and analysis and a willingness to consider unorthodox approaches. Gaining Russian agreement to even consider these approaches will be hard. In multiple discussions by the author with Russian experts, none of them believes a nontraditional approach is feasible. But the problem will not be improved by ignoring it. The era of Russian-American treaty-based strategic arms control as we know it is coming to an end. We can delay that outcome, though we likely cannot prevent it. But by thinking through the consequences, we can minimize the harm to our overall relations and to international stability. We should begin that thinking now.

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#### AUTHOR'S NOTE

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#### ABOUT THE AUTHOR

**Linton F. Brooks** has sixty years of national security experience, much of it associated with nuclear weapons. A retired Navy officer, he has held nuclear-related assignments in the Departments of Defense, State, and Energy, the Arms Control and Disarmament Agency, the Navy staff, and the National Security Council staff, culminating in supervising the U.S. nuclear weapons program as Administrator of the National Nuclear Security Administration. Brooks was Chief Negotiator for the 1991 Strategic Arms Reduction Treaty, holding the rank of Ambassador. He also supervised the preparation of the START II Treaty. Since leaving government, he has focused on mentoring future nuclear policy experts.

#### ENDNOTES

- <sup>1</sup> Arms control numbers can be misleading. In New START, missile launchers, the missiles they contain, and the warheads on those missiles are categorized as physical objects. Bombers, however, count as only one unit against the launcher, missile, and warhead limit, no matter how many bombs or cruise missiles they carry. Thus, as has been true in previous treaties, the actual capability allowed each side is greater than the 1,550 limit implies.
- <sup>2</sup> Thomas C. Schelling and Morton H. Halperin, *Strategy and Arms Control* (New York: Twentieth Century Fund, 1961).
- <sup>3</sup> See Elbridge A. Colby and Michael S. Gerson, eds., *Strategic Stability: Contending Interpretations* (Carlisle Barracks, Pa.: Strategic Studies Institute, U.S. Army War College, 2013).
- <sup>4</sup> Whatever the ultimate desirability and feasibility of abolishing nuclear weapons, the failure of nuclear-weapon states to show significant interest in abolition following President Obama's 2009 Prague speech, coupled with the increasing tension among the major powers, suggests that the conditions permitting serious consideration of abolishing nuclear weapons are unlikely to be present in the coming decades. As a result, abolition will not be considered further in this essay. For a description of the current U.S. approach—an initiative entitled Creating the Environment for Nuclear Disarmament (formerly Creating the Conditions for Nuclear Disarmament)—see Assistant Secretary of State Christopher Ashley Ford, “Remarks,” at The Nuclear Nonproliferation Regime—Towards the 2020 NPT Review Conference, Wilton Park, United Kingdom, December 10, 2018.
- <sup>5</sup> For details on the INF Treaty violation, see “Director of National Intelligence Daniel Coats on Russia’s INF Treaty Violation,” Office of the Director of National Intelligence, November 30, 2018, <https://www.dni.gov/index.php/newsroom/speeches-interviews/speeches-interviews-2018/item/1923-director-of-national-intelligence-daniel-coats-on-russia-s-inf-treaty-violation>. See also U.S. Department of State, *Adherence to and Compliance with Arms Control, Nonproliferation and Disarmament Agreements and Commitments* (Washington, D.C.: U.S. Department of State, 2019).
- <sup>6</sup> U.S. Department of Defense, *Nuclear Posture Review* (Washington, D.C.: Office of the Secretary of Defense, 2018), 74.
- <sup>7</sup> Donald J. Trump, “Presidential Message to the Senate of the United States on the Withdrawal of the Arms Trade Treaty,” April 29, 2019, <https://www.whitehouse>

.gov/briefings-statements/presidential-message-senate-united-states-withdrawal-arms-trade-treaty/.

- <sup>8</sup> The United States has significant military concerns with Russian conventional and nuclear strike capability at the regional level but has not thus far sought to deal with those concerns through arms control.
- <sup>9</sup> “Trump Will Decide Whether to Extend START Treaty ‘Next Year’: Official,” Reuters, May 29, 2019, <https://www.reuters.com/article/us-usa-russia-start/trump-will-decide-whether-to-extend-start-treaty-next-year-official-idUSKCN1SZ1V5>. The official quoted is National Security Council Senior Director Tim Morrison.
- <sup>10</sup> *Washington Free Beacon* interview quoted Shervin Taheran and Daryl G. Kimbal, “Bolton Declares New START Extension ‘Unlikely,’” *Arms Control Today*, July/August 2019.
- <sup>11</sup> Article VI reads: “Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.” While it is clear that the arms race has largely been ended, critics argue (with some justification) that there has been no progress on nuclear disarmament. See Treaty on the Non-Proliferation of Nuclear Weapons (NPT), available at <https://www.un.org/disarmament/wmd/nuclear/npt/text/>.
- <sup>12</sup> The reverse is also true, as illustrated by the commitments the Obama administration made in order to ensure the necessary Senate support for the ratification of New START.
- <sup>13</sup> For details, see Vince Manzo, *Nuclear Arms Control Without a Treaty? Risks and Opportunities After New START*, CNA Research Memorandum IRM-2019-U-01949 (Arlington, Va.: CNA, 2019).
- <sup>14</sup> Ministry of Foreign Affairs of Japan, *Bridges to Effective Nuclear Disarmament: Recommendations for the 2020 Review Process for the Treaty on the Non-Proliferation of Nuclear Weapons (NPT)* (Tokyo: Ministry of Foreign Affairs of Japan, 2018).
- <sup>15</sup> Arms Control Association, “UN Security Council Resolution 1540 at a Glance,” August 2017, <https://www.armscontrol.org/factsheets/1540>.
- <sup>16</sup> This concept originated with physicist and nuclear weapons expert John R. Harvey. In the approach envisioned here, Israel would be excluded since neither Israel nor the United States acknowledges its nuclear stockpile. North Korea would be excluded because its permanent possession of nuclear weapons is not accepted by the international community.
- <sup>17</sup> For details on these new systems, see Amy F. Woolf, *Russia’s Nuclear Weapons: Doctrine, Forces, and Modernization* (Washington, D.C.: Congressional Research Service, updated 2020), <https://fas.org/sgp/crs/nuke/R45861.pdf>.
- <sup>18</sup> The question of new kinds of strategic arms is dealt with in an ambiguous fashion in both New START and the original 1991 START. Article V of New START says, “When a Party believes that a new kind of strategic offensive arm is emerging, that Party shall have the right to raise the question of such a strategic offensive arm for consideration in the Bilateral Consultative Commission.” The comparable provision in Article XV of the 1991 treaty calls on the parties to “resolve questions related to the application of relevant provisions of this Treaty to a new kind of strategic offensive arm,” but is likewise silent on what happens if no agreement is reached. The U.S. article-by-article analyses of both treaties note that there is no obligation to delay deployment while the parties are seeking to resolve the issue. In 1991, the United States assumed it would be the one to develop

new kinds of weapons and wanted to preserve its ability to exclude non-nuclear intercontinental systems from treaty limits. See Treaty Between the United States of America and the Union of Socialist Soviet Republics on Further Reduction and Limitation of Strategic Offensive Arms (START I), available at [https://media.nti.org/documents/start\\_1\\_treaty.pdf](https://media.nti.org/documents/start_1_treaty.pdf); Treaty Between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START Treaty), available at <https://2009-2017.state.gov/documents/organization/140035.pdf>; Office of Strategic Deterrence and Capabilities, U.S. Department of Defense, "START: Article-by-Article Analysis," <https://www.acq.osd.mil/tc/start1/START1-AAA-toc.htm>; and Office of Strategic Deterrence and Capabilities, U.S. Department of Defense, "New START Treaty: Article-by-Article Analysis," <https://www.acq.osd.mil/tc/nst/NST-AAA/AAAtoc.htm>.

- <sup>19</sup> Some may argue that many of these are fig leaves that do not address the underlying substantive concerns. This is largely true but may not invalidate their utility in permitting the sides to reach agreement on an otherwise desirable treaty. There is a precedent from the 1991 START I Treaty. The Soviet Union wanted to limit nuclear sea-launched cruise missiles carried on nuclear-powered attack submarines. The United States was unwilling to accept any form of verification for fear it would reduce operational flexibility. The sides agreed to reciprocal unilateral declarations (with no verification) limiting the number of deployed nuclear sea-launched cruise missiles to 880. This met the Soviet need to deal with the issue but did not constrain the United States in any way since the 880 limit was more than the United States was capable of deploying, a fact the Soviets almost certainly knew.
- <sup>20</sup> The locations of U.S. weapons stored in Europe are widely known from various leaks but are treated as classified within the United States. The United States would need to consider whether increased transparency from Russia was worth formally declassifying these locations. The views of the host nations would obviously be a critical factor.
- <sup>21</sup> Such an agreement would meet Russian requirements for something legally binding but, given how long it takes Congress to approve and fund new programs, would not actually constrain U.S. plans. I am indebted to Ambassador Steven Pifer for the concept.
- <sup>22</sup> There are modest exceptions, the most important of which is the Ballistic Missile Launch Notification Agreement. A useful step would be to broaden the agreement to include other states with nuclear weapons, especially China.
- <sup>23</sup> A. A. Kokoshin, "Strategic Nuclear and Non-Nuclear Deterrence: Priorities in the Modern Age," *Herald of the Russian Academy of Sciences* 84 (3) (2014). For a general explanation of the Russian approach to conflict, see Dave Johnson, *Russia's Conventional Precision Strike Capabilities, Regional Crises, and Nuclear Thresholds* (Livermore, Calif.: Lawrence Livermore National Laboratory Center for Global Security Research, 2018).
- <sup>24</sup> Many practitioners and analysts believe artificial intelligence may be as disruptive to stability as space and cyber, although there is little agreement on either the exact nature of the problem or possible solutions. For a discussion of the stability implications of artificial intelligence, see Christopher F. Chyba, "New Technologies & Strategic Stability," *Daedalus* 149 (2) (2020).
- <sup>25</sup> For additional details on this concept, see James Timbie, "A Way Forward," *Daedalus* 149 (2) (2020).

# Why Arms Control?

*Jon Brook Wolfsthal*

*America survived the nuclear age through a complex combination of diplomatic and military decisions, and a good deal of luck. One of the tools that proved its value in both reducing the risks of nuclear use and setting rules for the ongoing nuclear competition were negotiated, legally binding, and verified arms control agreements. Such pacts between the United States and the Soviet Union arguably prevented the nuclear arms racing from getting worse and helped both sides climb off the Cold War nuclear precipice. Several important agreements remain in place between the United States and Russia, to the benefit of both states. Arms control is under threat, however, from domestic forces in the United States and from Russian actions that range from treaty violations to the broader weaponization of risk. But arms control can and should play a useful role in reducing the risk of nuclear war and forging a new agreement between Moscow and Washington on the new rules of the nuclear road.*

Nuclear arms control agreements that effectively constrain an opponent's capabilities in exchange for some form of American constraint can benefit American security and the security of its allies. Specifically, bilateral nuclear arms control agreements between the United States and the Russian Federation and between the United States and other nuclear-weapon states, and eventually broader multilateral arrangements, have the potential to enhance American security and global stability by reducing the risks of nuclear use and avoiding the dangers associated with arms racing and arms race instability. Such agreements have in the past reduced the risks of nuclear conflict, shaped and limited areas of nuclear competition, and tailored the global landscape in ways that benefitted global and American security.

Reaching such agreements, and making them effectively verifiable, takes time, leadership, political commitment, clear goals, and political compromise: commodities currently in short supply in the United States. However, this state of affairs is far from permanent and it remains likely that a future president may pursue such negotiated agreements.

Arms control agreements are far from perfect, but the same is true of deterrence, reassurance, military planning, and, of course, armed conflict. All of these elements of American nuclear statecraft entail risks. Some arms control

agreements have produced major security wins for the United States, while others never entered into force or collapsed due to neglect or outright violations. Even in the wake of an imperfect record, arms control can be used in the future to improve U.S.-Russian nuclear stability and global security. Rejecting the idea of arms control out of hand due to past failures or ideological opposition is dangerous: it risks depriving security officials of a proven method for addressing both emerging and uncontrolled areas of military competition. Just as it would be folly to support arms control blindly without a clear strategy and well-crafted agreements, it is folly to reject arms control when it can produce real benefits.

Assessing how critical arms control agreements were in building and preserving a stable U.S.-Soviet nuclear relationship and providing a mechanism to end decades of nuclear competition is a complex challenge.<sup>1</sup> During the main period of strategic arms control between Moscow and Washington – 1969 until 2010 – nuclear arms control agreements helped reduce the scale and impact of the Cold War arms race, created confidence between the United States and the Soviet Union that neither sought to initiate a wholesale nuclear conflict, codified an end of efforts by both states to gain nuclear superiority, and created norms of behavior and methods for communication that helped avoid conflicts that could escalate to nuclear war.<sup>2</sup> In some cases, these agreements shaped the landscape, and in others, deals were used to lock in a certain dynamic.

Perhaps the main feature of Cold War arms control was that the United States and the Soviet Union were able, over the course of their negotiations, to develop confidence that they had a shared goal: to create a strategically stable condition in which neither had an incentive to use nuclear weapons first or to initiate a nuclear conflict. Each was able to gain confidence that it could retain a critical element of deterrence, a survivable second-strike retaliatory nuclear force capable of inflicting unacceptable damage on an attacking state.<sup>3</sup> This shared definition of strategic stability was an essential element for why agreements from 1972 until the mid-2000s were sustainable. The breakdown of confidence that this remains a shared U.S.-Russian goal, as much as any other single factor, has undermined the role that arms control can play and has increased the risk of nuclear use through either deliberate acts, via escalation, or through accident or miscalculation.

Today, nuclear arms control is a polarizing term in the United States, and some analysts believe that legally binding, Senate-approved arms control deals have no viable future due to perceived costs and objectionable Russian behavior.<sup>4</sup> While some experts and officials see nuclear treaties as commonsense enhancements to national security and defense policy that should be pursued despite partisan opposition, critics see nuclear deals as dangerous and an unnecessary constraint on American freedom of action in the face of growing Russian and Chinese dangers.<sup>5</sup>

To be sure, there are risks associated with arms control agreements. This is true of most features of the nuclear debate including deterrence and, ultimately,



war-fighting. Arms control deals require the United States to accept constraints on areas of possible military procurement and deployment, some of which could be militarily useful both for deterrence and in a conflict, should deterrence fail. And in such deals, there remains the ever-present risk that the partner may not fully live up to its commitments. It is this history of noncompliance that currently dominates the debate over the future of arms control with Russia. These risks, however, are acceptable if they are needed to gain a commitment from a treaty partner to in turn constrain their capabilities (symmetrically or asymmetrically).

It is, of course, of concern that Russia has violated past arms control agreements. Even when the option for legal withdrawal is available, Russia has consistently either skirted or materially violated some arms control agreements. This lack of legal compliance has a direct bearing on both American security and the viability of negotiating future agreements with Moscow. However, the United States' consistent efforts to verify the terms of agreements and its ability to respond in a timely manner to potential Russian breaches has helped prevent Russia from gaining a clear military advantage through its violations. It also is true that Russia remains in full compliance with important agreements, including the 2010 New Strategic Arms Reduction Treaty (New START). That pact provides the United States with irreplaceable information on Russian nuclear activities and developments and remains squarely in the interest of America and its allies. However, in the face of Russian violations of multiple agreements, experts and politicians wonder why any new deals should be negotiated. Such behavior raises the bar on negotiating such agreements and suggests that the United States needs to consider new steps to improve the durability of negotiated deals, including considerably extending the timelines for withdrawal and the mechanisms for addressing issues of noncompliance.

While America should expect a treaty partner to abide by its commitments, good agreements have verification provisions built on the assumption that this will not be the case. Past arms control agreements were negotiated to enable the United States to take steps to protect its interests even in the face of violations.<sup>6</sup> Thus, even when Russia has proven to be less than 100 percent reliable, the United States has been able to pursue and implement other agreements. When Russia has violated its commitments, verification has made timely detection possible, allowing the United States to take steps either to bring Russia back into compliance or to secure its objectives through other means.<sup>7</sup> Despite the bleak current outlook for the future of nuclear arms control, negotiated, verified, and legally binding treaties and other understandings continue to hold great promise in managing the new competition between Russia and the United States, who together hold more than 90 percent of the world's nuclear weapons.<sup>8</sup>

Reviewing the role that arms control has played in the past and can play in the future with the appropriate investment in political and strategic capital is also critical in thinking about the long-term effort to address the risks posed by nuclear

weapons. Nuclear-weapon states – the United States, Russia, the United Kingdom, France, and China – and indeed all states under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) remain committed to ending the arms race and to general and complete disarmament. The global discord over the extent to which the United States and Russia (and other NPT nuclear states) are fulfilling this commitment is real, even if its effects are uncertain. Negotiated, verified agreements will clearly have to be part of that broader effort as envisioned by the originators of the NPT. Thus, questions about the future of U.S.-Russian arms control, how and at what point to expand the process (quantitatively or qualitatively) to include countries with smaller nuclear arsenals (China, France, and the United Kingdom), and how finally to expand an effective nuclear constraint system to include the countries outside of the NPT that possess nuclear capabilities remain undefined and daunting. These hurdles become much higher even to contemplate if the possessors of the world's two largest nuclear arsenals, with a history of engagement and cooperation to prevent nuclear risks, can no longer muster the political will or commitment to continue the arms limitation and reduction process.

**A**rms control is not done as a favor to any one or group of countries. Agreements and constraints, both legal and political – if part of broader strategy for stability and security – can make America and its allies safer and reduce the risk of conflicts (intentional or accidental) from escalating to the nuclear level. Agreements can also close off or manage the growth of new areas of military competition through transparency and constraints, saving money and enabling investment in other military or domestic areas.

Crafting effective nuclear agreements requires a common understanding among the parties of the nature of stability and the elements that need to be controlled to maintain or enhance that state. This crucial element of the Cold War discourse between Russia and the United States is missing today, and arguably is absent even in the United States.<sup>9</sup> It is no longer a given that differing parts of the American national security establishment remain committed to the concept of mutual vulnerability or to the idea that the goal of U.S. strategic nuclear doctrine should be to create conditions in which neither the United States nor Russia (nor any other state) has an incentive to use nuclear weapons first or early in a crisis or conflict. Until America knows what it wants, arms control may only play a limited role in American security.

Given today's global security picture, however, the United States would do well to recommit itself and gain Russian commitment to a set of strategic principles and seek to develop new, broader agreements that stabilize the bilateral nuclear relationship and manage new and dangerous areas of technical competition. Steps that would reduce the risk of nuclear use would be a good starting point, but others can and should be considered as well.

Sadly, the consensus for negotiated constraints on nuclear forces has been weakened by the broader domestic polarization in the United States and a lack of strategic consensus on how to deal with the geopolitical challenges posed by Russia and China. Ideological commitment to certain programs – primarily national missile defense – at the expense of preserving global nuclear stability and the inability of the American political system to sustain support for negotiated treaties from one administration to the next have increased instability and reduced the perceived viability of arms control.<sup>10</sup> Building support for new agreements in the United States will take time, patience, and an investment of political capital, but in the end should be pursued if they enhance American security.

Fortunately, circumstances can change quickly and negotiated agreements have proven to be flexible and valuable tools, able to adapt to new circumstances and requirements. Just as the Anti-Ballistic Missile (ABM) Treaty and Intermediate-Range Nuclear Forces (INF) Treaty looked different and covered different territory than START and New START, so too can future agreements address new and even more complex areas that undermine U.S. or mutual security. The technical means for addressing certain systems, whether substrategic nuclear weapons, hypersonic missiles, or a new generation of INF range missiles, either exist or can be brought to bear quickly if an appropriate level of political support can be achieved. More exotic and complicated challenges, including those associated with doctrine, cyber capabilities, or AI-related challenges will take more time and technical advancements, but can be the focus of joint efforts by the United States and Russia that can also generate trust and mutual cooperation.

The prospect for new agreements remains viable because there is little public support for a new arms race, and concern about the risks of nuclear use are growing.<sup>11</sup> Moreover, there is little evidence that arms control issues have much if any impact on electoral politics either way, creating space for political leaders to champion arms control as a component of a new strategy for improving American security if they choose to do so. It remains true, even in the face of vocal but limited opposition from certain parts of the national security community, that arms control agreements have provided multiple advantages for the United States in the past, including direct military and national security benefits, and can provide them in the future if properly configured and implemented.

**A**rms control agreements have effectively managed or limited the introduction of new technologies that could have negatively affected strategic stability. There is no stronger case than the early agreement between the Soviet Union and the United States recognizing a relationship between offensive and defensive forces and that controls on one were impossible without controls on the other. This understanding, based on the embraced logic of deterrence and mutual vulnerability, led to the negotiation and implementation of the ABM Treaty in

1972. This agreement limited both sides to no more than two missile defense facilities (later reduced to one) with no more than one hundred interceptors.<sup>12</sup> This meant that both sides could retain a large enough nuclear force to hold the other at risk without having to overwhelm more than one hundred interceptors, reducing the incentives to massively increase the number of nuclear weapons and offensive launchers both possessed. This agreement was based on the counterintuitive concept that, to be secure, one had to leave oneself vulnerable to attack, something that created broader political challenges that eventually led to its undoing at the hands of more conservative voices in the United States.<sup>13</sup> It should also be noted that the immature state of technology at the time, which precluded the development and deployment of effective missile defense, led the United States to eliminate its only ABM site (Safeguard) and the existence of the ABM Treaty likely saved the United States from investing billions of dollars in an attempt to build a working ABM system.<sup>14</sup>

The ABM Treaty, and the decision to acknowledge mutual vulnerability with the Soviet Union, was controversial from the start. Its long-term future was questioned as early as Ronald Reagan's 1983 Star Wars speech that called for the development of global missile defenses capable of shielding the United States from nuclear attack.<sup>15</sup> Russia, which had come to rely on the deterrent model that left both countries vulnerable to retaliatory attack – thereby reducing the risk of first nuclear strike or nuclear escalation – immediately began to question whether the offense-defense relationship both states had embraced in 1972 was going to remain valid.<sup>16</sup>

The United States withdrew from the ABM Treaty during the George W. Bush administration, eliminating a major pillar that underpinned the nuclear arms reduction process.<sup>17</sup> When the ABM Treaty was in force, Washington and Moscow were able to agree on multiple nuclear control agreements including SALT (Strategic Arms Limitation Talks) I and II, which limited the growth of nuclear forces, and START I and II, which significantly reduced the number of strategic weapons and missiles capable of striking the other country. In addition, the two negotiated the 1987 INF Treaty that helped enhance crisis stability and lengthen command decision time in both NATO states and Russia, to their mutual benefit. Following the death of the ABM Treaty, the United States and Russia were able to negotiate the New START agreement that sustained a viable verification and monitoring approach, but the process of both deep reductions and mutual steps to enhance strategic stability has broken down since 2003. Of course, the current prospect for a renewed arms race is not driven entirely by America's pursuit of missile defenses: Russia's need to rely on nuclear systems to compensate for its conventional inferiority, violation of other agreements, and domestic political concerns have also played a role. Yet the breakdown in the shared model for strategic stability, embodied by the ABM Treaty as much as any other element of the bilateral relationship, has clearly contributed to the poor state of U.S.-Russian nuclear relations.

Second, and while not the preferred outcome, the decision by the United States to withdraw from the ABM Treaty by using its legal provisions and providing notice gave Russia advance warning of the move and reduced the potential shock value of what could have happened in the absence of any agreement on defenses. It remains unfortunate and dangerous that Russia has failed to exercise withdrawal provisions of multiple agreements, including the INF Treaty, and instead has violated them covertly or without explanation. While Americans would likely prefer Russia to comply with and stay in agreements that serve a common goal, much of the distrust that has grown in the United States is based on Russia's apparent willingness to violate agreements instead of exercising legal withdrawal provisions.

If one accepts the ABM Treaty model as beneficial, then there are multiple areas in which U.S.-Russian agreements could play a role in managing areas of destabilizing competition in the future. The development of national missile defenses and their ability to undermine deterrence remain a critical issue, and it is possible to see how numerical constraints on missile defense on both countries – setting strict limits on the number of interceptors with constraints on rapid growth – could restore some stability and enable further nuclear reductions. While such constraints would be highly controversial politically, such opposition could be overcome if the benefits provided by such an agreement were clear and if opposition to it were confronted directly.

Of course, arms control did not solve all problems and, in some areas, failed to adequately anticipate or address emerging dangers. One of the most glaring historical lapses was the SALT I agreement's failure to constrain the development and deployment of multiple independently targeted reentry vehicles. This meant that the treaty limits on launchers did little to constraint a massive growth in the number of nuclear weapons that could be delivered against either country. START and New START, however, constrained these systems by assigning a specific number of weapons to specific launchers and enabled deep reductions in the level of strategic nuclear weapons deployed by both states. It is possible that the New START failure to include hypersonic systems will be seen historically in the same context.

**A**rms control agreements, including both treaties that limited the number and types of weapons systems each side would have and bilateral arrangements that helped the two states determine in advance how their militaries would operate in the face of incidents and potential conflicts, have also had the important benefit of preventing conflicts or accidents from becoming nuclear flash points.

Some of these agreements, including the 1987 INF Treaty, had multiple beneficial effects on the U.S.-Russian relationship.<sup>18</sup> The INF Treaty eliminated an entire class of launchers – ground-based missiles with ranges from 500 to 5,500 kilometers – and treated all such missiles as potential nuclear-delivery vehicles. In

adopting the agreement, the two sides made clear their desire to reduce the pressures on leaders of both sides to make nuclear launch decisions too quickly, which could lead to the early and possibly accidental use of nuclear weapons.<sup>19</sup> With missiles in Europe having very short flight times to Moscow and Russian missiles having very short flight times to NATO capitals, INF systems posed a unique challenge to stability in Europe. If a small number of nuclear weapons could be delivered against key targets in Moscow with little or no warning, Russian commanders would have to be ready to launch nuclear responses with little or no warning. This raised the risk that Russian leaders – possibly through a misinterpretation, as was the case in 1983 with the Able Archer event – might seek to preempt a decapitating first strike by launching its own nuclear weapons first.

The INF Treaty was also an important harbinger of more effective arms control agreements in that it was the first to allow for on-site inspections.<sup>20</sup> By accepting the presence of U.S. inspectors on Russian territory and vice versa, the two states were intentionally moving away from the idea that opacity and hiding capabilities were sources of strength and stability, and embraced the idea – with obvious limits – that transparency and access provided a more stable basis for deterrence and a steady bilateral relationship. The broadening of these transparency measures, including steps that enabled U.S. monitoring at key Russian missile production facilities and military bases, would form the basis for the intricate and advanced inspection procedures implemented in the 1991 START and the 2010 New START agreements.

While not formal arms control agreements per se, there are other negotiated commitments that set norms and expectations of behavior that have served to enhance crisis stability in certain regions. Such arrangements have reinforced the view that both Washington and Moscow wanted to set limits on the extent of their military and geostrategic competition to avoid or at least reduce the risk that lower-level incidents or interactions might quickly escalate and go nuclear. The 1972 U.S.-Soviet Incidents at Sea Agreement and the 1963 Memorandum of Understanding Regarding the Establishment of a Direct Communications Line, for example, have proven their value.<sup>21</sup> While direct communication is now an afterthought, in a crisis, secure communication links may prove critical, and in the face of stepped-up military exercises by both NATO and Russia, the Sea Agreement has proved its worth and helped to manage interactions. There appears to be room to expand such deals to include interactions between aircraft and naval forces, air-to-air interactions, and even land-based incidents. Russia has recently negotiated deals with Baltic states on civilian air traffic and discussed conflict resolution and avoidance agreements with other NATO states.

**O**ne of the most important benefits of arms control agreements, and a pre-eminent one today, is the transparency and predictability they can provide for defense and security planners. It is one thing to guess at how

many missiles and nuclear weapons your adversary might have that are capable of striking you or your allies, and it is another to have high confidence that the numbers fit within a specific range as supported by direct evidence and inspections that can both detect and deter violations.<sup>22</sup> The Cold War's early years and even some during the early days of arms control agreements are replete with examples in which the lack of insight into Moscow's nuclear capabilities led to worst-case planning that, in turn, led the United States to build more capabilities than were needed, driving Moscow to do the same in a cycle of arms racing and technical escalation.<sup>23</sup> The bomber gap, the missile gap, and the famous Team B exercise that overestimated Russia's nuclear capabilities and led the United States to direct resources into areas that did not enhance deterrence or stability are clear examples of this dynamic.<sup>24</sup> Having confidence in the size of an enemy's possible forces allows you to more effectively and sustainably plan for your own nuclear forces, balancing investments in nuclear and other competing defense and non-defense priorities.

The risk that the last remaining strategic arms control agreement – New START – could soon expire illustrates this concern. As less information is available on Russia's nuclear capabilities, it is easy to imagine how more militaristic or fearful strategists in Washington could pressure for expanding America's arsenal. Allegations of secret or undocumented programs and unverified numbers of weapons could become the basis for force planning in the United States. U.S. actions could again be seen in Moscow as cause for new actions of their own, fueled by their own lack of insight into U.S. force structure, as the arms race between Moscow and Washington quickens its pace.

Currently, New START provides a remarkable level of transparency and data exchanges, including through on-site verification in both Russia and the United States.<sup>25</sup> This feature, in the face of growing tension and instability in the U.S.-Russian relationship, is a critical element in U.S. national security decision-making. New START's possible expiration or demise would leave the two largest nuclear powers with no active and intrusive inspection or information exchange provisions to cover their strategic nuclear weapons, and could result in a large-scale expansion of the number of nuclear weapons each might determine it needs to maintain deterrence. As other areas of military competition expand, it seems essential that American intelligence and military officials have some confidence in their ability to determine the size and scope of Russia's strategic nuclear capabilities and to maintain some access to those systems through treaty inspections.

There are multiple areas of technological development that may likely have significant impacts on nuclear deterrence and stability.<sup>26</sup> It is worth considering how the lack of agreements covering such weapons and capabilities, and therefore the lack of transparency and predictability, are already affecting the strategic landscape. There has been some consideration over the past decade of whether

hyperglide missiles are ripe for limits or constraints, and it is interesting in retrospect how the tacit decision by Russia and the United States not to include hyperglide missiles in the New START agreement opened up an area of competition now cited by voices concerned about Russian military actions as a growing threat to the United States and its allies. This is one future area in which numerical limits on such systems could, if analyzed in the broader context of nuclear and related systems, be subject to future political or legal agreement bilaterally or more broadly.

A clear case for sustaining New START could be made on this basis alone. The United States is only at the starting point in modernizing its strategic nuclear forces, whereas Russia is nearing completion of its modernization cycle (something we know in detail because of the transparency provided by New START verification). Given the cost and schedule uncertainties that come with America's nuclear efforts, it makes great sense to maintain constraints and insight into Russia's nuclear systems while the U.S. modernization program advances. Lack of such controls combined with significant cost increases or schedule delays could put the United States in a major numerical mismatch with Russia, leading it to have to take other steps – such as uploading its forces – in a way that could increase uncertainty and instability with Russia.

Perhaps few images inspire as much derision as the idea of large U.S. and Soviet negotiating teams in Geneva or Vienna spending weeks at a time reading and responding to long, laborious, and frankly boring plenary and working-group statements. Decades of sitting across tables in ornate rooms hardly seems the setting for negotiating dramatic agreements that could decide the fate of hundreds of millions of people. And yet the hard, slow, and detailed work of negotiating and implementing arms control agreements provides one of the more important elements of the benefits that come from arms control treaties. Engagement, communication, and the willingness to work seriously toward a common solution have salutatory benefits that must not be overlooked.

It has quickly become apparent over the past half-century of engagement when both sides are serious about reaching agreements, and when they are not. The composition of delegations, the willingness to discuss real, pressing, and substantive issues as opposed to airing grievances, and seeking unrealistic solutions or compensation versus actually engaging on issues of mutual concern have all been indicators as to whether American and Russian officials and leaders are serious about using arms control to manage the strategic competition.

This motivated good faith is sometimes the case, and sometimes not. Recent negotiations provide examples of each.

Among the discouraging cases, it was clear from 2013 on that Russia was not treating U.S. concerns about Russia's development and testing of the 9M729 land-based



cruise missile in a way that enhanced confidence about Russia's intention to honor the INF agreement. The 9M729 was, according to U.S. sources, tested in a way that violated the INF Treaty, and Russia has now deployed several battalions of 9M729 land-based cruise missiles that Washington and NATO believe have a range beyond the INF limit of 500 kilometers. Russia's refusal to acknowledge the existence of the missile and later to deny and refuse steps to not deploy and even eliminate the offending system fed into concern within both the Obama and Trump administrations that Russia had no desire to preserve the INF Treaty. Of course, Russia likely has similar views about Washington's refusal to engage constructively on issues of concern raised by Russia, including the ability of the Mk-41 missile defense launchers to possibly hold and launch offensive cruise missiles. These cases strengthen the view in both countries that neither side remained fully committed to the benefits derived from the INF Treaty's ban on land-based medium-range missiles.

**T**here are multiple examples, however, in which the implementation bodies set up to aid in fully implementing agreements or resolving disputes have proven their worth and reinforced the perceived value of and commitment to arms control treaties. The ABM dispute over the Krasnoyarsk radar is one example, and ongoing discussion between the United States and Russia over the method by which the United States is converting nuclear-associated launchers to a non-nuclear role is another. The extent to which Washington seriously engages with Russia's concerns and how visible this engagement is to Russia will be important factors in preserving what is left of the partnership on basic predictability and transparency associated with New START.

There are several major areas that need to be addressed for arms control to assume a more central role in addressing and improving American security. First, the United States needs to have a clear concept of what situation it would consider stable and what mix of nuclear and non-nuclear systems it would need in the face of Russian activities to maintain deterrence and stability. That will require a clear-eyed assessment about what systems Russia has and is developing, and what specific capabilities pose new and unmanageable threats to the United States and its allies. For too long this conversation has been left to civilian and military officials to determine. It needs to include not only strategic thinkers from other parts of the U.S. government, but also from Congress, foreign policy experts, and the broader informed public. Developing and maintaining a new consensus on the principles of strategic and crisis stability is required to pursue them either through military or diplomatic means.

Second, the United States and Russia need to pursue sustained, high-level, and interagency engagement on a broad set of issues related to both nuclear and broader strategic stability. The lack of engagement at the presidential and leadership levels of the Department of State, Department of Defense, and the intelligence

communities has both created a major gap in our understanding of and confidence in Russia's strategic perspective and left us to guess at Russia's plans and intentions. In fact, the United States and Russia are now in the midst of the longest gap in either arms control negotiations or strategic stability discussions since before the Cuban Missile Crisis. This dangerous state of affairs cannot be allowed to continue. Talks do not in and of themselves offer the promise of new agreements, or even agreement on the current problems. But lack of engagement does guarantee that the state of affairs will maintain, if not worsen.

Third, the United States and Russia need to broaden the scope of possible negotiations beyond strategic nuclear weapons. While extending New START or finding a viable replacement that can replicate the level of confidence we have in the overall size and nature of Russia's strategic nuclear capabilities seems both commonsense and essential, it will likely prove impossible to pursue deeper reductions and more qualitative constraints through arms control unless the thorny issues of the offense-defense relationship and the impacts of advanced conventional, new intermediate-range, and other new military technologies are addressed in some way. Not all of these issues need to be included in one agreement, and not all need to be subject to binding, verified arms control. Some features could be pursued via political commitments and restraints, and other as unilateral declarations. It is hard to see how the United States and Russia can find common ground for anything other than sustaining the limited scope of strategic arms control agreements unless they begin to address sources of instability being pursued by both states. If so engaged, a wider range of agreements, understandings, and constraints could become viable.

Last, even if some semblance of a consensus can be developed in the United States, and if that domestic platform can be used to negotiate new broader deals with Russia, it appears that new norms within arms control agreements need to be considered and addressed to make them more durable. As evidenced by President Trump's readiness to withdraw from agreements, even those approved by the Senate and ratified by successors, as well as by multiple examples of Russia's violation of agreements, both Russia and the United States need to consider ways their commitments to treaties can be made more durable and their reversal less rapidly achieved. One idea would be to increase the declared withdrawal time to more than the three to six months included in current treaties to one year or even multiple years. The length of time it takes to design, build, and deploy new missile and delivery systems would not seem to preclude this as a starting point for negotiations. In addition, while the Trump administration has talked about wanting to make treaties more "enforceable" but has yet to propose any substance behind this idea, it behooves those who support the pursuit of new agreements to consider whether there can be certain terms of punishment built into an agreement, including *a priori* determination of economic or political sanctions or other

consequences for proven violations. Of course, this might require submitting issues of treaty compliance to outside arbiters, but that may also have some positive implications in certain cases that should be openly discussed by the parties.

Yogi Berra once said that “predictions are always hard, especially about the future.” This has always been the case with nuclear weapons. By possessing the means of our own and the world’s destruction, the future is always uncertain and the best we can accomplish is to reduce the scope of uncertainty and increase our ability to manage crises when they inevitably occur. Using arms control agreements – in their many forces and for the many potential benefits they bring – to our advantage must remain a viable part of our nuclear strategy. Without effective agreements, the costs of our nuclear complex as well as risks of conflict and the global danger of nuclear destruction only rise. That sobering thought should inform decisions by current and future leaders about how best to position the United States and Russia to enable arms control to play a continued role in our joint survival.

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#### ABOUT THE AUTHOR

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#### ENDNOTES

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# What History Can Teach

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*Most analyses of arms control during the Cold War focus on its role in maintaining strategic stability between the United States and the Soviet Union. However, history shows that the superpowers' search for strategic stability is insufficient to explain the roots and course of negotiations. This essay argues that arms control was used as one tool in a broader strategy of war prevention, designed to contain a series of challenges to U.S. and Soviet dominance of the international system that both sides worried could upset bipolarity and increase the chances of conflict between them. At the same time, U.S. policy-makers balanced this joint superpower interest with Washington's extended deterrent commitment to its allies, which ultimately upheld the integrity of the system as a whole. The essay concludes that today's leaders should integrate arms control into a more comprehensive strategy of political accommodation fit for twenty-first-century conditions.*

In the winter of 1985, Thomas Schelling was unhappy. Surveying the state of arms control negotiations in an article published in *Foreign Affairs*, Schelling argued that the enterprise had “gone off the tracks” since its heyday in the early 1970s, diverging from his and many other arms control theorists’ understanding of its basic aim: to ensure strategic stability between the superpowers. The 1972 Interim Agreement on Strategic Offensive Arms and the Anti-Ballistic Missile (ABM) Treaty had fit well with Schelling’s vision of arms control: the former froze both sides at approximate parity in intercontinental ballistic missile (ICBM) and submarine-launched ballistic missile (SLBM) launchers, making a disarming first strike extremely difficult, if not impossible; the latter banned nationwide missile defense systems, meaning that neither side could build an effective defense of its homeland, leaving both the United States and the Soviet Union open to a devastating retaliatory second strike if either sought to attack the other. Fitting with much existing arms control theory and administration rhetoric in support of the SALT I (Strategic Arms Limitations Talks) agreements, this strategic stability based on both sides’ vulnerability to a massive retaliatory attack became seen as the lodestar of superpower talks, establishing itself as a central point of contention in an increasingly polarized debate between supporters and opponents of arms control over subsequent decades.<sup>1</sup>

Yet since 1972, the effort to limit arms had not lived up to Schelling's early hopes. Arms control had gone off the rails, according to the strategist, because it had neglected the greatest contemporary threat to strategic stability: the race in technology. While Washington and Moscow argued over numbers of weapons, they had failed to tackle destabilizing developments such as "warheads per target point, readiness, speed of delivery, accuracy or recallability after launch," which had the potential to endanger Schelling's vision by making a disarming first strike theoretically more feasible.<sup>2</sup> As several scholars have recently reminded us, this technological arms race between Washington and Moscow continued throughout the 1970s and the 1980s.<sup>3</sup> If strategic stability was the fundamental aim of talks – as both advocates and critics of the process generally assumed – then this was a strange outcome indeed.

Recent scholarship can help unravel this mystery. Rather than exclusively pursuing strategic stability, research shows that during the 1960s and 1970s, U.S. leaders used arms control as one tool in the pursuit of a broader strategy to contain a series of international and domestic challenges they believed could upset the global balance of power and increase the risk of war. The first challenge was a growing crisis over the future of Germany in a divided Europe. The superpower standoffs over the status of Berlin in the late 1950s and early 1960s, culminating in the Cuban missile crisis of 1962, impelled policy-makers to use arms control to manage the cockpit of the Cold War. The second challenge related to what Lyndon B. Johnson's National Security Advisor Walt W. Rostow termed "the diffusion of power" away from the industrialized North toward the decolonizing Global South.<sup>4</sup> This diffusion included nuclear technology, which had the potential to supercharge states' quests for political independence by giving them the capability to counterbalance the existing nuclear powers with their own arsenals, while increasing the risk that regional conflicts could end in nuclear conflagration. The third challenge was the growing restiveness throughout the Eastern and Western Blocs during the late 1960s with the costs of prosecuting the Cold War, a trend that historian Michael Cotey Morgan has characterized as two "parallel crises of legitimacy" that undermined both superpowers' standing at home and within their respective spheres of influence.<sup>5</sup> As a result of sustained diplomatic engagement, U.S. policy-makers gradually realized that Moscow shared many of these anxieties regarding the future of world politics, providing the foundation for cooperation. The 1963 Limited Test Ban Treaty (LTBT), the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT), and the 1972 SALT I agreements governing strategic arms were in large part superpower responses designed to contain these three challenges, constituting the foundation of today's arms control regime. As international relations scholar Hedley Bull noted at the time, these accords limited the chances of nuclear war in a way that served the superpowers' joint interest in maintaining "the existing distribution of power" within the international system.<sup>6</sup>

Yet, in the words of historian John D. Maurer, “arms control is not always a cooperative enterprise” – indeed it could not be. Successive U.S. administrations pursued these negotiations with a keen eye to how any resulting treaties would affect their allies, balancing U.S.-Soviet joint interests with the need to maintain the integrity of U.S. security guarantees. Reinforcement of the credibility of the U.S. commitment to come to its allies’ defense often required military-technical innovations in the U.S. arsenal that ran counter to the strategic stability prescribed by Schelling.<sup>7</sup> By reassuring foreign governments and domestic critics that the United States’ commitments still held in an era of negotiation, however, these improvements to the U.S. nuclear arsenal had the effect of limiting allied incentives to pursue their own nuclear forces, stabilizing the nonproliferation elements of the nuclear order and hence the balance of power that the treaties were fundamentally designed to preserve. The United States thereby managed to retain the credibility of its pledge to use nuclear weapons in defense of its allies, while at the same time reducing the chances that it would have to do so.

This strategy was not foreordained and looks far clearer in hindsight than it did at the time. It required incremental and committed diplomacy, growing slowly out of what historian Marc Trachtenberg has described as “a web of understandings,” not only between the two superpowers, but also their allies, and at times, other states within the system.<sup>8</sup> If the United States wishes to adapt this regime for a new multipolar order – and given the relative success of the first iteration, it should do so – then it must continue to engage in a patient and sustained dialogue with both old and new rivals, as well as allies and the nonaligned. This will enable the United States to discover the emerging points of crisis, how those interact with the military postures of the states involved, and the extent to which arms control can help mediate the delicate balance between ensuring the joint great-power interest in containing destabilizing threats, while at the same time ensuring that the United States remains faithful to its security commitments. In this way, arms control can act as one tool in a broader political process of accommodation that will help us to survive this century.<sup>9</sup>

**F**rom the late 1950s to the early 1960s, the world’s attention focused increasingly on the developing superpower confrontation over Berlin. Deep within East Germany, yet divided between American, British, French, and Soviet occupying powers, the status of Berlin was an unresolved legacy of World War II. Soviet Premier Nikita Khrushchev’s 1958 and 1961 ultimatums demanding that the Western powers withdraw from Berlin were widely interpreted as an attempt to test the will of the United States to defend this outpost of capitalism. However, Trachtenberg has shown how the Berlin crises in fact stemmed from a toxic mix of Soviet anxieties regarding the precarious division of Germany, unratified by treaty, and the possibility that a future nuclear-armed Western Federal Republic



(FRG) might press for revision of this tenuous status quo. Moscow's pressure on West Berlin, Trachtenberg argues, was a form of oblique Soviet signaling regarding the danger of a revisionist, nuclear FRG – a signal that their Western interlocutors received and understood. A West German move toward an independent nuclear force, John F. Kennedy's Secretary of State Dean Rusk observed, "might be considered *casus belli* by the Soviets."<sup>10</sup>

With this in mind, the easiest way to resolve the crisis would be to pressure the FRG to forswear nuclear weapons in exchange for security guarantees. Whether Bonn was genuinely interested in pursuing the nuclear option is still hotly contested by scholars, but the FRG was not willing to unilaterally give up the nuclear option, a course that West German Chancellor Konrad Adenauer worried would be the first step toward superpower-enforced neutrality. By mid-1961, President Kennedy increasingly considered an agreement with the Soviets that would trade Soviet guarantees of Western rights in Berlin for Bonn's renunciation of any nuclear ambitions. However, the administration remained unwilling to confront the FRG directly on the nuclear issue given the fundamental West German security interests involved.<sup>11</sup>

Only in the aftermath of the Cuban missile crisis was Kennedy able to face this issue. The key was the change in the Soviet position. Khrushchev's failure in Cuba had persuaded him that a policy of confrontation had simply exhausted itself. Instead, the two powers attempted to come to an agreement that would place a lid on the German nuclear question without isolating Bonn in a way that would lead it to act unpredictably. The Limited Test Ban Treaty of August 1963, prohibiting atmospheric nuclear testing and thus making any non-nuclear signatory's efforts to develop a deterrent far more difficult, was the answer. Exchanges between Kennedy administration officials and the Soviets over the LTBT established an implicit linkage: West Germany would have less incentive to nuclearize if West Berlin were left untouched; similarly, Bonn would be wise to remain non-nuclear if it wished to protect Berlin. Thus, the Test Ban, according to Trachtenberg, "had come to represent a whole web of understandings that lay just below the surface."<sup>12</sup>

Bonn consented to this arrangement for a number of reasons. For Trachtenberg, a combination of the FRG's dependence on the United States and developments in West German domestic politics eventually compelled Adenauer to accept the LTBT. Meanwhile, the United States deepened its public commitment to the FRG's security by agreeing, in Trachtenberg's words, "to maintain a sizeable force in Germany on a more or less permanent basis." This commitment embedded West Germany's forswearing of nuclear weapons even more profoundly: any steps toward an independent deterrent would place this American pledge in jeopardy. Thus, the U.S. guarantee served both superpowers' aim of keeping West Germany non-nuclear, while ensuring Washington's interest that the FRG remain firmly embedded within NATO.<sup>13</sup>

However, it is clear that a continued U.S. commitment to a nuclear edge over the Soviet Union was also a key part of the American package. As the recipient of briefings on U.S. war plans, Kennedy increasingly recognized the declining utility of American nuclear superiority, such that at the time of the Test Ban's signature, he realized that a first strike on the Soviet Union could not meaningfully limit the damage the Soviet Union could inflict on the United States in retaliation.<sup>14</sup> Yet despite this, nuclear superiority remained a key element of the American rhetorical armory regarding the FRG, as well as at home. "The U.S. had succeeded in having its way on Cuba, because it had superior conventional and nuclear forces," Kennedy told Adenauer in November 1962. It was therefore necessary, the president argued, "to strengthen both Western conventional and nuclear forces, both in general and particularly in regard to Berlin."<sup>15</sup> These arguments became even more important as the Kennedy administration pushed the case for the LTBT. Secretary of Defense Robert S. McNamara argued to the Senate that, far from weakening American nuclear superiority, the Test Ban could in fact increase it because Washington was more proficient in the underground testing permitted under the treaty. McNamara privately reassured Adenauer that the Test Ban had only been possible because of "the increased military power of the West" and that both the United States and the FRG should "continue to expand their forces" under its aegis.<sup>16</sup>

This commitment to some form of nuclear edge over the Soviets, even as Moscow drew to effective parity in strategic launchers, would have long-term consequences for Washington as it sought to push forward with arms control. The agreements themselves would help manage central issues of dispute, stabilize superpower relations, and thereby reduce the chances of war. However, successive administrations would continue to expand and then modernize their nuclear forces. Domestically, further advances in the U.S. nuclear posture convinced some skeptical hawks that the United States would still be able to defend its interests under the treaties; internationally, it was designed to reassure nervous allies that Washington still had the capability and will to come to their defense. This necessity of the broader political settlement introduced just the kind of technology-driven instabilities feared by Schelling.<sup>17</sup>

**T**he case of West Germany highlighted another issue: the spread of nuclear technology beyond the reach of the superpowers. While the FRG had been contained somewhat by the LTBT, nuclear proliferation remained a cause of increasing superpower anxiety. McNamara estimated that, in addition to West Germany, as many as seven countries could go nuclear in the near term: the People's Republic of China, India, Japan, Australia, South Africa, Sweden, and Israel.<sup>18</sup> The prospect of further nuclear proliferation held the potential to supercharge the other major geopolitical development of the postwar years, besides the Cold War: the quest of former colonies for political independence. As historian Francis

J. Gavin has argued, U.S. policy-makers had been opponents of proliferation since the dawn of the nuclear age because of its “power-equalizing effects,” which could help states resist pressure from Washington and increase the risk of a premeditated or accidental nuclear conflagration.<sup>19</sup> A proliferated world would present American power with dangerous choices. U.S. intervention in a regional nuclear confrontation involving a Soviet ally could lead to a chain reaction ending in a U.S.-Soviet war. Yet American refusal to involve itself in a regional nuclear crisis, Director of the Arms Control and Disarmament Agency John Foster worried, could lead to “a renunciation of [U.S.] commitments and involvement all over the world.”<sup>20</sup>

The Chinese nuclear test in October 1964 forced policy-makers to fully come to grips with this reality. Kennedy’s National Security Advisor McGeorge Bundy had described a Chinese bomb as “the greatest single threat to the status quo over the next few years.” Yet Washington struggled to deter Beijing from pursuing nuclear weapons and rejected the possibility of a preventive strike.<sup>21</sup> The PRC’s test proved that a country that the CIA considered “near the margin of bare subsistence” could produce the ultimate weapon, setting a precedent for others.<sup>22</sup> A committee chaired by former Deputy Secretary of Defense Roswell Gilpatric feared that without a change in course, Washington’s influence would wane in Asia and the Middle East as regional powers such as India and the United Arab Republic went nuclear, ultimately weakening U.S. sway over Europe. If states in the Global South developed nuclear weapons, the committee concluded, it would be “unrealistic to hope that Germany and other European countries” would not do the same, despite the implicit bargain of the LTBT. The spread of nuclear weapons thus not only represented a major threat to international security, but also a menace to the United States’ global military and political reach.<sup>23</sup> Moscow shared these anxieties. “As the world’s other superpower,” historian Hal Brands has argued, “the Soviet Union would find its influence diminished and security challenged by proliferation no less than would the United States.” This indeed seemed to be the case as the Kremlin began to indicate through both public and private channels that it was also concerned with the spread of nuclear weapons.<sup>24</sup>

This joint superpower interest in nonproliferation had to be reconciled with U.S. security commitments. President Lyndon B. Johnson was cautious about abandoning plans for a multilateral force (MLF) – a fleet of missile-armed ships with multinational crews, controlled by a council of participating states – which was designed to balance West Germany’s demand for a role in NATO’s nuclear operations with the U.S. desire to maintain a veto over use. Only further evidence that India was moving toward development of a nuclear weapon in the wake of continued Chinese testing finally convinced both superpowers to compromise in the second half of 1966. The Kremlin consented to the U.S. pursuit of a “software solution” for NATO involving permanent West German membership of a consultative mechanism on Alliance nuclear issues, the Nuclear Planning Group, and

permitted the MLF to die quietly rather than be disavowed publicly as a precondition of a nonproliferation agreement. At the same time, the United States prosecuted a policy that international security scholar Daniel Khalessi has described as “strategic ambiguity” with regard to existing NATO nuclear sharing – under which allied personnel were trained to deliver U.S. manufactured and controlled nuclear weapons in wartime – loosening the language of Articles I and II of the NPT in a way that did not prohibit this arrangement. In late 1966, the Soviet Union stopped pushing the United States for more specific wording that would explicitly ban NATO nuclear sharing. As such, both sides compromised in order to manage their joint fear of a proliferated world. With these obstacles removed, the path to the 1968 Non-Proliferation Treaty became easier.<sup>25</sup>

Considerable challenges remained, not least persuading most of the world’s states to sign a treaty to forswear nuclear weapons. A key element of this campaign was supposedly the so-called bargain, whereby states would give up nuclear arms in exchange for peaceful nuclear technology and a commitment to disarmament by the nuclear powers. Yet research by political scientist Dane Swango has shown that linkage between adherence to the treaty and peaceful nuclear cooperation was not as strong as commonly assumed: the NPT allowed states to continue to work on civil nuclear projects with nonsignatories, while Washington was wary of extending more help to NPT parties or cutting assistance to significant hold-outs, such as Brazil.<sup>26</sup> Similarly, as international security scholar Matthew Harries has noted, the commitment to disarmament was highly qualified. Crucially, the final treaty did not mandate specific arms-reduction steps. Instead, Article VI of the NPT committed all dates to merely pursue – rather than conclude – “effective measures relating to” disarmament. Such language reflected “the core reality” that, “for a decisive number of [non-nuclear] states, those aspirations [to disarmament] were not worth sacrificing the mutual security benefit that an NPT would provide.” Instead, the language was designed “to offset the psychological effect of accepting ‘second-class’ status” by being able to show that the treaty represented “a positive policy of peace, rather than a passive acceptance of inferiority.” At the same time, through provisions for a review conference and language contextualizing it within a broader disarmament push, the NPT established a political process that “would allow non-nuclear-weapon states to continue to make the case for [a disarmed] world.” It was this compromise that allowed the central element of the nonproliferation regime to come into being.<sup>27</sup>

Containing the diffusion of power was not entirely successful, nor was it cost-free. The NPT entered into force in March 1970, but several important regional powers refused to sign, most notably India – on which much superpower attention had centered – but also Pakistan, Brazil, Israel, and South Africa. Of the five recognized nuclear states, France and China did not endorse it for decades. The FRG did not ratify it until 1975. This was indicative of a broader distrust. Despite

their acquiescence, many West and East European governments remained wary of the way the two superpowers had cooperated to preserve their dominance of global politics at the expense of their allies' military options. While states varied in their responses to the NPT, both signatories and nonsignatories worried that it presaged a new superpower condominium and looked for ways to maintain their room for political maneuver.<sup>28</sup>

**T**he increasing restiveness of the superpowers' close allies formed one half of what Morgan has termed the "parallel crises of legitimacy" that afflicted both the East and the West in the later 1960s. Both the United States and the Soviet Union had to deal with newly independent foreign policies from allies that had previously been relatively quiescent. While France had initiated an independent course earlier in the decade, from 1966 as West German foreign minister and 1969 as chancellor, Willy Brandt pursued a strategy designed to secure "peace in the fullest sense of the word" through human contacts across the Iron Curtain, a posture that U.S. policy-makers feared presaged a greater shift to independence than was in fact the case. This process was paralleled in Eastern Europe within stricter limits. In August 1968, Moscow moved decisively to crush Czechoslovakia's bid for greater independence during the Prague Spring, but East Germany, Poland, and Romania all became more assertive in pressing their economic and political autonomy within the Eastern Bloc.<sup>29</sup>

As the 1960s progressed, the perception that Washington and Moscow had reached some approximate balance of terror diminished fears of a superpower clash, opening space for new policies on the part of West European states and raising questions about how to move beyond the existing stalemate. This new situation exacerbated military questions for Washington. During the early 1960s, the United States had relied on its significant nuclear superiority over the Soviet Union to project an image of confidence in the crises over Cuba and Berlin, lending credibility to U.S. pledges to come to the defense of NATO. However, by the end of the decade, the Soviet Union was engaged in a huge strategic nuclear buildup, expanding its arsenal of ICBMs rapidly in an effort to reach nuclear parity.<sup>30</sup> By 1967, U.S. diplomats worried that the Soviet buildup would "lead many in Europe to fresh questioning of whether the U.S. would go to war on Europe's behalf," with the erosion of Washington's "ability to limit damage" to itself in a nuclear war further accelerating "the erosion of the trans-Atlantic relationship which is already in train." American policy-makers thought this could ultimately lead West European states to safeguard their security through independent accommodation with Moscow, as some worried Brandt was doing, or by developing an independent nuclear capability in the French manner.<sup>31</sup>

The new president shared these anxieties regarding the credibility of America's security commitments. Richard Nixon agreed that under conditions of

strategic nuclear parity, the U.S. policy of “flexible response” to defend Western Europe, carried over from the Kennedy-Johnson era, was “baloney.” Johnson had left Nixon with the option of talks with the Soviet Union on the limitation of strategic armaments. Moscow had rejected Johnson’s overtures for substantive discussions until late in his term, but now it became increasingly interested in negotiations in order, according to historian Vladislav Zubok, “to convert the growing power of the Soviet Union into the coin of international diplomacy and prestige.” However, Nixon wanted to ensure that the United States had as many programs as possible underway to bargain with. The Soviets had “closed the gap” and “continue to increase” in strategic arms, Nixon wrote to National Security Advisor Henry Kissinger, and “they want to talk. . . . We must see that the gap is not widened on the other side.” Nixon wanted Congress to authorize funds for an anti-Soviet missile defense system so the United States would have sufficient leverage to secure a halt to the Soviet offensive buildup. Strategic arms talks could thereby prevent the nuclear balance from tipping further against Washington, undermining its commitment to Western Europe, and deepening the crisis of U.S. legitimacy within the transatlantic community.<sup>32</sup>

Yet it was the domestic crisis of legitimacy that had the most direct impact on Nixon’s approach to arms control. Upheaval within the United States stemming from U.S. military involvement in Southeast Asia had already brought down one president, and during the 1968 presidential election Nixon had pledged to bring “an honorable end to the war in Vietnam.” Initially, Nixon and Kissinger planned to use the possibility of nuclear talks to entice Moscow into pressuring North Vietnam into coming to terms. As Nixon’s first year progressed, however, it became increasingly clear that this anti-Vietnam backlash was growing into a revolt against the militarized containment of communism. One of the early targets of this backlash was Nixon’s ABM program, which became the focus of intense debate in the Senate. Criticized for its expense and technical infeasibility, funding for the system passed the upper chamber in August 1969 by a margin of one. Designed to fortify Nixon’s hand at the upcoming strategic arms limitation talks, ABM became emblematic of how difficult it would be to launch new nuclear programs to offset future Soviet forces if Moscow did not sign a strategic arms agreement.<sup>33</sup>

In these unpropitious circumstances, SALT stalled, with the Soviets advocating for a treaty limiting technologically advanced U.S. ABM systems, but pressing for concessions on offensive forces that were unacceptable to Washington. By late 1970, Nixon’s strategy was in danger of failure. It was far easier to identify the Vietnam War as the root of Washington’s travails than to find a way out of it, short of capitulation. Pressure on Hanoi and Moscow, including conventional bombing, operations in Cambodia, and a secret alert of U.S. nuclear forces, had produced little.<sup>34</sup> Nor was there much to report on the administration’s attempts to reach out to the People’s Republic of China, with progress frozen until the spring of 1971.

Needing a breakthrough on at least one issue, the White House accelerated talks on strategic arms as a way to show that Nixon's strategy of peace was delivering tangible results. The framework agreement of May 20, 1971, was the outcome: Washington and Moscow would sign a treaty on ABM systems – the area of greatest Soviet concern – combined with “certain measures” regarding strategic offensive arms. This resulted in a permanent ABM Treaty, limiting both sides to two ground-based defensive missile sites each, and a five-year Interim Agreement on Strategic Offensive Arms that froze U.S. and Soviet land-based ICBM launchers at 1,056 and 1,618, with SLBM launchers capped at 656 and 740, respectively, or 710 and 950, all on modern submarines, if older SLBM and ICBM launchers were dismantled.<sup>35</sup>

Nixon signed the SALT I agreements with great fanfare at the Moscow Summit of May 1972, yet was criticized by former supporters, such as Washington Senator Henry M. Jackson, who believed he had given away too much. Nixon privately shared many of his critics' doubts, but given congressional opposition to new programs in the face of the Soviet buildup, it was the best deal available. The president lamented the American public's loss of will, which he saw as endangering Washington's extended deterrent guarantee. “The real question is whether the Americans give a damn anymore,” Nixon reflected a few weeks before he signed SALT I. “No president could risk New York to save Tel Aviv or Bonn.” Despite his upcoming meeting with Brezhnev at which he would conclude the first U.S.-Soviet strategic arms agreements, Nixon believed that ultimately, it was only U.S. “strength” that prevented “the world” from “becoming entirely communist.”<sup>36</sup>

While he found the post-Vietnam backlash against militarized containment distressing, Nixon understood that the “peace issue,” as he called it, was an unavoidable feature of the domestic political landscape. Gearing up for his reelection campaign, on his return from Moscow, Nixon argued that the agreements strengthened peace for both sides by limiting the arms race, adapting Schelling's arguments for a broader audience. To a joint session of Congress, Nixon claimed that the accords “enhanced the security of both nations” by limiting an arms race that was both “wasteful and dangerous.” Adopting the rhetoric of the arms controllers, Nixon argued that the agreements “reduce[d] the level of fear by reducing the causes of fear, for our two peoples and for all peoples in the world.”<sup>37</sup> The situation in Central Europe reinforced the sense that the world was indeed entering a new era. Instead of using nuclear parity to reopen the question of Berlin, Moscow opted for diplomacy, signing the Four Power Agreement regulating the situation in Berlin and the Treaty of Moscow on Germany's postwar borders. Just as U.S. quantitative superiority in strategic launchers receded into the past, so seemingly did one of its primary justifications: to maintain the status quo in Central Europe through the credible threat of force.<sup>38</sup>

Yet at the same time, as the president publicly advocated for arms control based on stability, the Nixon administration continued to press ahead in areas

unconstrained by SALT I. The United States had conceded a Soviet margin in numbers of strategic offensive missile launchers, but the administration argued that Washington would still retain a lead in warheads, with around 3,200 multiple independently targetable reentry vehicles (MIRVs) after the Interim Agreement expired in 1977. The United States also pressed ahead with developmental studies for a next-generation MX ICBM, the new Trident submarine-launched ballistic missile, and the B-1 bomber. In part, this was to build support for the agreements among Nixon's traditional conservative base, but also to secure the approval of the Department of Defense. Secretary of Defense Melvin R. Laird was adamant that such improvements were essential for the United States to maintain the credibility of its security commitments. As Maurer has recently argued, through this combination of arms control and new programs, the Nixon administration was able to defuse much of the post-Vietnam animus against strategic arms and cap Soviet offensive forces, while channeling the superpower arms race into an area of traditional American strength: technology.<sup>39</sup>

Given the reality of mutual vulnerability, the military significance of this technological edge was highly contestable, yet successive U.S. administrations believed it was important. According to political scientists Austin Long and Brendan Green, some American policy-makers entertained the idea of using these new capabilities to limit damage in a nuclear war. They also saw them as symbolically significant, calculating, in the words of Long and Green, "that the nuclear balance would shape the political choices of other states – the Soviet Union, NATO allies, and third parties – even in an era of nuclear plenty." Even if superpower politics had moved beyond the crises of the early 1960s, the Nixon, Ford, and Carter administrations held on to the belief that they needed to push forward with technological innovation in order to maintain the integrity of the U.S. security guarantee to NATO. U.S. leaders recognized that this technological advantage may have been more valuable as a symbol of American power than for its military effectiveness, but in a balance characterized by arsenals of almost unimaginable destructiveness, perception was perhaps more important in maintaining allied confidence than the reality. As Nixon put it to the National Security Council, "to our allies and the public, appearances matter." According to State Department official Seymour Weiss, "We told [the allies] we were qualitatively superior. We can't now say that that doesn't make any difference."<sup>40</sup>

The Nixon administration and its successors therefore struck a delicate but enduring balance between the imperatives of arms control and the requirements of extended deterrence. As such, successive administrations have been criticized for both going too far in institutionalizing a militarily unwise and immoral posture of "mutual assured destruction" (or MAD) through arms talks and at the same time doing too little to stop the self-defeating action-reaction cycle that left both Moscow and Washington running an interminable and destabilizing technological



race, as if they were “apes on a treadmill.”<sup>41</sup> Yet moving toward an exclusive reliance on either arms control or arms racing was fraught with dangers. The feared political consequences of conceding the technological race to the Soviets were large. Without a credible story to tell about the validity of extended deterrence to domestic and international audiences, the U.S. commitment to NATO could be called into question, leading allies to take a more neutral stance between East and West, or even reopening arguments regarding the need for an autonomous European deterrent, which would endanger the global nonproliferation regime and undermine the entire arms control edifice that had been built since the early 1960s. The dilemmas of maintaining allied confidence were brought home with the Soviet deployment of the SS-20 intermediate-range ballistic missile in the 1970s. “Periodic reassurances” to West Germany, the State Department argued, “have always been necessary” because “the Germans may never be wholly satisfied with American nuclear guarantees.” However, any U.S. counter-deployment to reassure Western Europe also needed to be combined with arms control, to minimize political controversy and maintain “stable East-West relations.”<sup>42</sup> NATO responded with the 1979 dual-track decision, balancing missile deployments with the offer of talks.

Moving to greater reliance on arms racing at the expense of arms control held its own disruptive potential. When the Reagan administration appeared to be doing so in its early years, the resulting antinuclear protests in both the United States and Western Europe played a role in the White House’s shift to greater engagement with the Soviet leadership while maintaining its modernization efforts.<sup>43</sup> This tradition of balance endured in the Obama White House’s approach to New START, at once cutting U.S. and Russian strategic forces to their lowest levels in decades while, at the same time, laying out a comprehensive plan for the technological overhaul of the U.S. arsenal. Thus, the “character” of U.S. weapons development, criticized by Schelling as endangering strategic stability, played and continues to play an important role in holding together the broader security order that American arms control efforts are ultimately designed to preserve.

**B**y the early 1970s, the foundations of today’s arms control regime had emerged. Over the preceding decade, Washington had crafted a network of treaties that helped to contain the disruptive potential of the German question and the spread of nuclear arms. The United States had also struck strategic limitation agreements with its superpower rival that saw off the domestic backlash against militarized containment in the United States while capping the Soviet offensive buildup. At the same time, these agreements preserved American freedom to develop increasingly effective nuclear weapons, helping to reassure its allies that it would still come to their defense, thereby stemming demand for independent deterrents and strengthening barriers against proliferation. As

such, arms control has proven an extremely useful tool in managing the manifold dilemmas that nuclear weapons pose to the United States' relations with adversaries, allies, and nonaligned states, as well as its domestic politics. Given this, it would be wise for Washington to seek the preservation of this network of treaties for as long as possible. Any steps to modify it should be taken in a way that does not jeopardize these enduring benefits.

The extent to which the current regime can be extended to stabilize the new multipolar era of great power relations is an open question. China defines its strength far more by its economic reach and conventional military than by its nuclear arsenal, presenting a fundamental challenge to those who argue it should join strategic arms control talks as befits its growing status. It also reminds us of Hedley Bull's dictum that "arms control is concerned chiefly with only one dimension of world order, *viz.* peace and security" and it would be foolhardy to "saddle it with responsibility for every dimension."<sup>44</sup> If arms control does not adapt to take account of China's growing military strength, however, it will lose its former level of effectiveness as a tool for managing the security dimension of great-power relations. Given the success that U.S. policy-makers have enjoyed in using arms control as a tool to uphold both American influence and global security, it is imperative that they try.

As well as underscoring the value of arms control and the risk of tearing up established pacts in search of the perfect agreement, history should teach policy-makers to look beyond formulae for strategic stability to other ways in which arms control can help to contain disruptive challenges to the balance of power and minimize the chances of war. Identification of these challenges, the joint interest in managing them, and the military-technical and diplomatic measures that can be taken to do so can only be achieved through the maintenance of sustained dialogue on the full range of issues confronting the major powers. This great-power exercise in threat management should be balanced with engagement with allies to find the compromises necessary to ensure the continued credibility of U.S. security guarantees and thereby broaden the domestic political coalition in favor of agreement.<sup>45</sup> This will be a piecemeal process, progressing in fits and starts, often in response to immediate crises, in a manner that will appear clearer in retrospect than it did at the time. The results will inevitably be imperfect, failing to satisfy fully any domestic political tribe or state within the system, but history teaches us that the sustained and patient elaboration and maintenance of such a web of understandings is our best hope to avoid catastrophe.

## AUTHOR'S NOTE

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# Cyber Warfare & Inadvertent Escalation

*James M. Acton*

*The advent of cyber warfare exacerbates the risk of inadvertent nuclear escalation in a conventional conflict. In theory, cyber espionage and cyberattacks could enhance one state's ability to undermine another's nuclear deterrent. Regardless of how effective such operations might prove in practice, fear of them could generate escalatory "use-'em-before-you-lose-'em" pressures. Additionally, cyber threats could create three qualitatively new mechanisms by which a nuclear-armed state might incorrectly conclude that its nuclear deterrent was under attack. First, cyber espionage could be mistaken for a cyberattack. Second, malware could accidentally spread from systems that supported non-nuclear operations to nuclear-related systems. Third, an operation carried out by a third party could be misattributed by one state in a bilateral confrontation to its opponent. Two approaches to risk reduction are potentially viable in the short term: unilateral restraint in conducting potentially escalatory cyber operations, and bilateral or multilateral behavioral norms.*

Cyber weapons may be relatively new, but non-nuclear threats to nuclear weapons and their command, control, communication, and intelligence (C3I) systems are not. In fact, before the United States dropped the bomb on Hiroshima in August 1945 – before it even conducted the world's first nuclear test in July of that year – it had started to worry about non-nuclear threats to its nascent nuclear force, in particular, Japanese air defenses.<sup>1</sup> As the Cold War developed, fears multiplied to encompass threats to almost every component of the United States' nuclear forces and C3I systems. While these threats emanated primarily from Moscow's nuclear forces, they were exacerbated by its improving non-nuclear capabilities, particularly in the final decade of the Cold War. A two-decade hiatus in worry following the Soviet Union's collapse is now over; today, non-nuclear threats to U.S. nuclear C3I assets – in particular, the growing capability of Chinese and Russian antisatellite weapons – are a major concern.<sup>2</sup>

The United States' experience is the norm. All nuclear-armed states have felt, and continue to feel, similar concerns. Indeed, the last few decades have seen the emergence of new potential vulnerabilities – this time in cyberspace – as nuclear weapons and C3I systems have come to rely increasingly on digital technology. To be sure, the networks involved in nuclear operations are almost certainly among the most secure anywhere. Yet there is broad agreement among technical experts

that perfect network security is “impossible.”<sup>3</sup> As a result, the possibility of cyber interference with nuclear forces and C3I systems is real.

The vulnerability of nuclear forces and C3I systems creates the risk of inadvertent escalation: that is, escalation resulting from military operations or threats that are not intended to be escalatory. So-called crisis instability, for example, could arise if a state were afraid of being disarmed more or less completely in a preemptive strike by an adversary, whether or not such fears were well founded.<sup>4</sup> In the most extreme case, “use-’em-or-lose-’em” pressures could lead the state to employ nuclear weapons, conceivably in its own preemptive attempt to disarm its adversary, but more likely in a limited way to try to terrify the opponent into backing down. In less extreme scenarios, a state afraid of being disarmed might take steps – issuing nuclear threats, for example, or dispersing mobile nuclear forces – that raised the likelihood of nuclear use later.

This danger is likely to be exacerbated by any cyber vulnerabilities affecting nuclear forces and C3I systems. Most directly, the existence of such vulnerabilities could intensify existing fears of being disarmed – fears that are already acute in China and Russia (as well as in Pakistan and, most likely, North Korea).<sup>5</sup> However, because of their unique characteristics and effects, cyber threats could create at least three qualitatively new mechanisms by which a nuclear-armed state might come to the incorrect conclusion that its nuclear deterrent was under threat. First, the purpose of cyber interference could be misinterpreted. In particular, espionage could be mistaken for an attack. Second, a cyberattack could have a more significant effect than intended. Malware implanted into information technology (IT) systems associated with non-nuclear weapons could accidentally spread into more sensitive nuclear-related systems, for instance. Third, the initiator of a cyber operation could be misidentified. An operation carried out by a third party, for example, could be misattributed by one state in a bilateral confrontation to its opponent. What makes these pathways so pernicious is that the catalyst for escalation could appear to its initiator to be a relatively benign action.

To make matters worse, such pathways could lead to inadvertent escalation even if the target of the cyber interference were not afraid of being completely disarmed. Today at least, this description fits the United States. If, in a conflict against Russia, say, the United States wrongly concluded that its strategic early-warning system was under cyberattack, it might reason that Moscow was seeking to undermine U.S. missile defenses, which use early-warning data, prior to launching a nuclear attack.<sup>6</sup> Given that U.S. declaratory policy explicitly highlights the option of a nuclear response to non-nuclear attacks on nuclear C3I assets, such a “misinterpreted warning” might lead Washington to use nuclear weapons.<sup>7</sup> But even if it did not, its response, which might include nuclear threats, could still be escalatory.

My focus here is narrowly limited to inadvertent cyber threats against, or interference with, one state’s nuclear forces or C3I systems by another nuclear-armed



state (C3I systems encompass not only communication capabilities, but also the intelligence, surveillance, and reconnaissance capabilities, including early warning, that would be critical to decision-making). To be sure, cyber vulnerabilities probably create other escalation risks too, though, in my judgment, they are less serious.<sup>8</sup> For example, while no state would likely try to detonate another's nuclear weapons, a nihilistic terrorist group might (though it is unclear whether such a group could obtain the requisite cyber capabilities). Separately, vulnerabilities associated with conventional forces or their C3I systems could increase the likelihood of a conventional war's escalating to a higher level of violence, thus making nuclear use more credible.<sup>9</sup>

Cyber interference with nuclear forces and C3I systems can involve two (not mutually exclusive) types of operations: espionage and attack. Cyber espionage involves collecting data from a target IT system without otherwise damaging it. A cyberattack involves undermining the operations of the target system, typically by compromising the integrity or availability of data. Cyber tools suitable for surveilling or attacking nuclear forces or C3I systems have innumerable differences from noncyber tools, which are themselves quite varied. Six of these differences are particularly salient to the risk of inadvertent nuclear escalation.

First, cyber espionage offers the potential to obtain information about an adversary's military forces and operations that cannot plausibly be obtained in any other way. By accessing an adversary's C3I systems directly, cyber tools may be capable of exfiltrating exceptionally sensitive information, such as the locations of mobile delivery systems. This is not to suggest that cyber surveillance is infallible. As a security measure, for example, a state could choose not to track the movements of its mobile delivery systems (or it could do so only approximately). Alternatively or additionally, it could try to use a cyber intrusion in its networks to feed misinformation to the adversary. In spite of these and other limitations, however, cyber espionage almost certainly offers unique advantages. For example, no practical constellation of high-resolution surveillance satellites in low Earth orbit could provide continuous coverage of a given location on Earth's surface.<sup>10</sup> Cyber surveillance, by contrast, may allow for continuous monitoring of an adversary's military posture.

Second, cyber weapons offer an unparalleled capability to manipulate the data that go into decision-making. Other types of weapons, by destroying or disabling sensors or communication systems, can also deny data to decision-makers. However, their use generally alerts the target to the fact it is under attack. By contrast, if a well-designed cyber weapon is used, a loss of data may appear to be, say, the result of a malfunction, potentially allowing the attacker to conduct surprise follow-on attacks. Even more significant, cyber weapons can be used to feed false

information to decision-makers. For example, the Stuxnet virus, which was reportedly developed by the United States and Israel, was designed not only to destroy centrifuges at Iran's Natanz enrichment plant, but also to hinder plant operators from discovering the cause of these failures by producing falsely reassuring readings on monitoring equipment.<sup>11</sup> In a similar vein, sophisticated cyber weapons offer a unique capability to shape an adversary's perception of a battlefield by feeding misinformation into C3I systems.<sup>12</sup> To be sure, information operations have always been a part of warfare. However, cyber weapons represent a sea change because their effects can be tailored with great precision in real time, and because they could be used to directly influence the perceptions of high-level decision-makers.

Third, cyber operations – whether conducted for espionage or offensive purposes – can present particularly significant risks of *unanticipated* collateral effects, that is, of affecting IT systems other than the intended target.<sup>13</sup> Noncyber weapons can, of course, lead to collateral damage. Yet such effects are inherently constrained by geography. Moreover, the likelihood of physical collateral damage can be often quantified, at least to some extent (military planners may be able to estimate, for example, the probability of an incoming weapon missing its military target and hitting a nearby civilian facility).<sup>14</sup> The risks of collateral effects in cyberspace are much more difficult to estimate. Minimizing such effects relies, in part, on detailed intelligence about the target network and on connections between it and other networks. Obtaining the requisite intelligence is potentially much more difficult than identifying what surrounds a target in physical space (as is verifying that the resulting picture is complete). To complicate matters further, sophisticated malware must generally be tailored to each target and, if revealed, will become ineffective once the adversary can clean its networks and fix whatever exploit was used to gain access. As a result, the effects of cyber weapons cannot usually be understood through testing, further increasing the likelihood of unanticipated collateral damage (simulations can be used but they are only as good as the available intelligence on the target).

Fourth, in peacetime, malware used to enable a cyberattack may often be inserted into an enemy's networks – but not activated – in the hope that it will remain undetected and thus can be used in a potential future crisis or conflict. (In theory, not only can a vulnerability in an operational IT system be exploited in this way, but so too could security weaknesses in the supply chain for the system's components.) Noncyber weapons, by contrast, are generally used as and when the decision to authorize a strike on a particular target is taken.<sup>15</sup> One consequence of this difference is that, if a state discovers dormant malware in its networks, it can be faced with the challenge of attributing it – that is, identifying which entity is responsible for its implantation – before activation. The equivalent challenge rarely arises with the kinds of noncyber weapons typically used in interstate warfare

(though it does arise in irregular warfare or counterterrorism with unexploded ordnance).

Fifth, and relatedly, cyberattacks are generally easier to conceal than other forms of attack. As a result, decision-makers may be more inclined to authorize them. In fact, if the goal is for a cyber weapon to have either a persistent effect or an effect when triggered at some future time, the malware used in the attack must remain hidden to be effective because exposure could enable the adversary to take countermeasures.

Sixth, and finally, distinguishing between offensive operations and espionage is significantly more challenging in cyberspace than in other domains.<sup>16</sup> To be sure, the line dividing espionage and offensive operations in physical space is not always entirely clear. Aircraft – unmanned aerial vehicles (UAVs), in particular – are used for both surveillance and offensive operations. But the distinction is much murkier in cyberspace. One challenge is that identifying the purpose of a piece of malware – understanding whether it can be used for espionage, offensive purposes, or both – can be time-consuming. In a fast-moving conflict or crisis, this process might move slower than decision-making. Moreover, even if a state quickly and confidently established that a piece of malware could be used solely for espionage, it could not be confident that whatever vulnerability was used to introduce the malware would not also be exploited for offensive purposes – at least until it had identified and fixed the vulnerability.

States can threaten each other's nuclear forces through a combination of offensive "counterforce" operations to target nuclear-weapon delivery systems preemptively, and air and missile defense operations to intercept whatever remained. The United States openly acknowledges it would seek to limit the damage it would suffer in a nuclear war.<sup>17</sup> Russian doctrine is believed to embrace a similar concept.<sup>18</sup> India may be moving in the same direction.<sup>19</sup>

The question of whether, in practice, a state could actually succeed in limiting the damage it would suffer in a nuclear war to an extent that decision-makers would consider meaningful is currently a subject of considerable debate.<sup>20</sup> However, from the perspective of inadvertent escalation, what matters is not whether damage-limitation operations would actually prove effective, but whether a potential target believes they might. In this context, Chinese and Russian fears that the United States is seeking the capabilities – non-nuclear capabilities, in particular – to negate their nuclear deterrents could prove escalatory in a crisis or conflict by generating "crisis instability," that is, pressures to use nuclear weapons before losing the capability to do so.<sup>21</sup> And even though the United States is not concerned today about the possibility of being disarmed, Washington appears to be less sanguine about the future, given growing threats to its C3I assets, in particular.

Cyber capabilities could contribute to damage-limitation operations in two distinct ways. First, cyber espionage could prove useful in collecting intelligence that might increase the effectiveness of counterforce attacks and air and missile defenses, especially if complemented by effective analytic tools for synthesizing large amounts of data from multiple sources.<sup>22</sup> If cyber espionage helped reveal the locations of mobile weapons, for example, it could enable preemptive attacks against them. And if it helped to reveal targeting data, it could assist defenses in intercepting missiles and aircraft after launch.

Second, cyber weapons could be used, alongside other capabilities, to conduct counterforce strikes. A hypothetical cyber “kill switch” that could permanently shut down an adversary’s nuclear C3I systems would certainly be attractive to any state with a damage-limitation doctrine. In practice, this kind of perfect capability seems fanciful, not least because a state could find analog or even nonelectronic ways to use its own nuclear forces given enough time (in fact, some states may even prepare such means in advance). At best, therefore, a cyberattack could be a “pause button” that delayed an adversary’s ability to use its nuclear weapons. Real cyber weapons are likely to be still less effective, however. All nuclear-armed states likely operate multiple C3I systems with some degree of redundancy between them. Cyber operations would probably not prove equally effective against these different systems, potentially delaying the target from using some elements of its nuclear forces for longer periods of time than others.

Even given these limitations, however, cyberattacks could still assist with damage limitation. They could buy more time for counterforce operations to attrite an opponent’s nuclear forces and reduce the coherence of any retaliatory attacks, somewhat simplifying the task of air and missile defenses. Moreover, the potential for cyberattacks to shape an adversary’s perceptions could prove valuable. For example, an attacker might try to “blind” its adversary’s early-warning system just before launching counterforce strikes on its nuclear forces.

Just how effective cyber-enabled damage-limitation operations might prove in an actual conflict is far from clear, not least because of the difficulty of testing cyber weapons. That said, any state that has made the enormous investments necessary to develop damage-limitation capabilities is likely to spend relatively modest additional sums on developing complementary cyber tools, and it might reach a different conclusion about their potential efficacy. Even more important, from the perspective of inadvertent escalation, its potential adversaries might do so too.

China, in particular, appears to be concerned about cyber-enabled damage limitation. Summarizing the thinking of their peers on this subject, two Chinese scholars, Tong Zhao and Li Bin, have concluded that “Chinese analysts have demonstrated an acute awareness of the potential vulnerabilities of the

country's nuclear C3I system, particularly against cyber infiltrations."<sup>23</sup> Russian views have been less aired. In fact, a dichotomy has emerged in what little public discussion there has been. For example, three respected experts, including a former general officer in Russia's Strategic Rocket Forces, have recently played down the threat, arguing that "because the command-and-control systems of strategic nuclear forces are isolated and highly protected, they are, in all probability, not vulnerable to cyber attacks."<sup>24</sup> At about the same time, however, another influential Russian scholar argued that, among the emerging non-nuclear technologies that could threaten nuclear forces, "probably the most dangerous development is cyber weapons, which could be used for non-nuclear disarming and decapitating attack by completely paralysing the entire command-and-control system."<sup>25</sup> News reports that Russia has created cyber defense units for its nuclear forces suggest that the Russian military may be less than sanguine about the cyber threat.<sup>26</sup>

Fears about cyber-enabled damage limitation may be particularly pernicious because of the potential difficulty of detecting a cyberattack. A sophisticated cyberattack on nuclear forces or C3I systems could conceivably occur without being detected. In the extreme case, a state might only find out that it had been attacked when it attempted to launch nuclear weapons and discovered that its ability to do so had been impeded in some way. If a state believed that it would be unlikely to detect an ongoing cyberattack, then it could rationally conclude that it might be under attack even in the absence of attack indicators. The simple belief that an opponent had highly sophisticated cyber capabilities could, therefore, precipitate a false positive – the incorrect assessment that an attack was underway – by itself. By contrast, if a state's nuclear forces were under assault from kinetic strikes, the target would likely be aware. To be sure, it is still not entirely impossible that a state could wrongly come to believe it was under kinetic attack. Early-warning systems, for example, have produced false warnings of incoming ballistic missile strikes.<sup>27</sup> But mistakes of this kind could be identified once the incoming weapons ceased to exist (though the window of time before they disappeared could be particularly dangerous).

To make matters worse, a state that was concerned about its nuclear forces and C3I systems coming under cyberattack might be inclined, especially in a crisis or conflict, to interpret ambiguous indicators in the worst possible light. For example, if one of its nuclear C3I systems malfunctioned because of, say, bad design or aging components, it might wrongly attribute the failure to a cyberattack (in fact, the temptation among operators to do so might be particularly strong if they would otherwise be held responsible for an internal failure). Regardless of precisely how it arose, however, a false positive that occurred in a crisis or conflict could generate significant escalation pressures.

Concerns about the potential for cyber operations to enhance the effectiveness of damage limitation can have effects beyond generating crisis instability at a time of heightened tensions or during a conflict. In peacetime, such concerns may induce nuclear-armed states to take steps to try to ensure that nuclear weapons could be employed when duly ordered in a crisis or conflict, even at the expense of exacerbating the danger of inadvertent or unauthorized use. Concerned states, for example, could remove permissive action links – electronic “locks” designed to prevent the unauthorized use of nuclear weapons – because of the perceived danger that they could be hacked and thus subverted to prevent authorized use.<sup>28</sup>

Alternatively or additionally, states could make plans to predelegate the authority to use nuclear weapons down the chain of command to guard against the possibility of the communication links serving national leaders being severed. The dangers of predelegation depend, in part, on the degree of flexibility afforded to commanders in determining whether and how to use nuclear weapons. Nevertheless, certain risks are inherent in any model. A localized communications failure might be mistaken for an attack, for example, leading to inadvertent use.<sup>29</sup> Predelegation also increases the risk of unauthorized use because a field commander could order the use of nuclear weapons in a scenario in which he or she was not permitted to do so. This danger becomes greater as more people are granted launch authority. In this respect, cyber threats could promote a particularly dangerous form of predelegation by inducing a state to entrust launch authority to the relatively large number of lower-level officers who are capable of issuing a launch order without electronic communications.

Surveillance operations in cyberspace, even if conducted exclusively for defensive purposes, pose unique risks of escalation. Cyber surveillance of an adversary’s nuclear forces can serve purposes besides damage limitation. In any dyad involving two nuclear-armed states, each has a strong incentive to monitor the status of the other’s nuclear forces at all times – and particularly during a crisis or conflict – including for the exclusively defensive purpose of spotting any preparations for nuclear use. Several intelligence collection techniques, including overhead imagery and signals intelligence, are likely used for this purpose. Given the potentially unique advantages of surveillance in cyberspace, however, states may see good reason to adopt it alongside these other approaches, especially if they judge that the likelihood of cyber espionage being detected is small.

Depending on the sophistication of the malware used and the target’s defenses, the true likelihood of being detected may or may not be small, but the consequences of being caught could be significant. In fact, if the target detected ongoing cyber espionage of networks associated with its nuclear forces or C3I systems,

inadvertent escalation could result from either of two concerns that are distinct from those that might plausibly be generated by other forms of surveillance.

First, even if the target of cyber interference were convinced that the operation was being conducted exclusively for the purpose of espionage, it might worry that the data being collected could be used against it in damage-limitation operations. Intelligence collection in physical space could also enable damage limitation, but it differs from cyber surveillance in one critical respect. In a crisis or conflict, a state would generally have no way of knowing whether or not countermeasures against physical surveillance (such as camouflage or concealment) had proved effective – unless its nuclear forces were successfully attacked. By contrast, if it detected an ongoing effort to collect intelligence through its C3I networks, it would know definitively that at least some of its cyber defenses had failed. This realization might lead the state to fear that attacks on its nuclear forces were imminent.

Second, because of the difficulty of rapidly distinguishing cyber espionage from a cyberattack, espionage against nuclear forces or C3I systems would risk being misinterpreted as an attack. In theory, the use of armed UAVs for surveillance of an adversary's nuclear forces could generate a similar risk. However, a state motivated by purely defensive considerations would have strong and obvious reasons not to use armed UAVs in this way.

The risks resulting from cyber espionage being mistaken as an attack would depend on who had initiated the operation and who was the target. China or Russia might assess that U.S. cyber surveillance was actually an offensive effort intended to undermine – or, more likely, give Washington the option of undermining – Beijing's or Moscow's ability to launch nuclear weapons, thus potentially generating crisis instability. By contrast, because Washington is apparently more confident in the survivability of its nuclear deterrent, cyber espionage directed against U.S. nuclear forces or C3I systems would be less likely to have the same result. Nonetheless, such operations would likely be of real concern to Washington and could, for example, be misinterpreted as a prelude to nuclear use by China or Russia.

**E**ven if the two states involved in a crisis or conflict did not engage in any kind of deliberate cyber interference with one another's nuclear forces or C3I systems, one of them might wrongly conclude that the other had. Such a misperception, which could be the result of collateral effects or third-party action, could also induce escalation through crisis instability or misinterpreted warning.

A state that eschewed cyber operations of any kind against an opponent's nuclear forces or C3I systems might still launch such operations against adversary military networks involved exclusively in non-nuclear operations. If, because of design flaws, imperfect intelligence, or mistakes in execution, the malware used in such attacks spread and infected networks that were involved in nuclear

operations, the target might conclude that its nuclear forces or C3I systems were under deliberate cyberattack or cyber surveillance.

There could be collateral effects even if a state's networks for nuclear operations were entirely isolated; air-gapping (physically isolating one particular network from others) is, after all, not a cyber security panacea.<sup>30</sup> Moreover, achieving perfect isolation could prove difficult in practice.<sup>31</sup> To give but one reason, every nuclear-armed state, apart from the United Kingdom, has dual-use delivery systems, which can be used to deliver nuclear or non-nuclear weapons. Such delivery systems represent a potential point of contact between the C3I systems supporting nuclear operations and those supporting non-nuclear operations.

In practice, some nuclear-armed states – perhaps many or even all of them – have not tried to isolate their nuclear C3I systems. The United States, for example, has a number of dual-use C3I assets for communications and early warning that support both nuclear and non-nuclear operations.<sup>32</sup> Other nuclear-armed states, including China and Russia, may as well, but are less transparent.<sup>33</sup> Because the networks supporting dual-use C3I assets are likely to be connected directly to others involved in non-nuclear operations, there may be a particularly high risk of their being subject to collateral effects.

Catalytic warfare is a long-standing theoretical concern about a multipolar nuclear world that cyber capabilities could make all too real. During the Cold War, American strategists occasionally opined that China might try to take advantage of a U.S.-Soviet confrontation by firing nuclear weapons (most likely from submarines) at one or both of the superpowers in the hope that they would misattribute the origin of the attack and proceed to launch a nuclear war that would “weaken or destroy” each other.<sup>34</sup> Such fears were clearly absurd then. Armageddon was not in China's interests, even if it were only a bystander. While that remains even truer today, the advent of cyber warfare makes catalysis plausible, albeit as a result of inadvertence rather than deliberate action.

In peacetime, multiple nuclear-armed states may simultaneously prepare for conflict against the same adversary. Currently, for example, China, Russia, and North Korea all have incentives to try and penetrate the United States' nuclear forces and C3I systems. If a state with multiple adversaries detected malware in the networks supporting its nuclear forces, the identity of the perpetrator might not be immediately clear.<sup>35</sup> (The same would be true, of course, for attacks against other networks, but the consequences would be less significant.)

Especially in a conflict or crisis, the difficulty of resolving this uncertainty could have serious consequences. One key factor that affects the “quality of attribution” for cyber operations is time: as more time is spent on attribution, conclusions are likely to become more accurate and more confident.<sup>36</sup> As a corollary, “when high-level decisions . . . have to be made under pressure, the speed of



political developments may outpace the speed of the attribution process.”<sup>37</sup> A crisis or conflict is one such circumstance. If a state found malware in its nuclear forces or C3I systems, then it might feel that it had no choice but to act on the assumption that its attacker was the other party involved in the contingency.<sup>38</sup> In February 1998, for example, the United States discovered a successful hack of military networks while preparing to bomb Iraq and, to quote White House official Richard Clarke, “assumed” that Baghdad was the culprit when, in fact, teenagers from Canada, Israel, and the United States turned out to be responsible.<sup>39</sup>

If a third party – and not the state’s immediate adversary – were, in fact, to blame for a cyber intrusion, then catalytic escalation with the immediate adversary could result. The severity of the escalation pressures in this case is up for debate. On the one hand, awareness of any uncertainty associated with attribution might limit the forcefulness of any response. On the other, in contrast to the Cold War, when a catalytic strike by China would necessarily have been limited, a cyber intrusion might appear to be the precursor to an all-out damage-limitation attack, exacerbating the escalation risks.

A final difference between the cyber and noncyber weapons that can threaten nuclear forces and C3I systems is the much greater difficulty of limiting or otherwise cooperatively managing cyber capabilities. Strategic nuclear forces have long been subject to arms control, at least between the United States and the Soviet Union or Russia. Other relevant noncyber capabilities, including high-precision conventional munitions and antisatellite weapons, have generally not been subject to any form of international governance, and the technical and political challenges to managing them cooperatively are very real. These challenges, however, pale in comparison to those associated with governing cyber capabilities. Nonetheless, two ways forward present themselves.

First, states can and should act unilaterally to mitigate the risks. States should, for example, enhance their ability to prevent, detect, and mitigate the consequences of cyber interference with nuclear weapons and C3I systems and their associated supply chains. While much of the required effort here would be highly technical – finding vulnerabilities, scanning networks, and so forth – states should also consider whether they should change the way that their nuclear forces are postured and operated in order to help mitigate the consequences of what will inevitably be some degree of cyber vulnerability. To give but one example, any military that currently tracks the locations of its own mobile nuclear forces after dispersal could consider whether, to reduce the consequences of cyber espionage, it should stop doing so. Indeed, when a U.S. ballistic missile submarine is deployed on a deterrence patrol, its location is unknown except to submariners serving on that vessel. While this security precaution was developed long before the emergence of cyber warfare, it could help reduce the likelihood that cyber surveillance

of U.S. C3I networks might compromise the most survivable component of the United States' nuclear forces.

Restraint represents another form of unilateral risk reduction. In particular, states should adopt a consciously risk-averse approach to authorizing potentially escalatory cyber operations, particularly those that are targeted directly against nuclear forces or C3I systems, including dual-use networks. All of the escalation pathways outlined above, with the exception of false positives, involve a cyber operation by one state against another (even if the initiator could end up being a bystander to the subsequent escalation sequence). States, therefore, should put in place rigorous internal processes – if they do not already exist – to ensure that, in deciding whether to proceed with a potentially escalatory cyber operation, the strategic risks are fully considered and weighed against the potential intelligence and military benefits.

Conducting such assessments fairly and rigorously would likely prove difficult. One challenge would be deciding which cyber operations were “potentially escalatory” and so subjected to greater scrutiny. A second would be ensuring that low-probability but high-consequence escalation risks were not unduly discounted in comparison to more obvious and immediate military and intelligence benefits. Part of the solution should be to ensure that the assessment of escalation risks is not narrowly confined to the military or intelligence personnel responsible for proposing, planning, and conducting cyber operations. Such personnel are generally not trained in estimating – if an adversary detected a cyber operation – how threatening it might perceive the operation to be and how it might react. Rather, a broader cast of experts, including intelligence analysts who specialize in understanding foreign decision-makers, should be involved. In this context, this essay and other academic works hopefully have a role to play by identifying and raising awareness of the potential risks.

Ultimately, the authority to approve or reject a proposed cyber operation should rest with the senior officials who would be responsible for managing the real-world consequences of escalation. In the United States, for example, it should generally fall, if it does not already, to Senate-confirmed civilians. In the case of cyber interference that would directly affect the nuclear forces or C3I systems of another nation, however, the president should be the decision-maker. Again, this proposal is easier to suggest than to implement: for it to be effective, real buy-in from the bureaucracy would be required. Advisers would have to bring the decision-maker rapidly up to speed on complex technical details about the proposed operation and on the adversary's strategic culture and threat perceptions. Moreover, planners should develop two or more options that posed varying escalation risks – at least one of which did not involve any interference with nuclear forces or C3I systems – so that the decision-maker could properly assess any trade-offs between escalation risks and military and intelligence benefits.

Behavioral norms represent a more challenging but complementary pathway to reducing escalation risks. For example, states could agree, on a bilateral or multilateral basis, not to launch cyber operations of any kind against each other's nuclear forces or C3I systems. While such an agreement would not be verifiable in the traditional sense, it might nonetheless be enforceable: any state that considered launching a cyber operation in violation of the agreement would have to reckon with the possibility that the target (which would presumably be scanning its networks continuously) would detect the intrusion and respond in kind. In this way, deterrence could motivate compliance. To be sure, the challenges to reaching such an agreement would be daunting. In particular, it would likely be difficult to define what systems would and would not be covered by any prohibition, not least because of the existence of dual-use C3I assets. In the short term, however, more modest steps are possible. For example, states should reassure one another that any decision to launch a cyber operation against another state's nuclear forces or C3I systems, including dual-use networks, would be taken at the head of state or head of government level.

Norms are far from an ideal way to try to manage existential risks, but there is evidence that they can change behavior, including in cyberspace. In 2015, for example, President Barack Obama and President Xi Jinping agreed that neither of their states would engage in "cyber-enabled theft of intellectual property . . . with the intent of providing competitive advantages to companies or commercial sectors."<sup>40</sup> In 2018, the U.S. National Counterintelligence and Security Center assessed that Chinese cyber activity was taking place at "lower volumes" than before the agreement, and that it was mostly directed against "cleared defense contractors or IT and communications firms."<sup>41</sup> This statement indicates that China largely ceased conducting cyber activities for commercial gain, even if its compliance was not perfect. On balance, this experience suggests that trying to negotiate behavioral norms can be worth the effort, even if success is not guaranteed. Indeed, in the case of an agreement designed to prevent nuclear war, the incentives for compliance would be particularly strong.

If these suggestions seem to fall far short of the challenge presented by the potential risk of cyber interference with nuclear forces or C3I systems, it is because they almost certainly do. There is a profound mismatch between the importance of governing cyber capabilities and governments' (in)ability to do so. That said, modest steps may prove to have extrinsic value. For much of the Cold War, the idea that the United States and the Soviet Union might conduct inspections of one another's nuclear forces seemed far-fetched. But such inspections, which today involve counting the reentry vehicles emplaced on intercontinental ballistic missiles, were the culmination of a stop-start confidence-building process that began, after the Cuban missile crisis, with the modest first step of creating a hotline between the two superpowers. Political change in the Soviet Union

was unquestionably a necessary enabling condition for the breakthroughs of the late 1980s and early 1990s, but it might not have been possible to capitalize on such change had there not been an ongoing arms control process on which to build. There is no guarantee that an analogous process for managing cyber capabilities is possible. But if it is, it will inevitably begin with a modest first step.

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#### ENDNOTES

- <sup>1</sup> Richard Rhodes, *The Making of the Atomic Bomb* (New York: Simon & Schuster, 1986), 687.
- <sup>2</sup> U.S. Department of Defense, *Nuclear Posture Review* (Washington, D.C.: Office of the Secretary of Defense, 2018), 56–57, <https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF>.
- <sup>3</sup> Defense Science Board, U.S. Department of Defense, *Task Force Report: Resilient Military Systems and the Advanced Cyber Threat* (Washington, D.C.: Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, 2013), 6, <https://nsarchive2.gwu.edu/NSAEBB/NSAEBB424/docs/Cyber-081.pdf>. For theory and evidence supporting this conclusion, see Andrew Futter, *Hacking the Bomb: Cyber Threats and Nuclear Weapons* (Washington, D.C.: Georgetown University Press, 2018), chap. 2 and 4; Page O. Stoutland and Samantha Pitts-Kiefer, *Nuclear Weapons in the New Cyber Age: Report of the Cyber-Nuclear Weapons Study Group* (Washington, D.C.: Nuclear Threat Initiative, 2018), [https://media.nti.org/documents/Cyber\\_report\\_finalsmall.pdf](https://media.nti.org/documents/Cyber_report_finalsmall.pdf); Erik Gartzke and Jon R. Lindsay, “Thermonuclear Cyber War,” *Journal of Cyber Security* 3 (1) (2017): 38–40; and Patricia Lewis and Beyza Unal, “Cyber Threats and Nuclear Weapons Systems,” in *Understanding Nuclear Weapon Risks*, ed. John Borrie, Tim Caughley, and Wilfred Wan (Geneva: United Nations Institute for Disarmament Research, 2017), <http://www.unidir.org/files/publications/pdfs/understanding-nuclear-weapon-risks-en-676.pdf>.
- <sup>4</sup> For the classic Cold War discussion of crisis instability, see Thomas C. Schelling, *The Strategy of Conflict* (Cambridge, Mass.: Harvard University Press, 1960), chap. 9. For more recent treatments that stress limited nuclear use, see Caitlin Talmadge, “Would China Go Nuclear? Assessing the Risk of Chinese Nuclear Escalation in a Conventional War with the United States,” *International Security* 41 (4) (2017): 50–92; and Michael S. Gerson, “No First Use: The Next Step for U.S. Nuclear Policy,” *International Security* 35 (2) (2010): 35–39.

- <sup>5</sup> See, for example, Futter, *Hacking the Bomb*, 117–125.
- <sup>6</sup> James M. Acton “Escalation through Entanglement: How the Vulnerability of Command-and-Control Systems Raises the Risks of an Inadvertent Nuclear War,” *International Security* 43 (1) (2018): 67–73. The focus of that work is dual-use C3I systems. However, because of their unique characteristics, cyber operations could also create misinterpreted warning, even in the case of C3I systems reserved exclusively for nuclear operations.
- <sup>7</sup> U.S. Department of Defense, *Nuclear Posture Review*, 21.
- <sup>8</sup> Deliberate interference could also create escalation pathways unique to cyberspace. For one such example, the “cyber commitment problem,” see Gartzke and Lindsay, “Thermonuclear Cyber War,” 41–45.
- <sup>9</sup> For example, David C. Gompert and Martin Libicki, “Cyber Warfare and Sino-American Crisis Instability,” *Survival* 56 (4) (2014): 7–22.
- <sup>10</sup> Revisit times are likely to be longest for the most capable satellites, which can generally only be procured in small numbers because of their cost.
- <sup>11</sup> Jon R. Lindsay, “Stuxnet and the Limits of Cyber Warfare,” *Security Studies* 22 (3) (2013): 384.
- <sup>12</sup> For example, David A. Fulghum, Robert Wall, and Amy Butler, “Cyber-Combat’s First Shot: Israel Shows Electronic Prowess: Attack on Syria Shows Israel Is Master of the High-Tech Battle,” *Aviation Week & Space Technology* 167 (21) (2007): 28–31.
- <sup>13</sup> Steven M. Bellovin, Susan Landau, and Herbert Lin, “Limiting the Undesired Impact of Cyber Weapons: Technical Requirements and Policy Implications,” in *Bytes, Bombs, and Spies: The Strategic Dimensions of Offensive Cyber Operations*, ed. Herbert Lin and Amy Zegart (Washington, D.C.: Brookings Institution Press, 2018), 274–276.
- <sup>14</sup> Other causes of collateral damage, such as planners’ misidentifying a civilian facility as a military one, are less easy to quantify.
- <sup>15</sup> Unmanned aerial vehicles capable of both intelligence collection and offensive operations are an exception because they can be used for surveillance ahead of a decision to employ them for offensive purposes. It seems unlikely, however, that one nuclear-armed state would use such platforms against another in this way in peacetime.
- <sup>16</sup> Lin and Zegart, “Introduction,” in *Bytes, Bombs, and Spies*, 6.
- <sup>17</sup> U.S. Department of Defense, *Nuclear Posture Review*, 23.
- <sup>18</sup> U.S. thinking about the requirements for force survivability can be explained only by the belief that Russia might conduct counterforce strikes.
- <sup>19</sup> Christopher Clary and Vipin Narang, “India’s Counterforce Temptations: Strategic Dilemmas, Doctrine, and Capabilities,” *International Security* 43 (3) (2018/2019): 7–52.
- <sup>20</sup> See, for example, Keir A. Lieber and Daryl G. Press, “The New Era of Counterforce: Technological Change and the Future of Nuclear Deterrence,” *International Security* 41 (4) (2017): 9–49; Charles L. Glaser and Steve Fetter, “Should the United States Reject MAD? Damage Limitation and U.S. Nuclear Strategy Toward China,” *International Security* 41 (1) (2016): 63–70; and Austin Long and Brendan Rittenhouse Green, “Stalking the Secure Second Strike: Intelligence, Counterforce, and Nuclear Strategy,” *Journal of Strategic Studies* 38 (1–2) (2015): 38–73.

- <sup>21</sup> For discussions of Chinese and Russian concerns, see, for example, Alexei Arbatov, Vladimir Dvorkin, and Sergey Oznobishchev, *Non-Nuclear Factors of Nuclear Disarmament: Ballistic Missile Defense, High-Precision Conventional Weapons, Space Arms* (Moscow: IMEMORAN, 2010), <https://www.files.ethz.ch/isn/144178/10002.pdf>; and Fiona S. Cunningham and M. Taylor Fravel, “Assuring Assured Retaliation: China’s Nuclear Posture and U.S.-China Strategic Stability,” *International Security* 40 (2) (2015): 15–23.
- <sup>22</sup> Paul Bracken, “The Cyber Threat to Nuclear Stability,” *Orbis* 60 (2) (2016): 197–200.
- <sup>23</sup> Tong Zhao and Li Bin, “The Underappreciated Risks of Entanglement: A Chinese Perspective,” in *Entanglement: Russian and Chinese Perspectives on Non-Nuclear Weapons and Nuclear Risks*, ed. James M. Acton (Washington, D.C.: Carnegie Endowment for International Peace, 2017), 62.
- <sup>24</sup> Alexey Arbatov, Vladimir Dvorkin, and Petr Topychkanov, “Entanglement as a New Security Threat: A Russian Perspective,” in *Entanglement*, ed. Acton, 13. They go on to add, however, that “radio channels for communicating with and controlling satellites—especially missile early-warning assets—are more vulnerable.”
- <sup>25</sup> Sergey Rogov, “Disarmament and Deterrence—Bridging the Divide,” remarks at the 5th EU Non-Proliferation and Disarmament Conference, Brussels, Belgium, November 3, 2016, [https://www.iiss.org/-/media/images/dialogues/eunp/eunp-2016/documents/disarmament-and-deterrence---bridging-the-divide\\_-sergey-rogov-\\_iiss.ashx](https://www.iiss.org/-/media/images/dialogues/eunp/eunp-2016/documents/disarmament-and-deterrence---bridging-the-divide_-sergey-rogov-_iiss.ashx).
- <sup>26</sup> “Cyber Security Units to Protect Russia’s Nuclear Weapons Stockpiles,” RT, October 17, 2014, <https://www.rt.com/news/196720-russia-missile-forces-cybersecurity/>.
- <sup>27</sup> For example, David Hoffman, “I Had a Funny Feeling in My Gut,” *The Washington Post*, February 10, 1999, <http://www.washingtonpost.com/wp-srv/inatl/longterm/coldwar/shatter021099b.htm>.
- <sup>28</sup> Martin C. Libicki, *Brandishing Cyberattack Capabilities* (Santa Monica, Calif.: RAND Corporation, 2013), 22–23, [https://www.rand.org/content/dam/rand/pubs/research\\_reports/RR100/RR175/RAND\\_RR175.sum.pdf](https://www.rand.org/content/dam/rand/pubs/research_reports/RR100/RR175/RAND_RR175.sum.pdf).
- <sup>29</sup> For a dated example, see Daniel Ellsberg, *The Doomsday Machine: Confessions of a Nuclear War Planner* (New York: Bloomsbury, 2017), 53–57. It bears emphasizing that technological developments have massively reduced the likelihood of a communications blackout and that the United States no longer predelegates launch authority. Rather, what’s significant in Ellsberg’s account is the predilection of the military officers he interviewed to regard a communication blackout as an attack.
- <sup>30</sup> Martin C. Libicki, *Cyberspace in Peace and War* (Annapolis, Md.: Naval Institute Press, 2016), 49–50.
- <sup>31</sup> *Ibid.*
- <sup>32</sup> Acton “Escalation through Entanglement,” 63–65.
- <sup>33</sup> *Ibid.*, 65–66 and 78–80.
- <sup>34</sup> Richard Rosecrance, *Strategic Deterrence Reconsidered*, Adelphi Paper 116 (London: The International Institute for Strategic Studies, 1975), 33.
- <sup>35</sup> The literature on catalytic escalation in cyberspace emphasizes the somewhat different case of a third party that wants to spark a conflict between two others. See, for example, Futter, *Hacking the Bomb*, 118; and Libicki, *Cyberspace in Peace and War*, 315.

- <sup>36</sup> Thomas Rid and Ben Buchanan, "Attributing Cyber Attacks," *Journal of Strategic Studies* 38 (1–2) (2015): 32.
- <sup>37</sup> Ibid.
- <sup>38</sup> Indeed, in wartime, states have to make such assumptions since it is simply not possible to attribute every incoming attack.
- <sup>39</sup> William M. Arkin, "Sunrise, Sunset," *The Washington Post*, March 29, 1999, <http://www.washingtonpost.com/wp-srv/national/dotmil/arkin032999.htm>. Relatedly, there is also evidence of states' attempting to collect intelligence about adversaries' capabilities by targeting third parties. Ben Buchanan, *The Cybersecurity Dilemma: Hacking, Trust, and Fear Between Nations* (Oxford: Oxford University Press, 2016), 69–71.
- <sup>40</sup> Office of the Press Secretary, The White House, "Fact Sheet: President Xi Jinping's State Visit to the United States," September 25, 2015, <https://obamawhitehouse.archives.gov/the-press-office/2015/09/25/fact-sheet-president-xi-jinpings-state-visit-united-states>.
- <sup>41</sup> U.S. National Counterintelligence and Security Center, *Foreign Economic Espionage in Cyberspace, 2018* (Washington, D.C.: Office of the Director of National Intelligence, 2018), 7, <https://www.dni.gov/files/NCSC/documents/news/20180724-economic-espionage-pub.pdf>.

# New Technologies & Strategic Stability

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*A variety of new technologies, ranging from broad enabling technologies to specific weapon systems, may threaten or enhance strategic stability. In this essay, I analyze a technology's potential to significantly affect stability along three axes: the pace of advances in, and diffusion of, this technology; the technology's implications for deterrence and defense; and the technology's potential for direct impact on crisis decision-making. I apply this framework to examples including hypersonic weapons, antisatellite weapons, artificial intelligence, and persistent overhead monitoring. Formal arms control to contain dangers posed by some of these seems technically possible, though currently politically difficult to achieve. Others, particularly enabling technologies, resist arms control based on effective verification. The major powers will therefore instead have to find other ways to cope with these technologies and their implications. These options should include exchanges with potential adversaries so that pathways to nuclear escalation, and possible mitigating steps, can be identified and discussed.*

New technologies can have direct and indirect military significance that in some cases may threaten strategic stability. Such technologies can arise anywhere along a spectrum extending from research in pure science to systems development driven almost exclusively by military goals. Genetic engineering, and in particular its powerful realization in the new CRISPR technology, exemplifies the former; airborne high-powered laser counterspace weapons would be an example of the latter.<sup>1</sup>

Rather than choose a selection of these new technologies and examine their potential effects, which has now been done by many others,<sup>2</sup> I choose to step back and suggest a framework for analyzing the impact of new technologies on strategic stability. If this effort is successful, others might modify or add to the framework in the future. My hope with this framework is to increase the likelihood that consideration of a new technology with possible significant implications for strategic stability would include a systematic assessment of that technology's potential stabilizing and, especially, destabilizing effects. This assessment would need to be specific to capabilities of, and employment against, particular adversaries. By thinking systematically about these potential effects, it might be possible to make these choices more wisely, and to argue – domestically, bilaterally, or multilaterally – for appropriate restraint, transparency, or control.



Whether a new technology or weapon system significantly impacts strategic stability depends on the intrinsic capacity of that technology or system to do so, but also on whether and how it is deployed and operationalized by different powers and the force structure of the adversaries against which it may be deployed. A classic example prior to the nuclear age was the debut of the aircraft carrier in 1917 by the British navy. It was the upstart navies of Japan and the United States that recognized that carriers could change the nature of sea power and they deployed them to this end. By contrast, the British navy, for a host of reasons, long viewed carriers as scouting and reconnaissance adjuncts to the battleship.<sup>3</sup> The destabilizing effect of naval aviation for the previous naval order therefore required not only the invention of the carrier, but their production in sufficient numbers and their appropriate deployment and use.

A quite different example from the nuclear era is the Cold War deployment by the United States and the Soviet Union of multiple independently targetable reentry vehicles (MIRVs) on both intercontinental and submarine-launched ballistic missiles (ICBMs and SLBMs). The deployment of MIRVs on ICBMs in either U.S. or Soviet silos vulnerable to first-strike nuclear attack is strategically destabilizing, since an adversary can hope to destroy many warheads on each silo-based missile with the expenditure of only one or two of its own warheads – thus tempting the adversary to strike first. But the deployment of the same technology on analogous missiles of intercontinental reach in the apparently invulnerable submarine ballistic nuclear (SSBN) fleet of the United States is less threatening to strategic stability, since the effectively invisible U.S. SSBNs do not tempt a first strike. (MIRVing SLBMs may still negatively impact stability by increasing an adversary's fear of an overwhelming first strike.)<sup>4</sup> This demonstrates that the destabilizing effects of a new technology can in fact be exacerbated or mitigated by deployment and doctrinal choices.

What is strategic stability? Because there is no single uncontested definition, this essay makes its own choice explicit.<sup>5</sup> I set aside broad non-nuclear definitions of the term involving a security environment in which states are not tempted to go to war.<sup>6</sup> Here I take *strategic stability* to include *crisis stability* and *arms race stability*. *Crisis stability* means that even in a crisis (possibly including conventional war or the near prospect of nuclear war), states do not escalate to nuclear weapons use. This means first that states choose not to escalate deliberately to nuclear first use (crisis or no), because each state recognizes that any such strike will lead to devastating nuclear retaliation. It also means that the situation is robust against inadvertent or mistaken nuclear escalation. The latter includes both escalation on the basis of misinterpreted or false information (whether intentionally created or accidentally acquired, the risks of both may be exacerbated in a crisis) and escalation due to breakdowns in command and control.<sup>7</sup> *Arms race stability* holds when the relevant powers have incentives to avoid action-reaction cycles that, in addition to being expensive, could also lead to deployments that undermine first-strike stability.

In principle, a new technology's impact on strategic stability could be positive with respect to some aspects of stability and negative with respect to others.

I define a "new" technology to be one that has not yet been overtly significantly deployed by any nation's military, so that its effects on strategic stability are still largely in prospect. By this definition, for example, ground-based midcourse ballistic missile defense (GMD) is not a new technology. True, substantial improvements in GMD's ability to differentiate warheads from decoys, or decisions to deploy much larger numbers of interceptors, or even announced doctrinal changes, could have serious consequences for strategic stability. But there are many currently deployed technologies for which qualitative improvements or quantitative expansion could have such consequences, and as a practical matter I choose not to include these many possibilities in this discussion. By my adopted definition, although "cyber" weapons have reportedly already been used in a variety of contexts – from targeting uranium centrifuges to interfering in national elections – their greatest potential impact in warfare remains undemonstrated and recessed.<sup>8</sup> Such technologies will therefore be included here.

Even with the restrictions placed by our definition, the list of new technologies that can be identified as having potential significant consequences for strategic stability is long. These include broadly applicable enabling technologies such as artificial intelligence (AI),<sup>9</sup> biotechnology (especially genetic engineering and synthetic biology),<sup>10</sup> and quantum computing and cryptography.<sup>11</sup> They include categories of counterspace weapons encompassing kinetic weapons, non-kinetic physical weapons (high-powered lasers and microwaves), cyber weapons, and electronic jamming and spoofing.<sup>12</sup> They also include weapons whose characteristics might appear to an adversary as suited for executing first strikes, such as conventional and nuclear hypersonic weapons, including hypersonic glide vehicles (HGVs), hypersonic cruise missiles (HCMs), and stealthy strategic autonomous systems.<sup>13</sup> And they include systems or capabilities that could help enable first strikes, such as persistent surveillance technologies for tracking mobile missiles, antineutrino detectors for tracking submerged SSBNs,<sup>14</sup> and some aspects of counterspace and cyber weapons.<sup>15</sup> There are also technologies that could in principle alter the underpinnings of multilateral strategic relationships, such as laser isotope separation for uranium enrichment.<sup>16</sup>

This is a vast array of technologies to be considered. Even if we constrain the challenge facing us by restricting the discussion to those technologies that could see significant deployment within the next twenty years, this likely rules out only the use of antineutrinos to detect the nuclear reactors of submerged submarines, and not necessarily any of the other technologies listed. In this essay, I further restrict discussion to the case of the major nuclear powers. I therefore will not consider, for example, the diffusion of laser enrichment technology, which, while potentially important for determining the number of nuclear powers and the

resulting web of strategic relationships, is unlikely to affect significantly the arsenals of the major powers over the coming twenty years.

The ability of a state to develop and deploy a technology with sufficient salience to alter strategic stability depends on factors that go beyond the readiness and scope of the technology. These include financial and organizational requirements as well as the extent to which adopting the technology would disrupt existing military practice or the status of relevant organizational elites.<sup>17</sup> At the same time, since strategic stability depends on perception as well as objective reality, it might be affected even by a very imperfect adoption of technology.

I analyze a technology's potential to significantly impact strategic stability along three axes: 1) the pace of advances in, and diffusion of, this technology; 2) the technology's implications for deterrence and defense; and 3) the technology's potential for direct impact on crisis decision-making. These three broad categories overlap and inform one another. Within each, I highlight several specific issues to consider.

1) **Pace and diffusion.** This category focuses on intrinsic properties of a technology that affect the speed at which the technology develops and the ease with which it may spread among major powers, albeit with a recognition of differences in adoptive capacity of individual states.

a) *Is the technology in question a weapon system or an enabling technology?*

An enabling technology is one that in itself is not a weapon, but that has broad implications for many areas of military and intelligence technology and practice.<sup>18</sup> A current example of a weapon system would be a hypersonic glide vehicle, and a contemporary example of an enabling technology would be artificial intelligence. The answer to the question has implications for the practicality of arms control measures for a given technology.

b) *Does the technology have characteristics in terms of cost, complexity, tacit knowledge, or commercial applications that suggest that it will diffuse quickly (or slowly) to the other major nuclear powers?*

For example, biotechnological power, by objective metrics, is falling exponentially in cost over time.<sup>19</sup> This reduction in cost is so rapid that continuing diffusion of this enabling technology among the major powers seems inevitable and commercial incentives so great that formal arms control seems fanciful.<sup>20</sup> Rapid diffusion of a technology may reduce potential "first-mover" advantages.<sup>21</sup> However, this conclusion depends on the force structure and posture of the states involved.

- c) *Are there important advances that are likely to remain “invisible” to adversaries?*

If so, at least barring enforced transparency and verification via, for example, treaty requirements, a state is more likely to adopt worst-case models for an adversary’s progress. Worst-case fears of an adversary may lead a state to adopt a posture in which nuclear weapons are more readily used. Strategic ballistic missile defense and cyber capabilities or artificial intelligence provide contrasting examples. The development of an even minimally credible strategic ballistic missile defense system requires testing that is visible to peer adversaries, even absent any arms control agreement facilitating monitoring and data-capture from each test. This stands in stark contrast with the development of cyber weapons, or with government-held advances in AI, which, absent espionage, likely remain unknown to an adversary until, and perhaps even beyond, actual use.

- d) *Is the pace of technological advance so fast that it outstrips states’ abilities to negotiate international regimes to manage the technology?*

Thomas Schelling and Morton Halperin famously defined “arms control” expansively as “all the forms of military cooperation between potential enemies in the interest of reducing the likelihood of war, its scope and violence if it occurs, and the political and economic costs of being prepared for it.”<sup>22</sup> But at least some of these approaches are undermined when a technology is growing in scope and power so quickly that the pace of its technical evolution greatly outstrips the pace of international rule-making (and *a fortiori* treaty negotiation). An arms control regime that involves considerable transparency and monitoring measures, as with U.S.-Russian strategic weapons under New START,<sup>23</sup> fosters crisis stability by reassuring states that their adversary does not hold some secret advantage.

2) **Deterrence and defense.** This category addresses the level of destruction that could result from the use of the technology, as well as its implications for deterrence and defense.

- a) *Could the damage or destruction resulting from the use of the technology rise to the level that would elicit a nuclear response?*

The answer to this question, at least formally, depends on the nuclear use doctrine of the target state. This question emphasizes that certain technologies may be destabilizing in the sense of fostering the use of nuclear weapons in response to their employment, without themselves being first-strike weapons. Biotechnology provides one example: the Obama administration’s Nuclear Posture Review specifically calls out advanced bio-weapons and their relation to biotechnology as one important reason why

the United States did not adopt a “sole purpose” doctrine for its nuclear arsenal.<sup>24</sup> (A sole purpose doctrine is one in which a state announces that the sole purpose of its nuclear weapons is to deter other states from using, or threatening to use, their own nuclear weapons.) The Trump administration’s Nuclear Posture Review also identifies a potential link between “highly lethal biological weapons” and nuclear posture.<sup>25</sup>

- b) *Is the attribution of an attack employing the technology straightforward or potentially difficult?*

(This includes the possibility of an attacker attempting to generate a misattribution for the attack.) Kinetic attacks are likely to be readily attributed: in the case of missiles, because their point of origin will probably be identified, as is also the case for launch-to-intercept antisatellite technology. (In general, because of its tracking capabilities, the United States seems likely to be able to trace the origin of any kinetic space attack, even one originating from an orbiting satellite. The Defense Intelligence Agency has stated that China and Russia also have significant space tracking capabilities.)<sup>26</sup> Attribution might be more challenging for non-kinetic weapons such as high-energy lasers, and could become difficult or very difficult for certain biological attacks and cyberattacks. In principle, this might also be true for nuclear attacks using stealth delivery systems, although nuclear forensics might, in this case, help provide an attribution.<sup>27</sup> Adversaries that anticipate that they are likely to remain unidentified are less likely to be deterred. Yet as we have seen, the attacked state may hold out an option to reply to sufficiently severe attacks with nuclear weapons. In this case, an adversary’s hope to avoid attribution and the resulting deterrence failure could lead to escalation to nuclear use, either because attribution was nevertheless achieved or because the victimized state had reasons other than technical forensics to identify a particular state as responsible.

- c) *Could the employment of the technology for intelligence, defense, or other purposes be misinterpreted as preparatory to a first strike?*

One technological example here is cyber capabilities. Cyber penetration of, for example, strategic command and control, artificial intelligence supporting war-fighting, or early-warning or surveillance satellites might take place for reasons of intelligence gathering. But it might not be apparent to the targeted country whether the penetration is for data extraction, intended to degrade certain conventional abilities in the context of a conventional war, or is an attempt to disable command and control systems in preparation for a first strike on the country’s strategic forces.<sup>28</sup>

- d) *Are there credible defensive measures (broadly understood) that a state could take to blunt or defeat an attack using the technology in question, and are these measures stabilizing or destabilizing?*

A credible defense that would seem ready to defeat or mitigate an attack could enhance stability by deterring the launching of the attack (deterrence through denial, by altering the risk/benefit calculation of the attacker), by reassuring the targeted state that rapid retaliation was not required, and/or by limiting the destruction caused by the attack to a level where retaliation with nuclear weapons seemed disproportionate. But defense may also be destabilizing if it has as the intended or ancillary effect of diminishing substantially a country's second-strike response to a first strike. There is a spectrum of examples. Improved disease surveillance and response to potential biological attack would seem to be purely stabilizing in its impact. Better defense against cyberattack might typically be stabilizing, although there may be forms of "active" defense that could be escalatory and hence destabilizing depending on an adversary's interpretation.<sup>29</sup> Finally, strategic ballistic missile defense might be stabilizing as a deterrent (by denial) for an adversary with very low numbers of ICBMs, such as North Korea currently, but simultaneously destabilizing with another potential adversary, for example by appearing to China to provide a U.S. capability to eliminate the small number of ICBMs that might "leak through" a U.S. first strike on China's intercontinental forces and command and control, thus weakening China's deterrent against a potential first strike.

- 3) **Effects on crisis decision-making.** New technologies could affect decision-making in a crisis – pushing those decisions toward or away from nuclear use – in a variety of ways.

- a) *Does the technology confer such a significant advance in first-strike capabilities that an adversary would be more likely to launch first, or to launch a second strike with less deliberation, for example, on warning of an attack?*

A historical example of such technologies would be the marriage between MIRVed ICBMs and SLBMs – thus providing the attacker with far more warheads per ballistic missile – and the ongoing revolution in accuracy that putatively allows these warheads to be placed close enough to their intended destination to destroy even extremely hardened targets.<sup>30</sup>

- b) *Could the technology substantially reduce (or enhance) decision-making time or strategic situational awareness for the leadership of a targeted state?*

Technologies might reduce decision-making time directly by putting command and control or second-strike forces at risk on a shorter timescale

than was previously the case. Or a technology might be used to disable, jam, or subvert early-warning satellites, or intercept and spoof communications from such sensors to command and control destinations, reducing a state's leaders' ability to determine if a strategic attack were underway. Either of these effects could make premature or mistaken escalation to nuclear weapons use more likely. At the same time, certain new technologies hold the prospect of reducing an adversary's ability to intercept and spoof without detection. Advanced weapons expert Lora Saalman has suggested, for example, that China's "avid" push for quantum encryption is driven by this desire to protect communications and data transmission against bogus information that could be inserted to create either false negatives or positives in the context of a U.S. first strike.<sup>31</sup> Perhaps in part to this and related ends, China launched the Micius satellite in 2016 as an experimental demonstration – using entangled photons – of quantum encrypted transmission from a space satellite.<sup>32</sup>

- c) *Would a particular deployment scenario for the technology be likely to fulfill the criteria for normal accidents?*

Normal accident theory identifies systems that simultaneously have high interactive complexity (meaning that the interactions of the system's components are nonlinear and can lead to unanticipated outcomes) and tight coupling (meaning that these interactions often happen too fast for humans to intervene effectively) as especially likely to suffer serious failures, and in ways that are not easily overcome (and may even be exacerbated) by usual practices intended to enhance reliability and minimize error.<sup>33</sup> In the strategic stability context, such failures could come in the form of misinterpretation or other errors that could increase the likelihood of escalation to nuclear use.

To illustrate the framework developed above, I will now apply it to several examples of new technologies with implications for strategic stability. I choose my examples from among those technologies that Secretary of Defense Jim Mattis singled out as particularly salient in his April 2018 U.S. Senate testimony, in which he stated:

Rapid technological change includes developments in advanced computing, big data analytics, artificial intelligence, autonomy, robotics, miniaturization, additive manufacturing, directed energy, and hypersonics – the very technologies that ensure we will be able to fight and win wars of the future. Ultimately, these technologies will change the character of war, a reality embraced by DoD.<sup>34</sup>

First, consider hypersonic weapons: weapons that will travel at more than five times the speed of sound.<sup>35</sup> The United States, Russia, China, and other countries are spending billions of dollars in pursuit of these weapons.<sup>36</sup> One particular example is hypersonic glide vehicles (HGVs), intended to be boosted into the upper atmosphere by rockets, after which they follow an unpowered glide to their target, possibly with midcourse propulsion for flight adjustments.<sup>37</sup> These vehicles could be developed to carry either conventional or nuclear warheads, and would be both very fast and, because of their maneuverability, possibly very accurate.

Consider HGVs according to the set of questions presented here. HGVs are a specific weapon type driven primarily by military applications that have spread rapidly among the major nuclear powers. As a kinetic system that requires testing, it seems likely that the major powers will have a fair sense of one another's progress, giving warning time to lessen any first-mover advantages. The pace of development is not so fast as to exclude formal or informal arms control measures, suggesting that destabilizing impacts of HGVs could be mitigated.

But a recent essay by Adam Lowther and Curtis McGiffin, strategic and nuclear deterrence scholars with the U.S. Air Force, asserts that because arms control for hypersonics would need to be multilateral, which would likely prove untenable, Russian HGVs (like the Avangard), as well as stealthy nuclear delivery vehicles (such as the Ocean Multipurpose System Status-6 underwater drone, were it to prove credible) could so greatly reduce U.S. command and control warning or response time as to threaten the credibility of the U.S. nuclear deterrent. Lowther and McGiffin argue that as a result, the United States may have to "develop a system based on artificial intelligence, with predetermined response decisions, that detects, decides, and directs strategic forces with such speed that the attack-time compression challenge does not place the United States in an impossible position."<sup>38</sup> These authors' intention is to protect strategic stability in the face of new technologies, but at the cost of placing weapons that could end human civilization under the control of an artificial intelligence.<sup>39</sup> Consider some of the framework elements described above, applied to this specific example of new Russian weapons (or potential weapons) and the proposed U.S. response: The deployment, or threat of deployment, of compressed-timescale or stealth delivery weapons increases U.S. concerns about a Russian first strike. AI-enhanced or even AI-controlled command and control is suggested as a defensive measure that would improve the deterrence of such an attack and possibly blunt it were it to take place. Yet deploying this potential U.S. defense, and its interactions with new Russian capabilities, seems likely to fulfill the criteria for normal accidents, thereby increasing the likelihood of serious error and possible disaster. Clearly this extraordinary defensive step would create a myriad of its own dangers to stability.

Along a different leg of the U.S.-Russia-China triangle, U.S. HGVs, whether conventional or potentially nuclear-armed, could arguably both increase the



threat to China's second-strike force and do so with a velocity that might reduce China's decision-making time. Joshua Pollack, editor of *Nonproliferation Review*, has written that the perception of reduced decision-making times "is encouraging the Chinese military to modify its nuclear posture in ways that tend to create greater risks for both sides," including discussions of shifting to a more alert posture and to continual patrolling with SSBNs.<sup>40</sup> That is, some (but not all) of the defensive measures China could take in response to HGV capabilities would lower the threshold for nuclear use. But a framework question described above – Does the technology confer such a significant advance in first-strike capabilities that an adversary would be more likely to launch first, or to launch a second strike with less deliberation? – leads us to ask whether HGVs would actually represent such a significant advance in first-strike capabilities that China would be more likely to launch first. Would HGV flight times really be shorter than existing SLBM attack times? Chinese nuclear policy expert and contributor to this *Dædalus* volume Li Bin has pointed out that a U.S. SLBM warhead has a flight time of only fourteen minutes, starting with launch from a range of four thousand kilometers.<sup>41</sup> SLBM (and ICBM) warheads are already hypersonic, reentering the atmosphere after ballistic trajectory at velocities as high as twenty-nine thousand kilometers per hour, or Mach 24.<sup>42</sup> For various possible scenarios, military analysts should rigorously ask under what circumstances HGVs would actually reduce warning times below those from the existing SLBM force. Or is it some other HGV capability – such as hypersonic *conventional* warheads – not flight speed as such, that is the putatively destabilizing characteristic? Dean Wilkening, defense analyst at the Johns Hopkins University Applied Physics Laboratory, has argued that the anticipated "exceptional maneuverability" of HGVs and hypersonic cruise missiles will make their targets – conventional or strategic – "difficult to discern until the last few minutes before impact." The resulting de facto entanglement of conventional and strategic targets could pressure Chinese leadership to launch strategic weapons while the hypersonic attack vehicles were still in flight, even if the United States had launched the attack purely to eliminate Chinese conventional targets.<sup>43</sup>

As a second example, consider growing Chinese and Russian capabilities in antisatellite (ASAT) technologies. The U.S. Director of National Intelligence (DNI) issued a threat assessment in 2018 that found that Russia and China had ASAT weapons that would reach "initial operational capacity" within the next several years.<sup>44</sup> These would likely be ground-launched missiles, but both countries were also moving forward with directed-energy weapons to blind U.S. remote-sensing or missile-defense satellites. The DNI report assessed that in the event of a future conflict between either country and the United States, each country could use attacks against U.S. satellites to offset any perceived U.S. advantage from military or commercial space systems. James Acton, co-director of the Nuclear Policy Program at the Carnegie Endowment for International Peace and an author in

this collection, has similarly argued that, in wartime, the Chinese might decide to strike U.S. early-warning satellites (satellites used for both conventional and strategic nuclear warning) in order to enable Chinese conventional ballistic missiles to circumvent U.S. defenses and reach their targets in East Asia. Acton warns that such strikes could be misinterpreted by the United States as an attempt to blind U.S. early warning against a Chinese strategic nuclear attack. Various paths to escalation to nuclear use would then exist.<sup>45</sup> The framework element questioning a technology's potential to reduce or enhance decision-making time or situational awareness was meant in part to capture this kind of destabilizing result.

There are many steps that the United States could take to mitigate the destabilizing effects of Chinese and Russian ASAT technologies. A 2015 Department of Defense white paper describes measures ranging from defensive actions, to rapid reconstitution (by launching replacement satellites), to resilience (such as spreading orbital capabilities among multiple payloads) that could be employed to reduce the effectiveness of Russian and Chinese ASAT capabilities.<sup>46</sup> The concern of the white paper is to identify measures that can be taken by the United States to “achieve warfighting mission assurance.” But an element in the above framework – Are there credible defensive measures (broadly understood) that a state could take to blunt or defeat an attack using the technology in question, and are these measures stabilizing or destabilizing? – emphasizes the need for a second filter to be applied to these responses: an assessment of which of the measures considered would, while helping achieve mission assurance, most enhance strategic stability. So, for example, while the ability to rapidly replace early warning satellites is intrinsically valuable and might in some important cases deter an adversary from targeting them, unless this replacement could take place on less than the thirty-minute timescale of a strategic missile attack against the United States, it might do too little to enhance crisis stability. U.S. leaders concerned about a Russian or Chinese strategic attack that would occur shortly after the U.S. losing some early warning satellite capability would not likely feel reassured by the thought that replacements would be in place some hours later. A focus on strategic stability would instead favor enhancing the resilience of U.S. orbiting platforms, for example through options outlined in the white paper of disaggregation, distribution, diversification, passive protection, proliferation, and deception.

A final and very different example is provided by artificial intelligence.<sup>47</sup> AI is a fast-moving, largely commercially driven (in the United States) enabling technology that will have increasingly important impacts throughout society as well as military operations. All of the major nuclear powers are strongly committed to it.<sup>48</sup> It is hard to imagine any plausible monitoring and inspection regime for this technology, though this characteristic is typical of enabling technologies, and not unique to AI: the technology is too widespread for a monitoring and inspection model to provide a good fit. It is also likely that at least certain specific

military-relevant advances will occur under cover of secrecy. The rate of advance in AI is now so strong that some observers are asking not whether its pace outstrips possible arms control regimes, but whether its pace will outstrip human civilization's ability to prevent AI takeover.<sup>49</sup>

Because it is such a broadly pervasive enabling technology, AI's impact on strategic stability will likely be both widespread and widely varying by application. For concreteness, consider one application that has attracted particular attention: the fusion of AI with big data analytics in the context of persistent overhead surveillance by satellite constellations.<sup>50</sup> The strategic context for such surveillance would be, for example, the tracking of road-mobile ICBMs in something approaching real time after they have left their garrisons. Russian and Chinese road mobile ICBMs provide a potentially survivable response to the revolution in accuracy in U.S. strategic systems. Multihundred kiloton weapons that will putatively fall within one hundred meters of their target will defeat any degree of hardening, so first-strike elimination of most silo-based ICBMs seems plausible.<sup>51</sup> One solution to this dilemma is to make the ICBMs mobile (albeit therefore unhardened) so that they cannot be successfully targeted and eliminated. The vast amounts of data that would be returned from persistent monitoring of the entire relevant road network of an adversary's mobile ICBMs, necessarily analyzed by AI, would be one realization of a new revolution in military affairs that moves beyond accuracy to include reliable and routine near-real-time localization of the enemy's targeted forces. Were such a scheme ever to become credible, it would be so first for the less-challenging case of North Korea than for the cases of Russia or China.<sup>52</sup> However, in this essay I am concerned primarily with the latter two cases, against which great numbers of satellites (sometimes called "swarms") would have to be deployed to enable near-continuous coverage of vast land areas.

Satellite deployments already underway indicate that this idea may not be incredible on a twenty-year timescale.<sup>53</sup> For example, SpaceX is deploying a constellation of optically cross-linked mass-produced small satellites (individual satellite masses of hundreds of kilograms) to create a space-based Internet communication system called "Starlink." SpaceX hopes to deploy twelve thousand of these satellites in three shells of low-Earth orbits with over two thousand in orbit by the mid-2020s, and a possible ultimate expansion to forty-two thousand.<sup>54</sup> The size of this constellation may be compared to the approximately 2,100 active satellites orbiting Earth in August 2019.<sup>55</sup> Starlink does not perform ground surveillance, but its numerical scale shows what is possible. In fact, swarms of surveillance satellites are already being put into orbit by the private sector. Planet Labs' more than three hundred miniature satellites now monitor Earth's entire landmass daily at three-to-five-meter resolution; the company's website promises "persistent global monitoring with low latency tasking to deliver early intelligence" for defense and intelligence purposes.<sup>56</sup> And Capella Space is launching a constellation of

forty-kilogram radar imaging satellites in polar orbits that will allow all-weather “hourly coverage of every point on Earth, rendered in sub-meter resolution.”<sup>57</sup>

None of these constellations does, nor is intended to do, what would be required for monitoring ongoing positions of Russian or Chinese road-mobile ICBMs. To reach that objective, persistent all-weather overhead imaging would need almost continuously to surveil vast areas, coupled with an AI able to sift and interpret the enormous data set that would be returned in near real time. Even then, there would be legitimate questions about the efficacy of defensive measures: clever ways to hide road mobile forces, including simply taking advantage of particular terrain or tunnels; flooding the roads with decoys; or using cyber, jamming, or other techniques to hack or confound the satellite constellations.<sup>58</sup> But because of the powerful *potential* threat to Russian and Chinese second-strike capabilities that it could pose, such a system, even if objectively imperfect and vulnerable, would likely be destabilizing from the perspective of the countries that felt themselves targeted. Even if such a constellation were openly devoted to other purposes, potential adversaries might plan on the assumption that it was either nevertheless intended to support a first strike, or that it could in the future, in a change of doctrine rapidly become so intended. That conclusion has likely been reinforced by analogy, in the decision by the United States in its 2019 Missile Defense Review to state explicitly that U.S. missile defense “policy, strategy and capabilities” must also address anticipated advanced Russian and Chinese delivery systems, not just the missiles of North Korea and Iran.<sup>59</sup>

Some of the defensive measures that China and Russia would seem likely to take in response to such AI-enabled surveillance swarms would be destabilizing. The construction of multiple road-mobile decoys would in itself be stabilizing by making a first strike harder to execute, even while making strategic arms control, and the broadly stabilizing confidently known quantitative knowledge that comes with it, harder to execute. Defensive efforts to jam, blind, or cyber-corrupt large numbers of targets in satellite constellations might be interpreted as a prelude to nuclear use, rather than as motivated by furthering nuclear target survival. And the country being surveilled might decide that even its road-mobile launchers were so vulnerable that their employment had to include the capability and doctrine appropriate for launch-on-warning.

Now evaluate this scenario from the perspective of the elements of the framework above. The combination of surveillance perceived as threatening to road-mobile second-strike systems, hypersonic weapons with the accuracy to strike located road-mobile systems rapidly before their location was lost, and counter-space and cyber weapons intended to degrade either that surveillance or its command and control (the framework element considering potential for misinterpreting a technology’s employment as preparatory to a first strike) would be a dangerous brew. In a conventional war, many of these capabilities would be employed for

reasons other than nuclear first strike, but in an environment in which decisions could increasingly have to be made at “machine speed,” since AI-enabled systems will require each party to exhibit the same rapidity of decisions and actions or be at a disadvantage. Even were this not done autonomously, and humans remained in or at least on the loop, the amount of data that would be processed, interpreted, and presented by AI might lead to automation bias, in which humans surrender judgment to an intelligent decision-support system that they may feel they have no choice but to trust.<sup>60</sup> This landscape seems almost designed to realize the criteria of normal accident theory summarized in the framework above (considering if a technology deployment scenario would likely fulfill the criteria for normal accidents), suggesting a reasonable likelihood for misinterpretation or mistakes that in this context could lead to nuclear escalation.

Formal arms control for a subset of these technologies (for classes of hypersonic vehicles, for example) would seem technically possible. But such efforts would face the desire of the parties to have conventional versions of these weapons, the likely requirement that any such treaty would need to impose constraints multilaterally, and the present context of U.S.-Russian collapsing bilateral arms control. In principle, these problems could all be overcome.<sup>61</sup> For example, satellite constellations could be made more resilient to attack, or states could refrain from building constellations that were so large and capable that road-mobile missiles became vulnerable. Satellite numbers and orbits are strongly verifiable, and limiting total numbers carries the ancillary benefit of lessening the space debris challenge.<sup>62</sup> This would require a willingness to trade (and in the U.S. system to explain successfully to Congress and the public) the prospect of damage limitation for the sake of greater strategic stability, a suggestion to which the political counterarguments are obvious but nevertheless need to be engaged. Finally, some proponents of a new technology may intentionally be choosing the pursuit of an advantage, or the hope for eventual primacy, over near-term strategic stability. Even in this case, however, the implications for stability of different technologies must be understood and weighed.

Many other technologies, particularly enabling technologies whose use is pervasive and not credibly subject to monitoring, resist arms control based on effective verification.<sup>63</sup> And in any case, such verification may, at this time, be politically difficult. The major powers will therefore instead have to find other ways to cope with these technologies and their implications. These efforts should include robust exchanges with potential adversaries so that pathways to nuclear escalation, and possible preventive or mitigating steps, can be identified and discussed.

#### ABOUT THE AUTHOR

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#### ENDNOTES

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- <sup>2</sup> See Christopher A. Bidwell and Bruce W. MacDonald, *Emerging Disruptive Technologies and Their Potential Threat to Strategic Stability and National Security* (Washington, D.C.: Federation of American Scientists, 2018); James M. Acton, “Technology, Doctrine, and the Risk of Nuclear War,” in *Meeting the Challenges of the New Nuclear Age: Emerging Risks and Declining Norms in the Age of Technological Innovation and Changing Nuclear Doctrines* (Cambridge, Mass.: American Academy of Arts and Sciences, 2018); Keir A. Lieber and Daryl G. Press, “The New Era of Counterforce: Technological Change and the Future of Nuclear Deterrence,” *International Security* 41 (4) (2017): 9–49; Benoît Pelopidas, Keir A. Lieber, and Daryl G. Press, “New Era or New Error? Technology and the Future of Deterrence,” *International Security* 43 (3) (2018/19): 190–193; Dean Wilkening, “Hypersonic Weapons and Strategic Stability,” *Survival* 61 (5) (2019): 129–148; Todd Harrison, Kaitlyn Johnson, and Thomas G. Roberts, *Space Threat Assessment 2019* (Washington, D.C.: Center for Strategic and International Studies, 2019), <https://www.csis.org/analysis/space-threat-assessment-2019>; and Edward Geist and Andrew J. Lohn, *How Might Artificial Intelligence Affect the Risk of Nuclear War?* (Santa Monica, Calif.: RAND Corporation, 2018).
- <sup>3</sup> Emily O. Goldman, “Reciprocity to Revolution: Carrier Air Power in Peace and War,” in *The Diffusion of Military Technology and Ideas*, ed. Emily O. Goldman and Leslie C. Eliason (Stanford, Calif.: Stanford University Press, 2003), 267–303; and Michael C. Horowitz, *The Diffusion of Military Power: Causes and Consequences for International Politics* (Princeton, N.J.: Princeton University Press, 2010).
- <sup>4</sup> I am grateful to David C. Logan for emphasizing the MIRV example to me, and to Leyatt Betre for deepening my understanding of the deployment of MIRVs on ICBMs and SLBMs during the Cold War.
- <sup>5</sup> See, for example, discussions in Elbridge A. Colby and Michael S. Gerson, eds., *Strategic Stability: Contending Interpretations* (Carlisle, Penn.: Strategic Studies Institute, U.S. Army War College, 2013); Bidwell and MacDonald, *Emerging Disruptive Technologies*; and Geist and Lohn, *How Might Artificial Intelligence Affect the Risk of Nuclear War?*

- <sup>6</sup> For a discussion of these broader definitions, see Linton F. Brooks, “The End of Arms Control?” *Dædalus* 149 (2) (2020).
- <sup>7</sup> For example, see Barry R. Posen, *Inadvertent Escalation: Conventional War and Nuclear Risks* (Ithaca, N.Y.: Cornell University Press, 1991). In principle, one could define crisis stability to include strong incentives not to escalate higher after nuclear weapons have already been used at a lower level of intensity. While clearly important should the nuclear-use threshold ever be breached, I focus here on that initial escalation to nuclear weapons use. A memorable discussion is that of Herman Kahn, who identifies forty-four distinct rungs on the escalation ladder. See Herman Kahn, *On Escalation: Metaphors and Scenarios* (Santa Barbara, Calif.: Praeger, 1965).
- <sup>8</sup> David E. Sanger, *The Perfect Weapon: War, Sabotage and Fear in the Cyber Age* (New York: Crown, 2018).
- <sup>9</sup> Michael C. Horowitz, “Artificial Intelligence, International Competition, and the Balance of Power,” *Texas National Security Review* 1 (3) (2018): 36–57; Geist and Lohn, *How Might Artificial Intelligence Affect the Risk of Nuclear War?*; Lora Saalman, “Fear of False Negatives: AI and China’s Nuclear Posture,” *Bulletin of the Atomic Scientists*, April 24, 2018, <https://thebulletin.org/2018/04/fear-of-false-negatives-ai-and-chinas-nuclear-posture/>; Herbert Lin, “Escalation Risks in an AI-Infused World,” in *AI, China, Russia and the Global Order: Technological, Political, Global, and Creative Perspectives*, ed. Nicholas D. Wright (Washington, D.C.: U.S. Department of Defense, 2018), chap. 19; and Vincent Boulanin, ed., *The Impact of Artificial Intelligence on Strategic Stability and Nuclear Risk* (Stockholm: SIPRI, 2019), <https://www.sipri.org/sites/default/files/2019-05/sipri1905-ai-strategic-stability-nuclear-risk.pdf>.
- <sup>10</sup> Christopher F. Chyba, “Biotechnology and the Challenge to Arms Control,” *Arms Control Today*, October 2006, 11–17; Daniel M. Gerstein, *National Security and Arms Control in the Age of Biotechnology* (Lanham, Md.: Rowman & Littlefield, 2013); and Kate Charlet, “The New Killer Pathogens: Countering the Coming Bioweapons Threat,” *Foreign Affairs* 97 (3) (2018), <https://www.foreignaffairs.com/articles/2018-04-16/new-killer-pathogens>.
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- <sup>14</sup> Bidwell and MacDonald, *Emerging Disruptive Technologies*. See also Adam Bernstein, George Baldwin, Brian Boyer, et al., “Nuclear Security Applications of Antineutrino Detectors:

Current Capabilities and Future Prospects,” *Science & Global Security* 18 (3) (2010): 127–192.

<sup>15</sup> Bidwell and MacDonald, *Emerging Disruptive Technologies*.

<sup>16</sup> Ryan Snyder, “A Proliferation Assessment of Third Generation Laser Uranium Enrichment Technologies,” *Science & Global Security* 24 (2) (2016); and Bidwell and MacDonald, *Emerging Disruptive Technologies*.

<sup>17</sup> The adoptive capacity of states, and what determines it, is a central concern of the military technology diffusion literature. See Goldman and Eliason, *The Diffusion of Military Technology*; Horowitz, *The Diffusion of Military Power*; and Horowitz, “Artificial Intelligence.” For an argument that the “exponential increase in the complexity of military technology” offsets “the diffusing effects of globalization,” at least for certain weapons and states, see Andrea Gilli and Mauro Gilli, “Why China Has Not Caught Up Yet: Military-Technological Superiority and the Limits of Imitation, Reverse Engineering, and Cyber Espionage,” *International Security* 43 (3) (2018/19): 141–189.

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<sup>19</sup> Robert Carlson, “The Pace and Proliferation of Biological Technologies,” *Biosecurity and Bioterrorism* 1 (3) (2003): 203–214; and Robert Carlson, *Causes and Consequences of Bioeconomic Proliferation: Implications for U.S. Physical and Economic Security* (Washington, D.C.: Department of Homeland Security Science and Technology Directorate, 2012), [http://www.biodesic.com/s/Carlson\\_Bioeconomic\\_Proliferation\\_Final\\_edited\\_for\\_public\\_release.pdf](http://www.biodesic.com/s/Carlson_Bioeconomic_Proliferation_Final_edited_for_public_release.pdf).

<sup>20</sup> Chyba, “Biotechnology and the Challenge to Arms Control.”

<sup>21</sup> Horowitz, *The Diffusion of Military Power*; and Horowitz, “Artificial Intelligence.”

<sup>22</sup> Thomas C. Schelling and Morton H. Halperin, *Strategy and Arms Control* (New York: Twentieth Century Fund, 1961).

<sup>23</sup> Vince Manzo, *Nuclear Arms Control Without a Treaty? Risks and Options After New START*, (Arlington, Va.: CNA, 2019), [https://www.cna.org/CNA\\_files/PDF/IRM-2019-U-019494.pdf](https://www.cna.org/CNA_files/PDF/IRM-2019-U-019494.pdf); and Brooks, “The End of Arms Control?”

<sup>24</sup> The relevant language reads [*italics mine*]:

The United States is now prepared to strengthen its long-standing “negative security assurance” by declaring that the United States will not use or threaten to use nuclear weapons against non-nuclear weapons states that are party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and in compliance with their nuclear non-proliferation obligations.... *Given the catastrophic potential of biological weapons and the rapid pace of bio-technology development, the United States reserves the right to make any adjustment in the assurance that may be warranted by the evolution and proliferation of the biological weapons threat and U.S. capacities to counter that threat.* In the case of countries not covered by this assurance – states that possess nuclear weapons and states not in compliance with their nuclear non-proliferation obligations – *there remains a narrow range of contingencies in which U.S. nuclear weapons may still play a role in deterring a conventional or CBW attack against the United States or its allies and partners. The United States is therefore not prepared at the present time to adopt a universal policy that the “sole purpose” of U.S. nuclear weapons is to deter nuclear attack on the United States and our allies and partners, but will work to establish conditions under which such a policy could be safely adopted.*



See U.S. Secretary of Defense, *2010 Nuclear Posture Review Report* (Washington, D.C.: Office of the Secretary of Defense, 2010), 15–16, <https://www.hsdl.org/?view&did=777468>.

<sup>25</sup> The relevant language reads [*italics mine*]:

“*There are two forms of uncertainty regarding the future security environment which U.S. nuclear policy, strategy, and posture must take into account. The first is geopolitical uncertainty. . . . The second form of uncertainty is technological. This includes the potential for unanticipated technological breakthroughs in the application of existing technologies, or the development of wholly new technologies, that change the nature of the threats we face and the capabilities required to address them effectively. For example, breakthroughs that would render U.S. nuclear forces or U.S. command and control of those forces highly vulnerable to attack would dramatically affect U.S. nuclear force requirements, policy, and posture. The proliferation of highly-lethal biological weapons is another example.*”

See U.S. Secretary of Defense, *Nuclear Posture Review 2018* (Washington, D.C.: Office of the Secretary of Defense, 2018), 14, <https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF>.

<sup>26</sup> Defense Intelligence Agency, *Challenges to Security in Space* (Washington, D.C.: Defense Intelligence Agency, 2019), [https://www.dia.mil/Portals/27/Documents/News/Military%20Power%20Publications/Space\\_Threat\\_V14\\_020119\\_sm.pdf](https://www.dia.mil/Portals/27/Documents/News/Military%20Power%20Publications/Space_Threat_V14_020119_sm.pdf).

<sup>27</sup> “The difficulty in successful forensics work, especially as part of an attribution process, should not be underestimated. However, the potential for nuclear forensics to play a crucial role in analysis of both pre- and post-detonation materials is enormous.” See American Physical Society and the American Association for the Advancement of Science, *Nuclear Forensics: Role, State of the Art, Program Needs* (Washington, D.C.: American Association for the Advancement of Science, 2008), 4.

<sup>28</sup> James M. Acton, “Cyber Warfare & Inadvertent Escalation,” *Dædalus* 149 (2) (Spring 2020); and Harrison et al., *Space Threat Assessment*.

<sup>29</sup> For one Chinese view, see Lyu Jinghua, “A Chinese Perspective on the Pentagon’s Cyber Strategy: From ‘Active Cyber Defense’ to ‘Defending Forward,’” *Lawfare*, October 19, 2018, <https://www.lawfareblog.com/chinese-perspective-pentagons-cyber-strategy-active-cyber-defense-defending-forward>.

<sup>30</sup> Donald MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge, Mass.: The MIT Press, 1990); and Keir Lieber and Daryl Press, “The End of MAD? The Nuclear Dimension of U.S. Primacy,” *International Security* 30 (4) (2006): 7–40.

<sup>31</sup> Franz-Stefan Gady, “Lora Saalman on How Artificial Intelligence Will Impact China’s Nuclear Strategy,” *The Diplomat*, November 7, 2018, <https://thediplomat.com/2018/11/lora-saalman-on-how-artificial-intelligence-will-impact-chinas-nuclear-strategy/>.

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<sup>33</sup> Charles Perrow, *Normal Accidents: Living with High-Risk Technologies* (New York: Basic Books, 1984); and Scott D. Sagan, *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons* (Princeton, N.J.: Princeton University Press, 1993).

<sup>34</sup> Jim Mattis, “Secretary of Defense Jim Mattis Senate Armed Services Committee Written Statement for the Record,” April 26, 2018, 13.

- <sup>35</sup> Existing warheads from ICBMs and SLBMs are hypersonic, but the term is typically used to refer to new technologies that are not ballistic or not purely ballistic.
- <sup>36</sup> Woolf, *Conventional Prompt Global Strike*; Aaron Gregg, “Air Force Awards Massive Hypersonic Contract to Lockheed Martin,” *The Washington Post*, April 18, 2018; Ben Brimelow, “Russia, China, and the U.S. Are in a Hypersonic Weapons Arms Race—And Officials Warn the U.S. Could Be Falling Behind,” *Business Insider*, April 30, 2018, <https://www.businessinsider.com/hypersonic-weapons-us-china-russia-arms-race-2018-4>; and Kosuke Takahashi, “Japan Developing Hypersonic Glide Weapon to Defend Remote Islands,” *Jane’s 360*, September 27, 2018, <https://www.janes.com/article/83397/japan-developing-hypersonic-glide-weapon-to-defend-remote-islands>.
- <sup>37</sup> Acton, “Hypersonic Boost-Glide Vehicles”; Speier et al., *Hypersonic Missile Nonproliferation*; and Wilkening, “Hypersonic Weapons.”
- <sup>38</sup> Adam Lowther and Curtis McGiffin, “America Needs a ‘Dead Hand,’” *War on the Rocks*, August 16, 2019, <https://warontherocks.com/2019/08/america-needs-a-dead-hand/>.
- <sup>39</sup> As Lowther and McGiffin note in *ibid.*, their suggestion is in some ways reminiscent of the Soviet Union’s reported “dead hand” retaliatory system. See David E. Hoffman, *The Dead Hand: The Untold Story of the Cold War Arms Race and Its Dangerous Legacy* (New York: Doubleday, 2009).
- <sup>40</sup> Joshua H. Pollack, “Boost-Glide Weapons and U.S.-China Strategic Stability,” *The Nonproliferation Review* 22 (2) (2015): 155–164.
- <sup>41</sup> Li Bin, “Tracking Chinese Strategic Mobile Missiles,” *Science & Global Security* 15 (1) (2007): 1–30.
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- <sup>47</sup> An illuminating informal definition of AI is “the use of computers to simulate the behavior of humans that requires intelligence,” from Horowitz, “Artificial Intelligence,” 40. John McCarthy, one of the founders of AI research, once wryly remarked that “As soon as it works, no one calls it AI anymore.” See Bertrand Meyer, “John McCarthy,” *Communications of the ACM*, October 28, 2011, <https://cacm.acm.org/blogs/blog-cacm/138907-john-mccarthy/fulltext>.
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*Intelligence and National Security* (Washington, D.C.: Center for a New American Security, 2019); and Elsa Kania, "Artificial Intelligence in Future Chinese Command Decision-Making," in *AI, China, Russia and the Global Order: Technological, Political, Global, and Creative Perspectives*, ed. Nicholas D. Wright (Washington, D.C.: U.S. Department of Defense and Joint Chiefs of Staff, 2018), chap. 20. Russia's President Putin famously predicted that whoever becomes the leader in AI "will become the ruler of the world." See James Vincent, "Putin Says the Nation that Leads in AI Will Be the Ruler of the World," *Verge*, September 4, 2017; and Samuel Bendett, "The Development of Artificial Intelligence in Russia," in *AI, China, Russia and the Global Order*, chap. 22.

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- <sup>50</sup> Bidwell and MacDonald, *Emerging Disruptive Technologies*; and Lieber and Press, "The New Era of Counterforce." Paul Bracken also considers AI fused with big data from persistent surveillance of other, less obviously realizable types, including swarms of oceanic vehicles or data obtained via systematic hacking of other countries' surveillance systems; see Paul Bracken, "The Cyber Threat to Nuclear Stability," *Orbis* 60 (2) (2016): 188–203. See also Austin Long and Brendan Rittenhouse Green, "Stalking the Secure Second Strike: Intelligence, Counterforce, and Nuclear Strategy," *Journal of Strategic Studies* 38 (1–2) (2015): 38–73.
- <sup>51</sup> Lieber and Press, "The End of MAD?" See also Peter C. W. Flory, Keith Payne, Pavel Podvig, and Alexei Arbatov, "Nuclear Exchange: Does Washington Really Have (or Want) Nuclear Primacy?" *Foreign Affairs* 85 (5) (2006): 149–157; and Jeffrey Lantis, Tom Sauer, James Wirtz, et al., "The Short Shadow of U.S. Primacy?" *International Security* 31 (3) (2006/07): 174–193.
- <sup>52</sup> Bidwell and MacDonald, *Emerging Disruptive Technologies*; and Lieber and Press, "The New Era of Counterforce."
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- <sup>55</sup> Union of Concerned Scientists, "UCS Satellite Database," December 8, 2005, <https://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database>.
- <sup>56</sup> See Planet Labs Incorporated, "Defense and Intelligence," <https://www.planet.com/markets/defense-and-intelligence/>.
- <sup>57</sup> See Capella Space, "The Capella 36," <https://www.capellaspace.com/technology/>.

- <sup>58</sup> Li, “Tracking Chinese Strategic Mobile Missiles.”
- <sup>59</sup> “New ballistic missile systems feature multiple independently targetable reentry vehicles (MIRV) and maneuverable reentry vehicles (MaRV), along with decoys and jamming devices. Russia and China are developing advanced cruise missiles and hypersonic missile capabilities that can travel at exceptional speeds with unpredictable flight paths that challenge existing defensive systems. These are challenging realities of the emerging missile threat environment that U.S. missile defense policy, strategy, and capabilities must address.” U.S. Department of Defense, *2019 Missile Defense Review* (Washington, D.C.: Office of the Secretary of Defense, 2019), ii.
- <sup>60</sup> M. L. Cummings, “Automation Bias in Intelligent Time Critical Decision Support Systems,” presented at AIAA First Intelligent Systems Technical Conference, Chicago, Illinois, September 20–22, 2004, <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.91.2634&rep=rep1&type=pdf>.
- <sup>61</sup> See Timbie, “A Way Forward.”
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# Nuclear Disarmament without the Nuclear-Weapon States: The Nuclear Weapon Ban Treaty

*Harald Müller & Carmen Wunderlich*

*The 2017 Treaty on the Prohibition of Nuclear Weapons (TPNW) represents a daring act of self-empowerment: nuclear have-nots produced an international disarmament treaty without the involvement of the nuclear-weapon states or their allies. In this essay, we assess how the new treaty relates to the existing nuclear order and its four central norms: constraints on use, political restraint, non-proliferation, and disarmament. We discuss the TPNW's origin in and impact on this contested order. At the heart of contestation are two security concepts: deterrence versus the immediate ban of nuclear arms, which result in fundamentally different ideas on how to pursue the road to "global zero." Whether or not the TPNW and the Treaty on the Non-Proliferation of Nuclear Weapons are compatible depends on how the opponents handle their controversies. The key is to overcome the emotionalized polarization and rediscover a common basis in order to prevent damage to the existing nuclear order and bring forward nuclear disarmament in practice.*

**T**he Treaty on the Prohibition of Nuclear Weapons (TPNW) is the product of more than fifty years of norm contestation regarding disarmament. It is essential to see the Nuclear Weapon Ban Treaty as a dependent variable of the politics surrounding the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). The TPNW has not fallen from heaven and is not the result of malign intentions, but is a consequence of the history of debates on and practices of disarmament since negotiations on the NPT began in the 1960s.

The TPNW, signed in 2017, represents a new approach to nuclear disarmament: rather than being hapless bystanders, the have-nots came together and produced an international disarmament treaty without the nuclear-weapon states (NWS) – the United States, the United Kingdom, France, Russia, and China – or their allies. What looks, for the NWS, like an undesirable intrusion onto their turf represents, for ban supporters, an act of self-empowerment in an area they regard as crucial to their own security and survival.

It is not, as some critics have maintained, preordained by the nature of the TPNW that it will damage the NPT. Whether the two treaties are compatible or not depends on how opponents and proponents of the TPNW handle their controversies. Reasonable policies can create a *modus vivendi*. Antagonistic policies can create incompatibility. Right now, the outcome is indeterminate.

**T**he TPNW debate affects the normative order concerning nuclear weapons. In this essay, we discuss four sets of norms that constitute this order: constraints on use, political restraint, nonproliferation, and disarmament.<sup>1</sup>

We understand norms as shared understandings about appropriate behavior.<sup>2</sup> Norms can be intended for constitutive, regulative, or procedural functions. We deal, however, with the intentional, unintentional, or counterintentional effects that norms have on actors. Norms can express and serve an actor's interest, leading to voluntary compliance on a utilitarian basis, and they can enable and constrain an actor's freedom of action, making compliance more likely without determining it. They can frame and solidify understanding of right and wrong, leading to stable views of appropriate behavior. But they may also provoke resentment and rebellion, expressed in contestation, deviant discourse, and noncompliance including with core norms.<sup>3</sup> "Negative" effects result when a) actors deem norms aversive to their interests or values; b) certain actors apply double standards to compliance and enforcement; c) actors unilaterally prioritize certain norms over others; or d) decision-making procedures are seen as unjust.

Norms concerning nuclear weapons have not emerged by strategic design. They are the product of superpowers' arms racing practices; experiences like the Cuban missile crisis that enhanced efforts to prevent catastrophic nuclear escalation; multilateral negotiations like those on the NPT and bilateral ones like those on SALT (Strategic Arms Limitation Talks) and START (Strategic Arms Reduction Treaty); efforts of the NWS to maintain their reputation as responsible powers; the aspiration of the NWS and their allies to preserve extended deterrence at the lowest possible risk; and the desire of non-nuclear-weapon states (NNWS) to achieve security and risk reduction through (normative) constraints on the NWS and disarmament. Multiple actors and motivations have rendered the nuclear order a patchwork drawing together contradictory impulses, not a coherent whole. The disparate influences of the ideas of deterrence and disarmament show in the four central norms of the order.<sup>4</sup>

The first norm is constraint on use in which deterrers and disarmers both have a significant interest. There is a strong presumption that nuclear use should be avoided (though strategic debates, doctrines, and rhetoric utter occasionally a more cavalier attitude). This norm finds expression in national doctrines like the Chinese and Indian "no-first-use" policies or NATO's "only in the most remote circumstances." It is legally codified in the NWS's security guarantees to

nuclear-weapon-free zones and politically codified in their nationally declared security guarantees to NPT non-nuclear-weapon states, noted by UN Security Council resolutions in 1968 and 1995. It has grown by practice and public discourse into a strong informal norm internalized by decision-makers: the “nuclear taboo,” based, depending on the theoretical perspective, on moral-cultural underpinnings or on tradition-induced reputational concerns.

The norm is doubly contested. Nuclear strategists argue the utility and possibility of nuclear use for political and military purposes. And in contrast, there are advocates for stronger constraints (such as unconditional, treaty-based universal security guarantees and codification of no-first-use) up to the demand to guarantee nonuse through the complete elimination of nuclear weapons and renunciation of nuclear deterrence as illegitimate.

The second norm, political restraint, is even more diffuse. It prescribes behavior minimizing the risk of nuclear escalation. It concerns doctrines and strategies, nuclear rhetoric, policies by nuclear weapons possessors toward neighbors, crisis avoidance and management, armament policies supporting strategic stability, and a viable balance of forces – key principles of nuclear arms control. The function of this norm is to prevent the strategy/practice of nuclear deterrence from getting out of control. Political restraint has been codified in the NPT preamble, which calls for the easing of tension and strengthening of trust in order to facilitate nuclear disarmament, refraining from the threat and use of force against the territorial integrity and independence of other states. Codification is found in several U.S.-Soviet agreements in the early 1970s, the “Basic Principles” that aim at preventing dangerous crises, the “Agreement on the Prevention of Nuclear War,” and the “Incidents at Sea Agreement,” deemed so useful by U.S. admirals that they dissuaded Reagan’s Secretary of Defense Caspar Weinberger from scrapping it.<sup>5</sup> This norm underlies the suggestion by the U.S. government to explore a security environment conducive to nuclear disarmament.

The norm has not been contested in principle, but is frequently ignored by great powers’ policies and armament practices. Contention comes from two angles. First, proponents of national superiority and territorial expansion loathe political restraint. Mutual accusations of trespassing normative thresholds (such as during the Iraq War or Ukraine crisis) have constituted important instances of applicatory contestation.<sup>6</sup> Ironically, the NWS that have called for political restraint as a condition for disarmament have themselves contributed the most to an unfavorable security environment. Second, contesters refuse any conditionality between environment and disarmament.

The third norm of renunciation/nonproliferation (as enshrined in the NPT) proscribes for states not possessing nuclear weapons the pursuit of them in any way. Contestation rages over the limits this norm imposes on the peaceful uses of nuclear energy, the intrusiveness of verification, or the strictness of nuclear-related

export controls. Also contested is the conditionality of such restrictions on parallel progress in disarmament.<sup>7</sup>

The fourth norm is nuclear disarmament, which can include everything from arms control and arms reduction to elimination, prohibition, and stigmatization. The (vague) codification in Article VI of the NPT was the essential condition for the NNWS to agree to the codification of the nonproliferation norm; its confirmation and specification to require the Comprehensive Nuclear-Test-Ban Treaty (CTBT), negotiation on a fissile material cut-off, and further systematic reductions of the nuclear arsenals was the quid pro quo for many NNWS to accept indefinite extension of the NPT in 1995.<sup>8</sup> The weight of disarmament, disarmament strategy, timing, conditionality, and the state of compliance have all been contested.

These norms constituting a global nuclear order are all interrelated to a certain extent. Such linkages may lead to conflicts and tensions between the norms, such as when states ascribe different relative priority to individual norms. The fiercest front of contestation lies between nonproliferation and nuclear disarmament. The NWS (except China) regard nonproliferation as the treaty's overarching goal and superior to disarmament (and peaceful uses), while most NNWS, particularly those from the nonaligned movement, emphasize the equality of these norms.<sup>9</sup> These differences sometimes result in playing the norms against each other, in particular, with regard to perceived unequal compliance: the NNWS demand equivalent compliance concerning all pillars as a condition for further nonproliferation measures.

Yet clustering norms into a package may conversely facilitate normative development and make individual norms more resilient to challenges.<sup>10</sup> Demands for strengthening a particular norm (such as verification) might endow less powerful parties with leverage to demand reciprocal strengthening of other norms (such as specified disarmament steps). Concessions on one issue will be granted only in return for concessions elsewhere, like the indefinite extension of the NPT in 1995 in exchange for an enhanced review process, the "principles and objectives for nuclear non-proliferation and disarmament" decision, and the Middle East resolution.

Norms may also be aligned with widely accepted norms outside the issue area, such as the humanitarian reframing of the disarmament norm.<sup>11</sup> The interrelation between norms, the possibility to prioritize, and linkages to other issue areas give options to actors and make norm decay, stalemate, or strengthening contingent on how actors handle norm conflicts rather than on any supposed essential meaning of the norms.<sup>12</sup>

**T**he TPNW pronounces a categorical prohibition of nuclear weapons in all aspects, from development to possession, deployment to use. It pulls together and sharpens the existing norms of restraint on use, nonprolif-



eration, and disarmament and leaves aside the norm on political restraint. It is incompatible with nuclear deterrence and envisages a state of the world profoundly different from the one when the NPT was negotiated.

The road to the TPNW followed a series of forks.<sup>13</sup> The first was whether to proceed outside traditional venues: the NPT review process and the Conference on Disarmament (CD). There, nuclear disarmament has been under the control of the NWS, notably, the United States and Russia. The *détente* period in the 1970s and the dissolution of the Cold War reawakened hope that the step-by-step approach to disarmament might succeed. The NPT conferences of 1995 and 2000 resulted in agreed disarmament agendas. The refusal of the U.S. Senate to ratify the CTBT was the first setback, followed by much worse experiences: at the 2005 Review Conference (RevCon), the Bush administration, seconded by Russia and France, rejected honoring past agreements because they were made by “another government” and under “other circumstances.” This fateful policy delivered the death knell to a step-by-step disarmament strategy under the auspices of the NPT. It does not represent a failure of the NPT. Rather, arbitrarily scrapping agreements achieved through hard good faith by a change of government or a redefinition of national interest represents a compliance failure by the NWS. It undermines the idea of a process in which the parties agree on measures that are subsequently implemented so that new steps can be negotiated. Dissatisfied actors were quickly grasping the gravity of this experience.

Immediately after the 2005 RevCon, a leading disarmament NGO, International Physicians for the Prohibition of Nuclear War (IPPNW), concluded that the old approach had failed because NWS commitments were unreliable. They considered taking nuclear disarmament out of the NPT and the CD, thereby emulating the Ottawa Process that had quickly produced the prohibition of antipersonnel mines despite great-power opposition. This approach had succeeded because a group of like-minded ban proponents established a negotiation process without vetoes and set a time goal for its conclusion.

The IPPNW’s reasoning attracted other disarmament NGOs and a few disarmament-minded governments. In 2007, the International Campaign to Abolish Nuclear Weapons (ICAN) was founded as an NGO coalition. Some small and medium powers plus NGOs devoted to disarmament and nonproliferation decided to take the initiative from the NWS; this was a response to the NWS practice of treating nuclear disarmament as their exclusive turf without influence by the have-nots. The like-minded actors established control by an Ottawa-like process in which the NWS would not dispose of veto power. The aim was a nuclear weapons convention, analogous to the Chemical Weapons Convention. Some voices at the end of the decade argued for a shorter and simpler ban, but this issue remained undecided. ICAN converged on this option in 2012, and supporting states joined after 2015.

Another fork in the road was the question of the discursive framework for the new approach. Again emulating the Ottawa Process, the campaign deemphasized the (national) security aspects of nuclear weapons and focused on the humanitarian impact of nuclear weapons use as a key reason for prohibition.<sup>14</sup> The support of the International Committee of the Red Cross gave a push to this shift.<sup>15</sup> Groups without a nuclear disarmament record but with experiences in humanitarian disarmament joined the movement. The coalition gained strength and cohesion through several series of informal meetings.

President Obama's policy served as encouragement: the president of the most powerful NWS declared a nuclear-weapon-free world his policy goal. This removed the stigma of irrationalism from the movement. However, Obama's disarmament efforts after the early achievement of New START slowed down, he failed to revive CTBT ratification, and he invested in modernizing the U.S. nuclear arsenal. New arms control initiatives stalled under the double juggernaut of a U.S. Congress controlled by the arms control-averse Republican right wing and the uncooperative policies of Putin's Russia. Hesitant coalition members and an increasing number of NNWS governments accepted that a decisive change was needed.

During the 2010 NPT Review, the successful NWS effort to water down much of the disarmament proposals for the final document reinforced the determination of campaign supporters to move elsewhere. An initiative in the 2012 United Nations General Assembly (UNGA) led to the establishment of an Open-Ended Working Group (OEWG) to explore future disarmament steps. Boycotted by the NWS (but not India and Pakistan), it met for three sessions in 2013. The embargo strengthened the positions of coalition members pleading for progressing without the NWS.

Meanwhile, the central role and capabilities of ICAN grew.<sup>16</sup> NATO member Norway (under a social democratic government) funded ICAN from 2010 to 2013 (when a conservative government was elected). ICAN grew into a well-organized, global organization with an international steering committee. In 2013, Norway invited ICAN to help prepare a conference in Oslo on the humanitarian consequences of nuclear war. While the organizers did not offer proposals for action, participants assessed the dangers presented by nuclear weapons as requiring action. The second conference in Nayarit, Mexico, that took place in February 2014, highlighted a "legal gap": the failure to prohibit nuclear weapons like biological and chemical weapons, antipersonnel mines, and cluster munitions despite their much higher destructivity. Austria, convener of the third conference in Vienna in December 2014, offered the "humanitarian pledge" to fill this supposed gap.

The failure of the 2015 NPT RevCon led to the next fork in the road. The NWS embargo of the OEWG and the humanitarian conferences (the United Kingdom and the United States attended only the last one) was confirmed by the harsh and arrogant demeanor of the NWS in 2015. The low point was an undiplomatic,

offending attack by the Western NWS and Russia against Swiss diplomat Benno Laggner, chair of Subsidiary Body 1 on nuclear disarmament, who did his best to present an outcome that reflected the two antagonistic positions.<sup>17</sup> In the end-game, the NWS blocked a series of disarmament measures that were agreed upon five years earlier without giving reason. Throughout, the NWS refused to engage with the humanitarian-risk argument either by negating its relevance or by pretending that they were already taking all necessary steps for risk reduction.

After this conference, the preference for negotiating without the NWS – and therefore avoiding compromises that would attract them to participate – won out. Following that, supporters had to strive for a simple ban, not a technical-operative convention; the latter option had become obsolete because it necessitated input from NWS expertise. Consequently, ban supporters used their majority in the UNGA to establish another OEWG, follow its recommendation for a negotiating body, and adopt the treaty text that this body produced. Throughout this process, the NWS were reduced to protesting powerlessly outside the negotiation room, while the have-nots were suddenly in control.

The final fork in the road concerned content, notably whether to improve the NPT or to avoid new obligations on the NNWS that would be necessary if the treaty should provide a solid basis for security in a nuclear-weapon-free world. Controversies concerned prohibiting transit of nuclear weapons through areas under the jurisdiction of parties, setting a verification standard above the NPT's comprehensive safeguards, establishing strict compliance and enforcement in case of suspected noncompliance, ensuring membership of TPNW parties in the NPT, and forsaking withdrawal rights because of the special purpose of the TPNW to grant a nuclear-weapon-free world. Negotiators settled – under self-imposed time pressure and the stubborn resistance of a group of states against stricter rules – for the weaker options, to the dismay of seasoned supporters of the Humanitarian Initiative (HI) like Switzerland or Sweden.<sup>18</sup>

Critics of the ban have characterized it as the result of deep frustration and impatience on the part of the majority of governments and NGOs. Frustration was certainly a powerful motivation; we know today from neuroscientists that emotions influence any decision we take and, after all, reliance on nuclear deterrence is motivated by the strong emotion of fear.<sup>19</sup> Participants productively turned frustration into self-empowerment. Small and middle powers and civil society demonstrated that they could accomplish something in nuclear policy despite its highly asymmetrical power distribution. The resulting emotional satisfaction is certainly motivating, but goes occasionally overboard.

As this narrative shows, actors decided at several forks which direction to choose; they did so on the basis of experiences with and behavior of the NWS, and on the basis of strategic considerations. The adoption of the TPNW and the emphatic and fierce opposition to it by the NWS and their allies remind us that

nuclear policy is not just about controlling dangerous physical items and coolly calculating costs and benefits. The dispute evokes moral antagonisms and involves strong emotions.

What will the ban's impact be? Ban critics claim that the TPNW weakens verification obligations compared to the NPT.<sup>20</sup> But the TPNW requires its parties to carry the same verification obligations they had under the NPT: at a minimum, comprehensive safeguards. TPNW parties have the Additional Protocol in force and will remain subject to this undertaking as well. Admittedly, the TPNW does not provide for a verification system that could master the security challenges of a nuclear-weapon-free world. Comprehensive safeguards offer no leverage against clandestine nuclear activities, but the Additional Protocol does. In a nuclear-weapon-free world, verification will have to be intrusive and intensive. TPNW negotiators did not want to address verification for lack of expertise. But they established a procedure for the NWS to work out effective verification measures. They could have done the same for the NNWS: like the NPT (Article III.1), the TPNW should contain a binding commitment to enter negotiations on stronger verification measures once a nuclear-weapon-free world is approaching. The same is true for compliance and enforcement procedures needed to maintain security in a nuclear-weapon-free world, which cannot remain entrusted to the UN Security Council: enforcement against illegal nuclear armament must not be subject to a veto. About this, the TPNW says nothing – exactly like the NPT.<sup>21</sup>

Ban critics maintain that TPNW Article 18 “supersedes” the NPT and that this could cause problems of interpretation and ensuing confusion.<sup>22</sup> But this critique assumes that undertakings in the TPNW contradict those in the NPT, which is not the case for the NNWS. The most critical case (overlooked even by ban critics) – the obligation not to transfer nuclear items without International Atomic Energy Agency safeguards (NPT Article III.2), which is not explicitly repeated in the TPNW – is covered by TPNW's catch-all prohibition of “assistance” for proscribed activities. Ban opponents still have to deliver proof for the “superseding” problem.

Ban critics claim that the TPNW creates and exacerbates fissures in the NPT review process.<sup>23</sup> But, as shown, the ban is the consequence of deep divisions in the NPT community, not their cause. Whether it will deepen these divisions is not determined by its nature, but by how actors handle the ban, and their divisions. After all, ban supporters will have a hard time disrupting the NPT review process as brutally as the Bush administration did in 2005. Ban critics have also not presented convincing arguments for the allegation that the TPNW is a showstopper for nuclear disarmament negotiations; negotiations had stalled years before the ban was negotiated.<sup>24</sup>

Ban critics state that supporters apply an ethics of absolute ends (*Gesinnungsethik*), rather than an ethic of responsibility (evaluating by the consequences).<sup>25</sup> But this is also not correct. The HI was motivated by the horrific consequences of nuclear use, and ban supporters believe future nuclear use has a probability above zero. Ban opponents often share the assessment of catastrophic consequences, but believe that deterrence can reliably prevent use. Both ethics are consequentialist, and both are built on opposite faiths; given the history of past nonuse, with good luck as a major factor, the faith of ban supporters could claim higher plausibility.<sup>26</sup>

Some have voiced concern that the ban might divert energies from strengthening the NPT or, when disarmament stalls, could induce parties to leave the NPT with the pretense that the TPNW is the better treaty. But nothing in the utterances and behavior of leading ban proponents confirms these fears. They are staunch supporters of the NPT and argue the compatibility and mutual strengthening of both treaties. In a situation of a dangerous nuclear arms race and no disarmament, states might possibly consider leaving the NPT, not because of the TPNW, but in order to be free to pursue a national nuclear deterrent.

Ban critics are correct that several TPNW clauses (withdrawal, accession for the NWS, and the nebulous “competent authority” that shall supervise nuclear weapons dismantlement) are unrealistic and impractical.<sup>27</sup> But the accusation that it hurts the NPT is unsubstantiated.

Ban proponents claim to have changed the nuclear discourse from “nuclearism” to “humanitarianism.”<sup>28</sup> But the humanitarian aspect is already in the NPT preamble. It has been articulated by diplomats like Alva Myrdal, Garcia Robles, Inga Thorsson, Miquel Marin Bosch, and Jayantha Dhanapala. It was inserted into the 2000 RevCon final document, a hard-won success of the New Agenda Coalition.<sup>29</sup> What is new is the building of a well-designed political campaign that motivated many to take a stand. However, the deterrence discourse is still alive; nothing proves this fact more clearly than its presence in the decisions by the key humanitarian initiative governments of Norway, Sweden, and Switzerland not to join the ban promptly.<sup>30</sup>

Ban proponents vow to exert strong normative pressure upon the NWS and their allies. ICAN Executive Director Beatrice Fihn has declared that even now, before the TPNW enters into force, “nuclear weapons are illegal.”<sup>31</sup> This perception is incorrect: the treaty will bind only its parties, and its possibility to become customary law is dim: more than 20 percent of UN membership, representing more than 50 percent of the world population and including all P5 states, will not accede to the TPNW and object to it regularly. Thus, the treaty cannot become customary international law because it does not represent the customary practice of virtually the whole international community.

Ban supporters promote a stigmatization of both nuclear weapons and the governments sticking to deterrence.<sup>32</sup> Normative pressure, they claim, will move

the NWS and their allies one by one into the ban. By the formula “first prohibiting, then eliminating,” this will finally lead to a nuclear-weapon-free world.<sup>33</sup>

However, the ban has changed the world in one important aspect, though not completely. Context is still there. Democracy is under double attack, from rightist populists domestically and from autocratic efforts to undermine it in the global systemic struggle. As civil society needs a democratic environment for its campaigns, ban supporters must consider how far they wish to stigmatize democratic governments and promote cleavages within democratic societies, which feed aims of both right wingers and autocratic NWS. This recognition of context seems to be alien to the ban campaigners’ horizon.

The impact of normative pressure remains uncertain. The TPNW may convince more people that nuclear weapons should be banned and induce young people to engage. But will it move masses to the streets and decide national elections? Nuclear disarmament is but one of many contested political issues and, among global priorities, is dwarfed today by climate change. Bread-and-butter questions have high salience for average citizens. But salience could rise when nuclear dangers become tangible through tensions among great powers and an ensuing arms race.

Normative pressure, then, could become a political factor. But effects in Western NWS (and allies) will differ from those in Russia and China. The tools of ICAN, such as blaming the private financing of nuclear weapons work or persuading city governments and parliaments to embrace the TPNW, meet better opportunities in democracies than in nondemocracies (a factor noted by pro-ban analysts, but without regard for the political consequences).<sup>34</sup> The lists of companies and cities concerned betray a yawning lack of Russian and Chinese names.<sup>35</sup> ICAN tools are ineffective in these NWS. Opportunities for civil society to challenge national security policies in Russia and China are extremely restricted, and those governments exacerbate repression of civil society and control of the Internet systematically. Chinese policies in Sinkiang, Tibet, and the South Chinese Sea and Russian policies in the Caucasus, Ukraine, and Syria do not give the impression that these governments care much for international opinion.

Hypothetically, this might lead to a Russian-Chinese nuclear weapons oligopoly rather than a nuclear-weapon-free world. ICAN and friends must either develop targeted tools to penetrate autocratic NWS or return to step-by-step disarmament – in a negotiation setting involving more nuclear-armed states – rather than achieve a nuclear-weapon-free world by pure normative pressure. Many would argue that a zero-nuclear world is preferable to today’s, but today’s is preferable to an autocratic nuclear weapons oligopoly or any monopoly.

An autocratic nuclear oligopoly is unrealistic because of countervailing processes: NATO governments feeling the asymmetric impact of normative pressure will choose one of two counterstrategies: First, counterstigmatize the ban campaign, evoke the specter of autocratic nuclear blackmail, and enhance nuclear

deterrence (the worst case in this regard would be counterdeploying land-based INF nuclear systems).<sup>36</sup> This may drive millions to the streets, supported by automatic disinformation campaigns. Western societies would be split. As a counterweight to antinuclear protesters, conservatives would “rally around the flag.” In a context of rising tensions and external threat, it is unlikely that majorities in NATO member states would wish to desert the alliance; one has to remember that NATO did not break up in 1983, and there is little reason to suppose that it would be different this time. With no final political success, the campaign would lose momentum, but democratic societies would remain fundamentally divided.

NATO’s second option is to emulate the early 1980s: maintain extended deterrence, but take new disarmament initiatives to pacify the protests. In today’s context, the smartest policy might be to base extended deterrence completely on air- and sea-based systems, remove the vulnerable, purely symbolic B-61 bombs from Europe, and strengthen missile defense in Europe. While not embracing the TPNW, NATO would take a significant, stabilizing nuclear disarmament step, explicitly embracing the disarmament norm. The odds of keeping majorities loyal to the alliance would improve.

**T**he debate on the TPNW highlights fundamentally different beliefs: many states and civil-society actors regard nuclear weapons as inhumane and immoral due to the devastating consequences of nuclear explosions. This perspective discredits nuclear deterrence. The proposition is unconditional and not subject to nuances. Given the danger nuclear weapons present for ban proponents, stigmatization and normative condemnation are key elements of the struggle to promote disarmament.

In contrast, a minority of states (but representing more than 50 percent of the world population) agrees that nuclear explosions would cause a humanitarian disaster. Still, they regard nuclear deterrence as a morally defensible war-preventing strategy as long as revisionist, adventurous states threaten vital security interests against which only nuclear weapons pose unbearable risks. Only changing this threatening security environment would permit far-reaching disarmament. In this assessment, Western NWS and all other nuclear weapons possessors agree, usually blaming the opponents for the bad “security environment” (United States) or for a lack of “stability and equal security for all” (Russia, China, and France). And in that perspective, transforming the security landscape is a precondition for nuclear disarmament, and the TPNW is regarded as “undermining the existing international security architecture which contributes to the maintenance of international peace and security.”<sup>37</sup> The recent U.S.-led initiative promotes the exploration of ways to make the security environment more disarmament-friendly, but this is seen by ban proponents as a diversionary attempt to conditionalize disarmament, which they regard as an unconditional duty.<sup>38</sup>

These positions are philosophically incompatible and materialize in different ideas on how to pursue “global zero” (step-by-step approach/“creating the environment for disarmament” versus stigmatization/prohibition/elimination) as well as in a seemingly irreconcilable attitude of mutual repudiation. Defense scholar Heather Williams has remarked:

NWS and ban supporters are talking past each other. Ban supporters’ message may be getting lost on target audiences, such as NATO members, whereas NWS will struggle to engage with ban supporters in the context of the NPT. This presents a challenge to the cooperative process that underpins the global nuclear regime.<sup>39</sup>

In extremis, it is presented as a Manichean struggle, good against bad, with no compromises. Ban supporters stigmatize their opponents as inhumane, patriarchal, militaristic, and racist (politely ignoring blatant violations of human rights some of their ban allies commit at home).<sup>40</sup> Ban opponents apply pressure and intimidation toward governments considering signature and ratification.<sup>41</sup> These strategies create a spiral of hostile emotions and deepen divisions. They damage both the NPT and nuclear disarmament. With eighty signatories at the time of writing this essay, thirty-five full parties, and more states in the ratification process, the TPNW will likely enter into force within the next few years, though the decisions by the Swiss and Swedish governments not to join now were a backlash. Critics better learn how to live with the TPNW in order to prevent damaging and unnecessary tensions between the ban and the NPT.

Yet, without moderating their attitudes and trying to resume meaningful communication and even cooperation, neither side will realize its objectives. The best hope may be learning through strategy failure followed by behavioral change: when the pro-ban campaign does not progress as hoped, when the TPNW enters into force despite the frantic intimidation campaign, pundits may reconsider their strategies.

**T**he key is to overcome the emotionalized polarization that sees the opponent as an incarnation of evil, and to realize that values, fears, and desires inscribed into the NPT preamble are still embraced by both sides: averting nuclear use and war, preventing proliferation, stopping the arms race (revived in a multipolar constellation), and investing in nuclear disarmament are subscribed to by all actors in the nonproliferation/disarmament game. This common basis must be rediscovered.

Next, mutual recognition of partnership on a level playing field despite fundamental disagreement must be achieved. Much of the present hostile atmosphere is due to negating the other side’s legitimacy of actorship. This makes cooperation impossible, because adverse emotions will stop it in its tracks. However, any disarmament process needs cooperative partnership or it will not take place. Parties



should reassure each other that, despite fundamental disagreements about strategy, path, timing, and circumstances of nuclear disarmament, they are both looking for ways to bring it closer. Deterrence pundits should admit that nuclear disarmament must eventually lead to a complete prohibition. Ban pundits must admit that whatever impact the ban will have, devising practical steps to work down existing arsenals toward zero will remain inevitable.

On the security environment, the following considerations might mitigate antagonisms.<sup>42</sup> Disarmament – through the lens of Article VI and its interpretation in the 1996 advisory opinion of the International Court of Justice issued at the request of the UNGA – is an unconditional undertaking. (The court voted unanimously that “there exists an obligation to pursue in good faith and bring to a conclusion negotiations leading to nuclear disarmament in all its aspects under strict and effective international control.” The vote did not condition this obligation on any circumstances.) Yet different qualities of international relations hamper or facilitate nuclear disarmament. This is not a malign U.S. invention but a logical proposition that has been inscribed into the NPT preamble and is borne out by history: disarmament succeeded whenever the relationship between the superpowers was in a state of *détente*, and slowed down, stopped, or gave way to additional armament whenever tensions rose.<sup>43</sup> Each time, improving the security environment was helped by disarmament successes. Political relations and the disarmament process did not move sequentially or independently, but in parallel and interdependently. It is thus every NPT party’s, particularly the great powers’, duty to help create a disarmament-favorable environment. Simultaneously, the unconditionality of the disarmament obligation requires defining steps toward disarmament that can already be taken while the study of the environment is still underway.

Two lines of action ensue: First, engaging in a serious, impartial, and operative exploration of the “benign security environment.” It should *not* be controlled by an NWS, the P5, or states involved in regional conflict.<sup>44</sup> It must identify responsibilities for a deteriorating international environment and must take steps to improve it. The best option may be an independent nongovernmental experts commission appointed by the UN secretary-general.

The second track would seek agreement on specific steps for the next review cycle. Several such steps could be acceptable to “disarmers” as useful movements toward a world without nuclear weapons and to “deterriers” as compatible with the desired degree of deterrence. Such steps could be found in the area of risk reduction. The NWS and allies have an interest in lowering the risk of nuclear war. Ban proponents have an interest in minimizing the risks of use as long as it is not totally eliminated through complete nuclear disarmament. De-alerting, discussions on doctrine, doctrinal constraints on use, transparency, military contacts, hotline agreements among nuclear weapon possessors, “accident measure”

agreements, and notification exercises are options. Agreement will not be easy, as the NWS prefer soft measures and reject changes in alert status and doctrine, which ban proponents demand strongly.

Bringing into force the CTBT would mark progress. For this to happen, opposing senators should finally overcome their atavistic<sup>45</sup> and unscientific aversion against ratification. This means abandoning the policy of unilateral security-seeking and acknowledging the proven success of cooperative security strategies and the capability of the verification system. Moreover, final documents of NPT RevCons offer a rich menu from which some “dishes” could be prioritized. Beyond, there is a multitude of good ideas.<sup>46</sup> The return to a practical agenda, however, must be sealed by the joint pledge that negotiated and agreed commitments (such as in RevCon final documents) cannot be revoked unilaterally but only collectively by a later RevCon.

The TPNW is no catastrophe to the NPT, but compatible with it. It has not divided the NPT community, but is the product of a foundational division that has grown worse since 2005, largely due to NWS policies. The TPNW is not the philosopher’s stone to solve all problems of nuclear disarmament. It gives an impressive normative statement of the majority of UN members and their NGO supporters, and is thereby a tool for arguments and campaigns. As a sovereign assessment of national security interests, it is at least as legitimate as nuclear deterrence. But it will not move operative disarmament or establish new cogent international law. It will not lead to one-sided disarmament of democracies; extended deterrence will most likely not collapse, as some ban critics fear. But it will impact Russia and China only if ban supporters recognize the problem and create effective tools. The TPNW establishes a new normative fact. How it impacts the NPT and Western public opinion is not a matter of physical laws, but of agency: how governments handle security policies and treat their opponents in the disarmament debate, and how campaigners react to policies short of ban membership (the likely case in most if not all NATO countries). A continuation of confrontation and mutual vilification is counterproductive for both sides’ objectives. A sincere common search for ways to carry disarmament forward in practice would not eliminate the controversy, but could achieve two valuable goals: keep the NPT viable and permit some tangible progress in disarmament.

## AUTHORS' NOTE

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# A Way Forward

*James Timbie*

*This essay develops elements of an agreement to limit and reduce nuclear forces that would succeed the New START Treaty. The successor arrangements would be more complicated than the bilateral INF, START, and New START treaties, involving more subjects and more countries, as the negotiations consider each of the issues the United States and Russia have said should be addressed in a new agreement. The result is a comprehensive program of practical steps to enhance predictability, resume the reduction of nuclear forces, and reduce the risk of conflict in an increasingly complex world.*

As New START (New Strategic Arms Reduction Treaty), the last of the bilateral strategic nuclear arms treaties, approaches its expiration – which seems likely by 2026 and perhaps much sooner – the international security situation grows steadily more complex. The strategic forces of the United States and Russia no longer dominate the nuclear landscape as they did when the bilateral treaties were negotiated. Past success in reducing U.S. and Russian strategic nuclear warheads has increased the salience of other nuclear weapons, nuclear weapons of other countries, missile defenses, and advanced conventional and space systems, all of which need to be considered in future negotiations. Looking ahead to a transition from bilateral treaties to more complicated arrangements involving more subjects and more countries, this essay outlines a program of practical steps to enhance predictability and transparency, resume the process of reductions in nuclear forces, and reduce the risk of unintended conflict in an increasingly complex world.

While strategic competition between the United States and Russia and China greatly complicates consideration of the diplomatic engagement with Russia and China necessary to negotiate and implement the cooperative measures suggested here, placing bounds on otherwise unregulated competition could enhance the security of all involved. At this difficult moment, international cooperation can help to reduce the risk of conflict and need not be deferred to a perhaps distant future with a more favorable political climate.

The objectives of the steps outlined here are to:

- Reduce the risk of unintended nuclear conflict, as a result of misinterpretation of rapidly unfolding events in multiple domains with little historical precedent.



- Promote equality and predictability, and thereby reduce incentives to expand nuclear forces in order to match the other side.
- Provide transparency into the nuclear forces of other states.
- Support nonproliferation of nuclear weapons.
- Support the security of allies, partners, and friends.
- Encourage further reductions in nuclear warheads, in support of a long-term enterprise to manage and reduce the existential threat posed by nuclear weapons.

While these objectives are generally familiar, the first (reduce the risk of unintended nuclear conflict) is adapted to our current circumstances. Those who negotiated the strategic arms treaties of the 1970s, 1980s, and 1990s were concerned about the risk of deliberate large-scale nuclear attack in a crisis situation, and sought to enhance stability and provide for equality and predictability at lower levels of forces.<sup>1</sup> Today, a deliberate large-scale nuclear attack seems effectively deterred by the prospect of certain retaliation in kind, and is therefore unlikely. Blundering into unintended nuclear conflict is the more likely scenario. The chances of conflict involving conventional, cyber, and space actions escalating to the nuclear level are not necessarily small and seem to be growing.

As for the second objective (promote equality and predictability), the large-scale strategic modernization programs of the United States and Russia now respect the limits of New START. In the absence of any regulation, however, each side could take steps to match the other in an upward spiral. A goal of cooperative measures would be to provide for a measure of equality at or below New START levels, avoiding incentives for expansion on one side to offset expansion on the other side.

**W**hile our objectives are somewhat familiar, the environment in which they are now pursued is not. We live in a world in which the major powers (and others) are preparing to fight in all domains. Now that military prowess on land, in the air, and on and under the sea critically depends on support from space and cyber assets, the future of conflict includes offensive and defensive operations in all of these domains. The pace of innovation is rapid, including:

- Precision conventional systems, some of which may threaten nuclear forces. The end of the Intermediate-Range Nuclear Forces (INF) Treaty could lead to increased emphasis on long-range precision conventional systems.
- Autonomous systems, some of which can be produced in large numbers at low cost, some of which can strike at long ranges, and some of which can strike in swarms.

- Missile defenses, of uncertain effectiveness against offensive countermeasures.
- Space and counterspace systems.
- Offensive and defensive cyber capabilities.
- Enhanced communications and surveillance.
- Development of hypersonic systems.
- Modernization of nuclear forces. Nuclear forces are no longer being reduced; some are growing.

Initiation of the use of nuclear weapons is being considered in an increasing number of circumstances, not only in retaliation to nuclear strikes, but in response to conventional, space, and cyber actions as well, which increases the complexity of the current situation and the potential danger.

It is difficult to assess the stability of this multidimensional situation; the potential advantages of going first with cyber and space actions raise questions about stability.<sup>2</sup> It is also difficult to predict the outcome of a conflict once it is initiated. There could be surprises.

This is the world in which we now live. These developments must be taken into account when contemplating the way forward. It is safe to assume that negotiation of further bilateral U.S.-Russian treaties will no longer play a central role, as many other issues will need to be addressed,<sup>3</sup> including:

- Nuclear weapons of countries beyond the United States and Russia, beginning with China.
- Nuclear systems beyond deployed strategic nuclear warheads (including nondeployed and nonstrategic warheads).
- Subjects beyond strategic nuclear forces (including missile defenses, precision conventional systems, hypersonics, space systems, and cyber capabilities).

Steps can be taken to reduce the risk of nuclear conflict, through resilience, deterrence, international cooperation, and unilateral measures. None of these is a solution, but working together, they could improve an otherwise increasingly complex and potentially dangerous landscape.

*Cyber resilience.* While it is impossible to completely defend against the most sophisticated cyberattacks, defense against the rest of the spectrum of potential threats is feasible and a great deal can be done to make societies and military establishments resilient to cyberattack.<sup>4</sup> In response to relatively unsophisticated distributed denial-of-service attacks that crippled government websites, email servers, media, commerce, and banking for several weeks in 2007, the government of Estonia has taken a series of steps to increase resilience to cyberattack, including:<sup>5</sup>

- Protection for information systems that support vital services and critical infrastructure.
- Increased public awareness of cyber risks, including cyber crime and cyber warfare.
- Establishment of a national monitoring system.
- Promotion of cyber security cooperation between the public and private sectors, and international cooperation with allies and partners.

Implementation of such a whole-of-society approach can substantially increase resilience to cyberattack, and to cyber crime as well, and is well worth the resources and public-private cooperation required.

*Space resilience.* Space-enabled communications, surveillance, and navigation systems can decisively affect the outcome of conflict on Earth. These essential space assets can be destroyed or degraded in a number of ways, including kinetic operations from the ground or from space, electronic interference with signals or control systems, directed energy, or attacks on ground-based support facilities, with the prospect that counterspace operations are likely to be an important theater of future conflict. Many space systems are dual-use, with vital civil as well as military missions. Some are dual-use in that they support both nuclear and conventional forces.

Resilience is the first line of defense for critical space assets. Modern technology allows space functions to be distributed among large constellations of small satellites, complicating attacks. Less capable but more survivable backup terrestrial systems could also be put in place to assume priority missions as necessary.

*Military resilience.* Special attention should be devoted to making nuclear forces and nuclear command and control systems resilient to cyberattack. A portion of conventional forces can also be maintained to a high standard of resilience to cyberattack, to protect conventional as well as nuclear response options.<sup>6</sup>

**A**t all levels of conflict, from cyber intrusion to nuclear war, deterrence can be sought from two components: punishment (threat of retaliation) and denial of success (defense).<sup>7</sup>

*Deterrence through threat of punishment.* Deterrence of nuclear attack is established by maintaining a second-strike force whose ability to survive, retaliate, and inflict catastrophic damage under any circumstances is unquestioned.

The prospect of punishment contributes to deterrence at other levels of the spectrum of conflict as well, but deterrence of conventional conflict is more complex (and less reliable) and does not rely on retaliation alone.

The prospect of punishment (in kind or by other means) contributes to deterrence of cyberattack as well, but again, deterrence is complex, as the attribution of the origin of an attack can be ambiguous and take time to determine, and the

consequences of a counterstrike in the cyber domain (and perhaps in other domains as well) can be hard to predict. The prospect of punishment helps to deter attacks on spacecraft as well, either response in kind or response in another domain, but is not a reliable solution to the problem of vulnerability of critical space assets.

*Deterrence through denial of success.* Defense of the population and economic infrastructure of the United States and our allies against a substantial Russian or Chinese nuclear attack is not technically feasible, hence reliance on an assured second-strike capability to deter nuclear attack by a strategic competitor.

Defense can be considered against a small and unsophisticated nuclear strike, to augment the deterrence provided by offensive nuclear forces. The performance of such a defense against an attack by North Korea is uncertain. Construction of a defense against North Korea has a deterrent effect as it calls into question the success of an attack, but it also encourages North Korea to pursue larger and more sophisticated nuclear offensive capabilities designed to overcome the defense.

Defenses can make a substantial contribution to deterrence of conventional- and cyberattacks. Deterrence cannot be relied upon, however, to prevent conventional- or cyberattacks. (Conventional wars are fought and can be won.)

**I**nternational agreements can reduce the risk of unintended conflict in an increasingly complex world in which actions can have unpredictable consequences, but the future will not be like the past. Future agreements will likely consist of political commitments rather than formal treaties, involve more countries in addition to the United States and Russia, and address a wide range of subjects in addition to strategic nuclear warheads.<sup>8</sup> Given that the United States and Russia hold the great majority of the world's nuclear weapons, and they share the need to manage the existential threat to each other, it makes sense to begin with bilateral negotiations between the United States and Russia, recognizing that other countries starting with China will need to become part of the solution at some point, and that we would proceed in close consultation with allies, partners, and friends.

The measures outlined here are intended to address, in an initial way, concerns the United States has expressed (including nonstrategic nuclear forces and new nuclear systems), concerns Russia has expressed (including missile defenses and precision conventional systems), and subjects of potential concern to both sides (such as space systems, hypersonics, and INF systems). In order to address, even in a preliminary way, all of the subjects the United States and Russia would like to see in an agreement, the list of potential measures is necessarily long. The steps outlined here are meant to be a balanced and coherent set of measures that could plausibly be the basis for an initial agreement between the United States and Russia (and, where appropriate, China) if given a serious effort by all concerned.

Such an agreement would necessarily include commitments in areas subject to rapid technological change, including missile defense, advanced conventional

systems, and space. The duration of such commitments could be fixed, such as for a period of ten years. There would be provision for a review after five years, in which the sides would discuss extension of commitments from years eleven through fifteen, possibly in modified form. This rolling format would allow periodic reassessment, changes as warranted by an evolving technical picture, and consideration of further reductions over time.

*Strategic nuclear forces.* A useful way to begin would be for the United States and Russia to reaffirm the November 1985 Reagan-Gorbachev statement that “a nuclear war cannot be won and must never be fought.” It follows that both sides recognize their mutual vulnerability as a technical fact and rely on deterrence of nuclear conflict.

In the context of this reaffirmation of deterrence of (rather than prevailing in) nuclear conflict, the two sides could maintain and extend the predictability provided by New START by extending New START for five years, or by making commitments not to exceed for five years (such as through 2025) the levels specified in New START (1,550 deployed warheads, 700 deployed missiles and bombers, and 800 deployed and nondeployed missiles and bombers). They could further commit not to exceed somewhat reduced levels (such as about 20 percent below New START levels) from 2026 through 2030. The ten-year time frame for the commitments on offense would match the time frame of commitments in other areas, including missile defense. If New START is no longer in force, the new commitments could incorporate by reference the levels and definitions in the expired treaty.

While predictability advantages could be achieved by commitments not to exceed current New START levels, there would be advantages to returning to the reductions approach of the past thirty years.

- We can begin to reduce strategic forces without a fundamental reassessment of strategic posture or policies. The United States could implement reductions from 1,550 strategic warheads to 1,250 by, for example, reducing the planned number of new ICBMs (intercontinental ballistic missiles) from four hundred to one hundred.
- Reducing the size of the Russian strategic nuclear force is an important part of our long-term strategy to manage, reduce, and eventually eliminate the existential nuclear threat to the United States.

As holders of the majority of the world’s nuclear weapons, the United States and Russia could lead the process. They could seek commitments from China and other holders of nuclear weapons not to increase their numbers of nuclear warheads as the United States and Russia reduce theirs.

*Information exchange, transparency, and visits.* The intrusive verification procedures of New START could not be replicated using political commitments.

Verification of commitments would be carried out by national means, which could be enhanced by cooperative measures, and by a less intrusive approach established by a combination of exchanges of information on numbers and locations of deployed and nondeployed systems and visits to those locations. Routine visits could enhance confidence that commitments are being fulfilled and information exchanged is accurate. Visits could also help resolve questions that arise.

*Nonstrategic nuclear forces.* Nonstrategic nuclear forces are important to the United States as political and symbolic links between U.S. nuclear forces and the security of our Atlantic and Pacific allies. They are important to Russia to counter conventional capabilities of the United States and China. Russia has large numbers of nonstrategic nuclear warheads that in time of conflict could be mated with a wide variety of systems, including tactical aircraft and missiles, submarine-launched missiles and torpedoes, and air and missile defenses.<sup>9</sup> The United States has a much smaller number of nonstrategic warheads for tactical aircraft, some of which are deployed in Europe.<sup>10</sup>

There is concern in the United States that Russia's nonstrategic weapons are becoming increasingly important as strategic forces are reduced, and that Russia's nonstrategic nuclear posture is designed in part to support the potential use of a small number of such weapons with the objective of ending a conventional conflict on favorable terms. For its part, Russia has long expressed concern about U.S. nonstrategic weapons deployed in Europe.

U.S. objectives would be to reduce the size of Russian nonstrategic nuclear forces, relocate them away from the territory of allies, and increase transparency. A Russian objective would be to remove U.S. nuclear warheads from Europe. Specific steps that could be considered include:

- Reducing the number of Russian nonstrategic nuclear warheads and consolidating them in designated facilities away from Russian borders.
- Eliminating certain classes of nonstrategic nuclear weapons, such as nuclear air and missile defenses, nuclear missiles and torpedoes on ships other than strategic ballistic missile submarines, and short-range ground-launched nuclear missiles.
- Exchanging information on types and numbers of delivery systems for nonstrategic nuclear warheads, and on numbers of associated warheads. Visiting locations of delivery systems and warhead storage.
- Committing not to mate nonstrategic nuclear warheads with delivery systems, which might indicate that nuclear conflict was imminent.
- Committing not to exceed a combined limit on nonstrategic and non-deployed strategic warheads.

Given the asymmetries inherent in constraining nonstrategic forces, and the difficulty of verification, such steps would best be implemented as coordinated unilateral steps. And given the problematic implementation of the Soviet and Russian unilateral initiatives of 1991 – 1992, the steps would include the exchange of information on implementation of these commitments and visits to facilities to confirm the information.

*Intermediate-Range Nuclear Forces.* With the demise of the INF Treaty, new cooperative steps could address land-based missiles with ranges between 500 and 5,500 kilometers. The constraints of the INF Treaty applied to conventionally armed missiles because of the difficulty of distinguishing them from nuclear-armed variants. This simplified verification, but over time, the constraints on long-range conventional systems contributed to the incentives to terminate the treaty. New steps, which would apply only to systems tested and deployed for nuclear weapons delivery (not to conventional missiles), could include:

- A Russian commitment for ten years to limit nuclear INF systems to a small number (fewer than one hundred) deployed a specified distance from its borders.
- A U.S. commitment for ten years to limit nuclear INF systems (for which it has no current plans) to the same number deployed in the continental United States.
- A Chinese commitment for ten years to limit nuclear INF systems (including nuclear variants of the DF-21 and DF-26) to the same number deployed a specified distance from its borders.
- Exchange of information on deployments of nuclear INF systems, and visits to confirm the information.

*New systems.* President Putin has announced the Russian development of a variety of new systems designed to ensure penetration or circumvention of missile defenses.<sup>11</sup> The relationship of some of these new systems to New START is questionable. An objective of new cooperative steps would be to address concerns about these new systems, including:

- *Burevestnik nuclear-powered cruise missiles.* This is not a new concept; past efforts at nuclear-powered missiles and aircraft have raised safety and environmental hazards. Russia and the United States could commit for ten years not to test or deploy nuclear-powered aircraft or cruise missiles.
- *Poseidon nuclear-powered long-range nuclear-armed torpedoes.* The nuclear torpedo is another way to circumvent missile defenses. In the context of ten-year restraints on missile defense and on nuclear weapons on ships other

than strategic ballistic missile submarines, Russia could agree to forgo testing and deployment of the Poseidon system for ten years.

- *Avangard boost-glide vehicles.* Russia has announced plans to deploy boost-glide vehicles on ICBMs to counter midcourse and terminal defenses. Since boost-glide vehicles do not follow a ballistic trajectory, their status under New START is arguably ambiguous. Russia and the United States could commit for ten years to test and deploy boost-glide vehicles for delivery of nuclear weapons only on ICBMs, and to count them and their launchers against New START warhead and launcher limits.
- *RS-28 Sarmat new heavy ICBM.* The Sarmat is designed to counter missile defenses in a variety of ways. Russia could commit for ten years to exhibit this new system, provide information required by New START, and count its warheads and launchers against New START limits.
- *Kinzhal hypersonic air-launched missiles.* The Kinzhal is a hypersonic missile that can be launched from aircraft against land targets or ships, including land- and sea-based missile defenses. Russia could commit for ten years not to test or deploy the Kinzhal for delivery of nuclear weapons (consistent with commitments on other hypersonic systems).

*Missile defense.* The United States and Russia have limited defenses against strategic ballistic missiles and more extensive theater missile defenses, none of which pose a significant threat to the ability of the strategic offensive missile forces of the other side to carry out a retaliatory strike. Russian concerns about the potential of U.S. missile defenses, however, have been a major obstacle to reductions in strategic offensive forces.

The United States has accepted vulnerability to a large and sophisticated nuclear missile attack as a technical fact, but not as a policy choice. As a result, we have no defenses designed to counter Russian or Chinese ICBMs or SLBMs (submarine-launched ballistic missiles), a task deemed beyond our technical capability, and rely on deterrence to prevent nuclear conflict with these strategic competitors. We have growing defenses designed to counter North Korean ICBMs, a task deemed technically feasible, and rely on a combination of deterrence and defense to prevent nuclear conflict with North Korea.

If we judge that as a technical matter missile defenses are not likely to be capable of countering ICBM and SLBM forces of the size and sophistication of those of Russia and China for the next ten years, we can consider constraints that could address Russian concerns and that do not inhibit efforts to defend against smaller and less sophisticated North Korean threats. Such constraints on missile defenses, measured in scope and in time, will be necessary to secure significant constraints on strategic offensive forces.



Missile defense can be addressed in the following ways:

- The United States and Russia could exchange information annually on numbers, locations, and characteristics of certain missile defense systems (in Alaska and California for the United States, near Moscow for Russia), along with plans for the next ten years (such as through 2030). Plans would be updated annually as they evolve.
- Exchanges of information on numbers, characteristics, and plans could be extended to other U.S. and Russian missile defense systems as well (such as THAAD, PAC-3, Aegis, Aegis ashore, and S-300/400/500).
- The United States and Russia could also engage in technical discussions of ballistic missile defenses and their implications for maintaining a second-strike capability and undertake cooperative measures such as visits to missile defense deployments and observation of tests.
- The United States and Russia could commit, for ten years, not to test or deploy space-based missile defense interceptors or comparable directed-energy systems.<sup>12</sup> While neither side has such systems, and they raise technical and cost challenges, the potential for future space-based interceptors has been an obstacle to efforts to limit and further reduce strategic offensive systems. A ten-year commitment not to pursue space-based missile defense interceptors could open the way to a ten-year commitment to restrain and reduce strategic offensive arms. China could also commit not to pursue space-based missile defense interceptors. (Space-based sensors, which have a wide variety of purposes, including early-warning, would not be constrained.)

*Early warning and nuclear command and control.* A small number of early-warning and nuclear command and control spacecraft and associated ground-based facilities provide continuous assurance that a nation is not under attack. Interference with these systems could easily be interpreted as an indication of imminent attack, with potentially serious consequences. Recognizing the special sensitivity of these systems, the United States and Russia could establish a bilateral mechanism to share information on critical space-based early-warning and nuclear command and control systems, and to develop confidence-building measures such as refraining from approaching these spacecraft closer than a specified distance and refraining from intruding into or interfering with nuclear command and control systems. This mechanism could be used for consultations in the event of any indication of interference with these systems. A similar bilateral mechanism could be established with China.

*Early-warning cooperation.* The United States and Russia could take a further step to display to each other real-time information derived from their early-warning systems. The two displays would show routine worldwide missile-launch activities

and confirm the absence of launches directed at each other. This concept for early-warning cooperation would realize with current technology an approach that was considered but not implemented in the past. Early-warning cooperation could be expanded to add China, which could provide information based on its early-warning assets and view information provided by the United States and Russia.

*Spacecraft proximity.* A concrete step in the space domain would be a U.S.-Russian agreement that the approach of a spacecraft of one side closer than a specified distance to a spacecraft of the other side would be cause for concern. This would limit the potential of surveillance activities to be misinterpreted and lead to unintended conflict. Such an understanding on proximity could be extended to China, and eventually to all spacefaring states.

A second step could be U.S.-Russian commitments not to place spacecraft into the planes of each other's navigation and timing satellites. Such an agreement could also be extended to China and to all constellations of navigation and timing satellites, and could be considered for other constellations as well.

A third step could be U.S.-Russian commitments not to test or deploy systems in space for attacking targets on Earth. While there are no such systems today, Russia has expressed concerns about this possibility.

*Cyber exercises.* There is little prospect for establishment of norms for cyber activities whose scale and effects are comparable to armed conflict. The Tallinn Manual process seeks to establish norms by applying existing international law governing armed conflict (such as proportionality and self-defense) to the cyber domain. The resulting cyber norms are not widely accepted, in part due to the imperfect analogy between cyber activities and conventional military activities, and in part because some countries (including Russia and China) do not accept the concept of application of existing international law to cyber activities. The other existing effort to develop cyber norms, the UN Group of Governmental Experts, produced a set of eleven useful norms for responsible behavior in 2015, but subsequent efforts to go further have not met with success. Given the poor prospects for agreement on norms for cyber activities whose scale and effects are comparable to armed conflict, one way to proceed would be to pursue bilateral government-to-government (initially U.S.-Russian and U.S.-Chinese) exercise scenarios designed to illustrate how cyber and kinetic activities can interact. A series of such exercises could develop an appreciation of uncertainties and risks, increase understanding of practices that can lead to escalation or that might stabilize a situation, and establish a cadre of military and civilian officials with practical experience with adversaries on this subject who could be called upon in times of tension or conflict.

In a crisis, in which conflict is possible and perhaps imminent, all parties will seek to enhance collection of information to increase situational awareness and support decisions. Misinterpretation of cyber actions to collect information as preparations for attack could trigger responses leading to unintended conflict.

In the cyber domain, the distinction between information collection and attack preparation can be difficult to make on technical grounds. Precrisis exercises with potential adversaries could call attention to this problem and reduce the chances of unintended conflict.

*Long-range precision conventional systems.* Steps to address long-range precision conventional systems include:

- Exchange of information on the numbers and characteristics of precision conventional systems over a specified range capability (such as one thousand kilometers), along with plans for the next ten years (such as through 2030). There could also be technical discussions to assess as a practical matter the limited threat such systems pose to strategic forces.
- Commitments by the United States, Russia, China, and eventually others not to test or deploy hypersonic systems for delivery of nuclear warheads. This would reduce the risk of a nuclear response based on misinterpretation of a launch of a conventional strike. (New START–accountable systems, such as ICBMs, could be tested and deployed with nuclear hypersonic systems, such as Avangard boost-glide vehicles. Other hypersonic systems, including the Russian Tsirkon and Kinzhal and U.S. and Chinese hypersonic systems could be tested and deployed only for delivery of conventional munitions.)

*Prospects for negotiations.* Notwithstanding the renewed strategic competition, election interference, hostilities in Ukraine, and sanctions, the United States and Russia would both benefit from an agreement that provided a measure of predictability and stability, rather than the costs and risks of unregulated arms competition. Since the conclusion of New START, Russia has taken the position that further agreements must address third-country forces, missile defense, space, and precision conventional systems. The United States has called for further reductions in strategic nuclear forces and constraints on nonstrategic nuclear forces. The measures outlined here would address all of these. This combination of measures could be a plausible basis for an initial agreement that would begin to address concerns of both sides and reduce the risk of unintended conflict.

Up to now, China has not been open to negotiations on most of these subjects. The suggestion here is for the United States and Russia, at a certain point in their negotiations, to approach China in specific areas in which U.S.-Russian agreement depends on Chinese participation in some way. This would be a new question for China and could lead to further consideration and a constructive response.

Negotiation and implementation of an agreement along the lines outlined here would require an intense effort by the governments of the United States and Russia. National teams can be established in each country to negotiate and implement commitments, provide and receive information, host and conduct visits,

and discuss and resolve implementation questions. The national teams of the United States and Russia would be able to communicate 24/7, forming a mechanism for exchanging routine information on a day-to-day basis and for rapid communication in the event of problems, incidents, or ambiguous situations. China and other countries could be connected to this network as well.

**T**here are also unilateral steps nuclear powers can take to increase predictability and reduce the risk of unintended conflict.

*Invest in capabilities to respond to conventional- and cyberattacks* (rather than plan to take preemptive action). There may be substantial advantages to being first to initiate advanced conventional, cyber, or counterspace actions in a tense situation. But in current circumstances, with the outcome of armed conflict becoming increasingly unpredictable, and our ability to manage escalation questionable, decision-makers in situations in which conflict seems imminent deserve options beyond preemption. Planning should include capabilities to respond effectively in all circumstances.

*Refrain from policies linking nuclear responses to non-nuclear (cyber, counterspace, and conventional) attacks.* Planning to initiate nuclear strikes, which would put the existence of the United States at risk, in response to non-nuclear attacks is not a prudent response to the increasingly complex and dangerous situation. Investment in resilience, defense, and capabilities for non-nuclear responses is more challenging and requires more resources, but represents a safer course.

*Use caution in drawing upon artificial intelligence to support decision-making.* Machine learning systems make mistakes, including in the transition from training to real-world situations. Use of automated systems to decide what information to display to decision-makers should also be approached cautiously. Some use of artificial intelligence in decision-making is inevitable – to manage the vast amount of information collected by modern systems and, later, to keep pace with the automated systems of adversaries – but caution is warranted to avoid mistakes that lead to unintended conflict.

*Increased emphasis on research and education.* The cumulative effect of advancing technology in all domains is that decisions on use of force involve considerable complexity and uncertainty in uncharted territory. All involved, military and civilian, would benefit from research and education that facilitates critical assessment in novel situations. All would benefit from research at universities and think tanks that helps strategy and policy keep up with technology and increases attention to the choices before us in an increasingly complex and dangerous world.

**T**he bilateral treaties that for decades provided valuable predictability and dramatically reduced U.S. and Russian strategic nuclear forces are no longer a good fit for the more complex world in which we now live. The

approach outlined here is designed to accommodate the greater number of subjects, countries, and advancing technologies that must now be considered.

International cooperation has a role to play, along with resilience, deterrence, and unilateral steps, in reducing the risk of nuclear conflict. The addition of space and cyber as domains for conflict, along with rapidly advancing technology across the spectrum of military forces, greatly complicate the task of negotiating and implementing agreements (just as they increase the costs, risks, and uncertainty of unmanaged competition).

The United States and Russia have outlined additional subjects that they believe should be addressed in future agreements. The approach suggested here is to address all of these subjects, for a limited period of time, in a balanced package, and in a format that accommodates commitments on a wide range of issues.

Negotiation and implementation of an agreement along the lines suggested here would require an intense effort by all concerned. But even in difficult times (perhaps especially in difficult times), international cooperation that helps to reduce the costs and risks of unregulated competition, and to manage and reduce the existential threat of nuclear conflict, merits a priority effort.

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#### AUTHOR'S NOTE

The opinions and characterizations in this essay are those of the author and do not necessarily represent those of the U.S. government.

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#### ENDNOTES

- <sup>1</sup> This essay avoids use of the term “arms control,” as it has come to be associated with formal treaties, which are no longer a good match to the current task, and the term “strategic stability,” as it has come to have many different meanings, some of which are far removed from the original technical concept of avoiding incentives to strike first.

- <sup>2</sup> For further discussion of the stability implications of new technologies, see Christopher F. Chyba, “New Technologies & Strategic Stability,” *Dædalus* 149 (2) (Spring 2020).
- <sup>3</sup> For further discussion of the unlikely prospects for further bilateral treaties, see Linton F. Brooks, “The End of Arms Control?” *Dædalus* 149 (2) (Spring 2020).
- <sup>4</sup> Defense Science Board, *Task Force Report: Resilient Military Systems and the Advanced Cyber Threat* (Washington, D.C.: U.S. Department of Defense, 2013), iii.
- <sup>5</sup> Republic of Estonia Ministry of Economic Affairs and Communications, *2014 – 2017 Cyber Security Strategy* (Tallinn: Ministry of Economic Affairs and Communications, 2014).
- <sup>6</sup> Defense Science Board, *Task Force Report*, 85.
- <sup>7</sup> In principle, deterrence can also be derived from entanglement with an adversary, so that damage to the adversary also results in damage to oneself. This would not seem to play a substantial role in deterring serious military conflict in current circumstances.
- <sup>8</sup> For further discussion of restraints other than formal treaties, see Nina Tannenwald, “Life beyond Arms Control: Moving toward a Global Regime of Nuclear Restraint & Responsibility,” *Dædalus* 149 (2) (Spring 2020).
- <sup>9</sup> Amy F. Woolf, *Nonstrategic Nuclear Weapons* (Washington, D.C.: Congressional Research Service, 2019), 27.
- <sup>10</sup> *Ibid.*, 21.
- <sup>11</sup> Jill Hruby, *Russia’s New Nuclear Weapon Delivery Systems* (Washington, D.C.: Nuclear Threat Initiative, 2019).
- <sup>12</sup> For a more comprehensive discussion of a commitment not to pursue space-based missile defense interceptors, see James N. Miller Jr. and Richard Fontaine, *Navigating Dangerous Pathways: A Pragmatic Approach to U.S.-Russian Relations and Strategic Stability* (Cambridge, Mass.: Harvard Kennedy School, Belfer Center and Center for a New American Security, 2018), 22–24.

# Life beyond Arms Control: Moving toward a Global Regime of Nuclear Restraint & Responsibility

*Nina Tannenwald*

*Today, we are on the verge of a world without nuclear restraint. In the absence of formal arms control, how do we proceed? What broad principles and norms would we want? What measures might nuclear-armed states take, even without formal agreement, that would reduce the risk of nuclear war and control the arms race? I suggest that nuclear-armed states move toward a global regime of nuclear restraint and responsibility. Restraint would primarily take the form of reciprocal commitments and unilateral measures to avoid an arms race and reduce nuclear dangers. Responsibility refers to the fact that nuclear-armed states must pursue limited forms of deterrence and are accountable to the international community. I suggest several steps that governments, with the help of civil society, could take, beginning with the most minimal, declaratory initiatives and unilateral measures, and proceeding to steps that require more action.*

**T**oday, we are on the verge of a world without nuclear restraint. If the New START (Strategic Arms Reduction Treaty) between the United States and Russia disappears after 2021, there will be no formal limitations on strategic nuclear weapons for the first time since 1972. The restraints on missiles and warheads imposed by New START, along with its critically important verification regime, would either be tacit and informal or nonexistent. Nuclear-armed governments appear to be enthusiastically embracing an arms race in an era of heightened hostility while demonstrating little interest not only in formal arms control but in nuclear restraint of any kind. Arms control treaties are being discarded and norms are eroding; new qualitative arms races are underway while quantitative arms races may be in the offing; and some governments are reviving old war-fighting strategies including damage limitation and battlefield nuclear weapons. Almost no stability talks are taking place while leaders brazenly brandish their nuclear arsenals and engage in brinkmanship. Most experts agree that the risk of nuclear war is the highest it has been since the height of the Cold War. We are, in short, in a world of what I would call “irresponsible deterrence.”

Unfortunately, little prospect exists for negotiating new treaties. Increasing polarization in the political sphere, both domestically and in the global nuclear regime, will make it exceedingly difficult to agree on any new treaties. In the United States, the Republican Senate is averse to treaties. Internationally, increasing great-power hostility, growing regional tensions, and virulent nationalism are leading to new trade wars and looming arms races while undermining prospects for cooperative agreements among the great powers. In the global nuclear realm, the approval of the Treaty on the Prohibition of Nuclear Weapons, or Nuclear Weapon Ban Treaty, in 2017 has exacerbated polarization in the international community between those states that favor the ban treaty and disarmament, and states committed to maintaining nuclear deterrence. These two groups increasingly exist in separate universes, making it ever harder to find common ground at UN meetings.

In the absence of formal arms control agreements, how do we proceed? What broad principles and norms would we want? What measures might the nuclear-armed states take, even without formal agreement, that would reduce the risk of nuclear war and rein in the arms race? In this essay, I focus primarily on nuclear-armed states, which have the major (though certainly not the only) responsibility here. This group includes not only the five “declared” nuclear-armed states acknowledged by the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) – the United States, Britain, France, Russia, and China – but also India, Pakistan, Israel, and North Korea, which possess nuclear weapons but are not parties to the NPT. I suggest that nuclear-armed states should move toward a global regime of nuclear restraint and responsibility. In the absence of formal arms control, restraint would primarily take the form of reciprocal commitments and unilateral measures to avoid an arms race and reduce nuclear dangers. Responsibility refers to nuclear-armed states pursuing limited forms of deterrence and being accountable to the international community. Needless to say, in the current environment of heightened great-power competition, the nuclear-armed governments are probably incapable of moving toward a regime of restraint and responsibility without significant prodding. Therefore, much of this work will fall to civil society and domestic politics, as well as to diplomacy at the United Nations and other international organizations, such as the International Atomic Energy Agency, the Conference on Disarmament, and even alliances such as NATO.

Many will argue that the current global nuclear order is illegitimate and unsustainable, and that nuclear risk can ultimately be managed only through disarmament. A concept of responsible deterrence must indeed be compatible with the pursuit of disarmament. Responsible deterrence is not simply about maintaining secure command and control or refraining from giving weapons to terrorists (though it certainly includes these measures). It must also be consistent with reducing global nuclear dangers. In a global regime of nuclear restraint and responsibility, disarmament must remain the ultimate goal. The immediate goal,



however – and the focus of this essay – is preventing nuclear war. Thus, even those for whom disarmament is so far in the future as to be illusory should still be able to embrace many of the tenets of responsible deterrence laid out here.

**M**any alternatives exist to the negotiation of formal, legally binding treaties for achieving arms control objectives. These include informal agreements that are politically but not legally binding on their parties, and unilateral initiatives that may or may not be coordinated with other parties but are expected to be reciprocated. Additional approaches include agreements in principle (agreements to agree), parallel policy statements, joint declarations, and tacit agreements.

The history of U.S.-Soviet/Russian arms control provides numerous examples of nontreaty approaches, including the 1987 Nuclear Risk Reduction Centers Agreement, the U.S.-Soviet 1988 Ballistic Missile Launch Notification Agreement, and the 1992 Cooperative Threat Reduction program under which the United States assisted Russia in reducing the number of its nuclear weapons and securing its fissile material. Prominent unilateral initiatives included the 1991 U.S. and Russian Presidential Nuclear Initiatives (PNIs) under which the United States and Russia withdrew approximately seventeen thousand tactical nuclear weapons from service. The PNIs were “reciprocal unilateral commitments”: that is, they were politically, not legally, binding and were nonverifiable.

Yet treaties do have some advantages over political commitments. Whatever gets written into a treaty becomes the law of the land and, consequently, has the “force of law” behind it. Treaties create a strong sense of legal obligation that whatever measures negotiators write into a treaty – say, intrusive verification – will in fact be carried out. In contrast, a political agreement lacks the force of the law. Consequently, implementation tends to be more politicized and less certain. The force of law is one important benefit that is lost in a world without treaties.

**T**he goals of traditional arms control are to reduce threats, provide predictability, foster stability and transparency, reduce the risk of nuclear use, and strengthen norms of restraint. Many of these goals can still be pursued in the absence of treaty-based agreements. Indeed, for the United States, the near impossibility of getting a treaty through the Senate these days means that pursuing restraint through political agreements is more likely to produce results.

Thus, the nuclear-armed states need to move toward a global regime of nuclear restraint and responsibility: a set of principles and goals that would provide a broad framework for reciprocal political agreements among nuclear powers to reduce nuclear dangers.<sup>1</sup> Restraint – or “keeping a situation under control or within limits” – is associated with notions of self-control, moderation, and prudence.<sup>2</sup> Without a collective effort by nuclear-armed states to renew practices of

restraint, a competition in excess is likely to occur, heightening the risk of nuclear war.

Responsibility as applied to the nuclear realm has tended to be defined narrowly in terms of upholding nonproliferation norms. Nuclear-armed states like to tout themselves as “responsible nuclear powers” if they do not proliferate nuclear weapons and materials and maintain secure arsenals. Yet not all nuclear-armed states, such as India and Pakistan, are members of the NPT, and nuclear responsibility must be much broader than simply nonproliferation.<sup>3</sup> It must also include nuclear doctrine, nuclear safety and security, and commitment to norms of nuclear restraint, including arms control and disarmament. Together, these practices are key elements of responsible deterrence. At minimum, a regime of nuclear restraint and responsibility would include the following principles and goals.

### Principles

1. *Security cannot be achieved unilaterally.* A regime of nuclear restraint and responsibility must be based on the fundamental recognition that security in the nuclear age cannot be achieved unilaterally. It requires the cooperation of others. U.S. and Soviet leaders learned this crucial lesson during the Cold War. Today’s leaders must recommit themselves to this shared understanding.
2. *Must include all nuclear-armed states.* While the United States and Russia have by far the largest nuclear arsenals and therefore bear the greatest responsibility for containing the nuclear arms race, all nuclear-armed states contribute to nuclear dangers. States with smaller nuclear arsenals should not be allowed to hide behind the excuse that they are smaller. China and the other new nuclear states have traditionally resisted a multilateral arms control process, perceiving that it would be about preserving the dominant power position of the original nuclear states, and that unequal nuclear-conventional balances disadvantage them and complicate arms control calculations. In a regime of restraint and responsibility, however, all nuclear-armed states must take appropriate steps to reduce nuclear dangers. U.S. leaders should allay Chinese concerns that risk-reduction or arms control measures would provide useful intelligence on the location of Chinese nuclear weapons to U.S. targeteers. Rather, to reduce nuclear dangers, nuclear-armed states need to understand each other’s doctrine and decision-making, not the location of weapons.
3. *Recognize that every person and every state in the world is a stakeholder.* We are long past the days when nuclear-armed states could pretend that they had the sovereign right to possess nuclear weapons and do with them whatever they wanted regardless of the consequences for others.<sup>4</sup> A nuclear war would almost surely affect many countries. Even a regional nuclear exchange, such as between India and Pakistan, would have an effect on Earth’s atmosphere and climate,

possibly wiping out large swaths of agriculture and resulting in nuclear famine.<sup>5</sup> It could also produce radioactive fallout extending thousands of miles from the explosion site to produce health effects, for example, in China and Southeast Asia.<sup>6</sup> States and civil society groups have a legitimate right to offer proposals and criticisms to reduce nuclear dangers. Nuclear-armed states, for their part, have an obligation to participate in such efforts and to hold themselves more accountable for the consequences of their nuclear policies, including greater transparency, reporting, and information exchanges.

All nuclear states need to be more accountable for the possible consequences of their nuclear postures and decisions about use. Since 1945, principles of accountability have become a much more prominent feature of international law and relations, and states have agreed to be increasingly accountable to each other in many realms such as trade, pollution, human rights, and justice.<sup>7</sup> Accountability remains low in the realm of nuclear weapons policy, however, both domestically and among nation-states. Domestically, the American public and Congress are excluded from any decision to use nuclear weapons, raising questions about democratic oversight of a momentous decision.<sup>8</sup> Internationally, non-nuclear states struggle at NPT review conferences to extract more accountability from nuclear-armed states in terms of reporting and transparency about stockpiles, doctrine, weapons developments, and the consequences of their war plans. Accountability in general is under siege everywhere in today's increasingly antidemocratic politics. Yet in the same way that efforts are under way to strengthen accountability for any use of chemical weapons, accountability for the consequences of nuclear weapons policies must be a much more central principle of responsible deterrence.<sup>9</sup>

## Goals

1. *Focus on reducing the risk of nuclear use.* This must be the primary goal and would entail a whole range of measures to reduce crisis instability and the possibility of nuclear war through inadvertence, miscalculation, or accident. As long as nuclear weapons exist, states must depend on responsible deterrence to prevent the deliberate use of nuclear weapons (if a state is determined to start a nuclear war, no set of norms can prevent it from doing so). Yet experts widely agree that the likelihood of nuclear use by accident, miscalculation, or design is rising. The purpose of risk-reduction measures is to find ways to prevent leaders of nuclear-armed states from thinking they have to act because the other side is about to escalate, or to minimize the possibility of miscalculation. Risk reduction is not a new idea, but in the current climate, it has become more urgent.<sup>10</sup>
2. *Strengthen norms of nuclear restraint.* These norms include nonuse, nonproliferation, deterrence, and disarmament. Additional norms include the norm of

no-explosive-testing, the right to peaceful uses of nuclear energy, nuclear safety and security, and a firm commitment to effective political control over nuclear policy and planning and to reserving decisions on nuclear use to heads of government. Important procedural norms include reciprocity (reciprocal commitments) and transparency. Transparency regarding nuclear stockpiles, deployments, force postures, and doctrine is an important means of stabilizing expectations and reducing worst-case analysis and miscalculation.<sup>11</sup>

I propose twelve steps that governments, with the help of civil society, could take to demonstrate nuclear restraint and reduce the risk of nuclear war. Because the prospects for even confidence-building measures seem so bleak today, these proposals begin with the most minimal, declaratory initiatives and unilateral measures, and proceed to steps that require action, not just words. In reality, many of these steps will likely have to begin with initiatives by civil society. Certainly, other proposals might be possible, but I have focused here on a small set that could serve as initial steps or way stations for further progress.

#### For All Nuclear-Armed States

1. *A joint public declaration by the leaders of all nuclear-armed states reaffirming the Reagan-Gorbachev statement: "Nuclear war cannot be won and must never be fought."* This 1985 statement about the futility of nuclear war represented an important statement of nuclear restraint and a political turning point in U.S.-Soviet efforts to control the arms race. The two leaders also agreed that their countries would not seek military superiority over one another. In articulating the declaration, Ronald Reagan and Mikhail Gorbachev played key leadership roles. Today, such a declaration could be promoted by civil society and the United Nations, and leaders of all nuclear-armed states could be asked to sign on. It could be announced at Hiroshima by a group of senior statespeople. UN disarmament officials have already been using and encouraging adoption of this language.<sup>12</sup> Sweden presented a working paper at the 2019 NPT preparatory meeting calling for nuclear-armed states to make this "unequivocal expression against any notion of nuclear use."<sup>13</sup>

Despite the seemingly low-cost nature of such a declaration, however, at a side event at the NPT preparatory committee meeting in May 2019, the British ambassador to the Conference on Disarmament, Aidan Liddle, in response to a question, struggled to explain to his baffled audience why his country could not endorse the Reagan-Gorbachev statement at this time. The fact that the P5 states – the United States, the United Kingdom, China, France, and Russia – find themselves unable to reaffirm this basic statement today is astonishing and signals how far backward we have gone in terms of beliefs about nuclear use (the Trump administration may be reluctant in part because it imagines

it can win a nuclear war with North Korea). Such a declaration nevertheless remains a critical starting point for reaffirming that the shared goal must be nonuse of nuclear weapons. If it is not feasible to have a declaration endorsed by all nuclear-armed states, the United States should seek bilateral statements with Russia and China declaring that nuclear war between the United States and Russia or China cannot be won and must never be fought. India and Pakistan should also be encouraged to make such a joint statement. These bilateral statements would provide at least some benefits. Leaders should also pledge to refrain from brandishing nuclear weapons or engaging in nuclear coercion.

2. *Explicit reference to the seventy-four-year tradition of nonuse.* An alternative declaration would adopt the Obama-era talking points that explicitly emphasize the tradition of nonuse: “It is our fervent hope that the [74]-year tradition of nuclear non-use will continue forever.” Ideally, this declaration should always be tied to actual risk-reduction efforts. Fervent hope is not enough; there must be an active effort to maintain the nonuse tradition in perpetuity. More generally, leaders should make speeches that lay out the risks of nuclear use and emphasize the importance of the tradition of nonuse.
3. *Risk reduction.* The United States, Russia, and other NPT-declared nuclear-weapon states, as well as India and Pakistan, should engage in discussions on the full range of measures to reduce to an absolute minimum the risk of nuclear use. This would include consideration of measures such as de-alerting, as well as changes in doctrine and operational practices to strengthen crisis avoidance and management. The UN Institute for Disarmament Research has developed a comprehensive set of nuclear risk-reduction measures that focus on risks associated with doctrine, escalation, unauthorized use, and accidents.<sup>14</sup>

One possibility is that discussions of nuclear risk reduction could be part of an improved “P5 process.”<sup>15</sup> For the past decade, this process has brought together government officials from the five NPT nuclear-weapon states to coordinate their positions on issues and undertake initiatives as part of the NPT review process. Although the P5 states tout their process, the deliverables so far have been extremely modest. An improved P5 process could focus much more on risk reduction. Although there will be some reluctance to do this, the P5 have a strong mutual interest in avoiding nuclear war. The P5 states could use this existing forum to engage in dialogue about possible scenarios of nuclear escalation, whether through miscalculation or accident, as well as concepts of strategic stability. Exchanges of views could be followed by the development of cooperative steps to reduce risks.

Nevertheless, a recognized shortcoming of the P5 process – in addition to the modest results – is that it is tied to the NPT and therefore does not involve India or Pakistan. An alternative is for the Nuclear 7 (the P5 plus India

and Pakistan) to discuss improvements in nuclear safety and security via an exchange of best practices.<sup>16</sup> If this works, it would provide a foundation to build on. If such efforts to discuss safety and security fail, it is likely that talks on more ambitious steps would falter. Moving outside formal state-to-state discussions, another idea is to develop a global commission on military nuclear risks, an independent, globally representative body of diverse nongovernmental experts to offer an authoritative assessment of trends in nuclear risk.<sup>17</sup>

4. *Nuclear-armed states should find a way to engage constructively with the goals of the ban treaty.* Nuclear-armed states are unlikely to join the 2017 Nuclear Weapon Ban Treaty any time soon, but they should find a way to engage constructively with its goals rather than dismissing it. In addition to much greater effort on risk-reduction measures, as discussed above, a positive step by nuclear-armed states would be to offer more public transparency about the extent to which their nuclear war plans meet humanitarian criteria. For example, the United States has formally declared that its nuclear war plans must meet the criteria of the laws of armed conflict (discrimination, proportionality, and necessity).<sup>18</sup> The United States should publicize this commitment and other nuclear-armed states should consider it. Even if other nuclear powers decline to make such a commitment, however, the U.S. example is important. Further, as part of this effort, nuclear-armed states should seek to minimize the consequences of even limited nuclear use, especially for noncombatant states. This is a major concern of the humanitarian consequences movement. Nuclear-armed states should declare publicly what steps they are taking to minimize collateral harm from nuclear use.

Finally, in the effort to bridge the gap between ban treaty supporters and defenders of deterrence, U.S. allies can play a key role. For example, Japan has offered a thoughtful set of ideas about how to move forward, including regular dialogues between deterrers and disarmers, and feasibility studies of minimal nuclear arsenals.<sup>19</sup> States may be able to build on these ideas, and having a dialogue not exclusively driven by the United States may be advantageous.

5. *Adoption of no-first-use policies.* The other nuclear-armed states should move toward joining China and India in adopting no-first-use or “sole-use” policies. These could be unilateral or joint declarations. No-first-use policies are crisis stability measures and signal a willingness to limit nuclear use.<sup>20</sup> A U.S. no-first-use policy would reduce the risk of Russian or Chinese nuclear miscalculation during a crisis by alleviating concerns about a devastating U.S. nuclear first strike. To be credible, this declaratory pledge would need to be reflected in retaliatory-strike-only nuclear force postures. When fully implemented, such a policy would eliminate first-strike postures, preemptive capabilities, damage limitation, and other types of destabilizing war-fighting strategies. It would emphasize restraint in targeting, launch-on-warning, alert levels of deployed

systems, procurement, and modernization plans. Organizations such as Global Zero have proposed detailed deterrence-only postures incorporating many of these measures, including eliminating land-based missiles.<sup>21</sup> It would be desirable to make the force structure changes by agreement, but the United States could also do so unilaterally.

Many practitioners believe that the “calculated ambiguity” of a U.S. first-use threat creates uncertainty in the mind of an adversary that contributes to deterrence. A first-use threat is also necessary to reassure allies that the United States will come to their defense. Yet today, the risks and costs of an aggressive first-use posture appear to outweigh the benefits. For this reason, numerous former Pentagon officials, including former Secretary of Defense William Perry, former Vice Chairman of the Joint Chiefs of Staff General James Cartwright, and former Head of the Strategic Command General Lee Butler, among others, believe the United States should move toward a no-first-use posture. Although the political moment does not seem propitious for the adoption of no-first-use policies, nuclear-armed states should nevertheless begin dialogues – perhaps at the Track 2 (back channel) level – on moving toward such a policy. This should include discussion about the conditions, if any, under which first use of nuclear weapons would be morally acceptable. The United States should begin discussions with allies about limiting the role of nuclear weapons in extended deterrence policies to deterring, or responding to, a nuclear attack.

6. *An expanded accountability regime.* This could be organized under the United Nations to hold all nuclear-armed states accountable for the consequences of their nuclear policies. Currently, one of the big asymmetries of the NPT is that the Security Council plays a role in enforcing the nonproliferation pillar but not the disarmament pillar. A framework for a global regime of nuclear restraint and responsibility could eventually be adopted by the UN Security Council, similar to the way the Security Council adopted the “responsibility to protect” principle in 2005.

#### For the United States, Russia, and China

7. *Commit to “no new deployments” beyond New START limits and of land-based missiles abroad (both nuclear and conventional).* These commitments would be a type of freeze. Just as the United States and Russia continued to observe SALT II (Strategic Arms Limitation Talks) limits even though the treaty was unratified, they could continue to observe New START limits. As nuclear analyst Vince Manzo has proposed, “the two countries could pledge, in the form of parallel political commitments, to remain at or below the treaty’s limits after New START expires. Each country’s restraint would be contingent on the other’s reciprocation.”<sup>22</sup> Likewise, in the wake of the demise of the Intermediate-Range Nuclear Forces (INF) Treaty in August 2019, a political understanding not to deploy

new land-based missiles abroad would reduce tensions. Russia has warned the United States against deploying new missiles to Europe and threatened to deploy its own in response. Since European governments are unlikely to be interested in hosting new U.S. missiles, a commitment to no new deployments would avoid creating political turmoil as well as a destabilizing strategic situation in Europe. Reintroducing U.S. land-based missiles in Asia to deter China, as some analysts have proposed, also seems unwise for similar reasons.<sup>23</sup>

8. *Commit to transparency.* The United States, Russia, and China should not go backward on transparency; instead all three countries should pledge greater transparency in nuclear weapons stockpiles, force postures, deployments, and doctrines. The United States has always been more transparent about its nuclear weapons stockpile than either Russia or China, which gave it the moral high ground to demand more transparency from others. Thus, the Trump administration's decision in April 2019 to halt, without explanation, a decade-long practice of disclosing the current size of the nuclear weapons stockpile is an unfortunate – and puzzling – step backward in transparency. As analyst Hans Kristensen has noted, with this decision “the Trump administration surrenders any pressure on other nuclear-armed states to be more transparent about the size of their nuclear weapon stockpiles.”<sup>24</sup> Since the Trump administration had repeatedly complained about secrecy in the Russian and Chinese arsenals, instead it now appears to endorse their secrecy. Likewise, if New START disappears, it is in the strong interest of both the United States and Russia to continue maintaining the verification provisions, which provide the only windows into the strategic posture of the two sides.

China has traditionally declined to engage in transparency measures, arguing that its small arsenal and no-first-use posture mean it has to preserve uncertainty about the exact size and structure of its arsenal. But as part of responsible deterrence, and as a matter of risk reduction, China must commit to greater exchange of nuclear information. For example, the United States and China should establish a reciprocal advance-launch notification agreement for long-range missile systems. Such an agreement would duplicate existing ballistic missile-launch notification agreements between the United States and Russia (1988) and between Russia and China (2009). As advocates note, it would serve two purposes. “First, it would establish the foundation for a broader military notification mechanism. Second, it would serve as a test case for informal arms control arrangements between the United States and China.”<sup>25</sup>

### Unilateral Measures

9. *Unilateral efforts by each of the nuclear powers to enhance awareness of the risks of entanglement of conventional and nuclear arms and strengthen crisis stability.* Advances



in sophisticated, long-range conventional global-strike weapons, as well as the creation of dual-use weapons, are increasingly entangling nuclear and conventional deterrence and defense, creating new kinds of escalation scenarios.<sup>26</sup> Nuclear-armed states should undertake unilateral efforts to enhance awareness of these dynamics and possible escalation pathways. Dialogue among nuclear powers could eventually follow in the form of stability talks.

10. *Interpret “parity” broadly.* The United States’ commitment to having a nuclear arsenal “second to none” does not require duplicating every weapon of the adversary. The Trump Nuclear Posture Review unfortunately gave new life to old arguments that the United States must match Russia in every category of weapon on the escalation ladder, regardless of whether such weapons add meaningfully to U.S. deterrence. In fact, strict parity may not be necessary. As Manzo has argued, even if Russia were uninterested in maintaining New START limits, there are strong reasons for the United States to stick to them unilaterally. The United States could meet all its deterrence objectives at New START levels “even if Russia exceeds them by hundreds of deployed strategic warheads.”<sup>27</sup> As long as the United States maintains a triad of strategic delivery vehicles, U.S. posture is resilient to Russian increases. Staying within the New START limits – even if Russia does not – would enable the United States to avoid a quantitative arms competition it might lose and would also help avoid a negative reaction from allies and other friendly nations if New START expires.<sup>28</sup>

Likewise, a strict interpretation of parity is an ill-suited guide for the U.S.-Chinese relationship. In the interest of nuclear risk reduction, the United States and China should engage in regular nuclear weapon information exchanges. While these should be reciprocal, they will need to be asymmetric, given the very different force postures and also the two countries’ different outlooks and experiences on cooperative transparency.<sup>29</sup> For their part, Chinese leaders cannot cite asymmetry in arsenals as an excuse for avoiding greater transparency and information exchange.

11. *To increase arms race stability, Congress can cut the budget for nuclear modernization.* By cutting funding for unnecessary new weapons that both fuel an arms race and might be destabilizing in a crisis, Congress can use its power of the purse to shape a nuclear arsenal that exhibits more restraint. Modernization of the nuclear arsenal is important for the safety and reliability of the weapons, and U.S. spending on its nuclear arsenal constitutes only about 6–8 percent of all U.S. defense spending. Still, the Trump administration’s expansive modernization plans include a new low-yield warhead to match Russia’s supposed “escalate to de-escalate” strategy, and a new submarine-launched cruise missile that many analysts argue would be destabilizing. Because both Russia and China are increasing the number of their low-yield nuclear weapons, the Pentagon thinks it will have

a deterrence “gap” and seeks similar weapons. There are compelling arguments that the United States does not need these weapons for deterrence. U.S. interests would also not be served by matching Russia’s violation of the now-defunct INF Treaty by developing a comparable U.S. ground-launched missile, as called for in the 2018 Defense Authorization Act. Congress should limit the funding for unnecessary and destabilizing new weapons.

12. *Congress can adopt measures to strengthen the checks and balances on the president’s ability to launch nuclear war unilaterally.* A silver lining of the Trump era is that members of Congress have become acutely aware of how easy it would be for a president to launch a nuclear war unilaterally and of the tremendous risks of this unchecked power. This issue is primarily a matter of U.S. constitutional norms, not the norms of the global nuclear regime. Beginning in 2016, Representative Ted Lieu (D-CA) and Senator Edward Markey (D-MA) have regularly introduced a bill that would prohibit the president from launching a first-strike nuclear attack without congressional approval.<sup>30</sup> In January 2019, Senator Elizabeth Warren (D-MA) and Representative Adam Smith (D-WA) went even further, introducing legislation that declared: “it is the policy of the United States to not use nuclear weapons first.”<sup>31</sup> Congress is divided on these matters, however. More desirable may be institutional changes to require the secretary of defense and the attorney general to participate in any decision to use nuclear weapons. The secretary of defense would certify that a given order is valid (meaning that it is definitely from the commander in chief); the attorney general would certify that it is legal (that is, within the president’s authority and proper legal bounds). These changes may be better done by executive decision rather than congressional legislation.<sup>32</sup>

More feasible in the near term might be the recent proposal by political scientists Jeffrey Lewis and Scott Sagan that the United States should declare it will not use nuclear weapons “against any target that could be reliably destroyed by conventional means.”<sup>33</sup> Congress could hold hearings on the topic, which would invite useful debate on what targets, if any, really require a nuclear weapon. While this debate over presidential authority is primarily a matter of U.S. constitutional norms, it also usefully highlights the widely shared international norm that nuclear use is (and should be) a last resort.

If taken, these proposals, individually and together, would help mitigate the larger effects from the loss of a formal arms control regime by establishing alternative approaches for dealing with destabilizing developments, minimizing the costs and risks of arms race instability, and fostering transparency and predictability. The unilateral proposals that I offer are framed primarily in terms of the United States, but there is no reason they cannot also be an exhortation to other nuclear-armed states to take similar measures.

What is the feasibility of this agenda in an environment of toxic politics and difficult geostrategic relations? Skeptics on the right will argue that in an unstable, threatening international environment, policies such as no-first-use are unwise. Critics on the left will argue that notions such as responsible deterrence legitimize nuclear possession. In the face of resistance from nuclear-armed governments, civil society and domestic politics will likely play a key role in fostering nuclear restraint in the absence of treaties.

The nuclear freeze movement of the early 1980s provides a relevant comparison. The call to halt the nuclear arms race launched by activist Randy Forsberg in the late 1970s grew into the nuclear freeze movement in the United States, the largest peace movement in American history. It advocated a bilateral halt to the testing, production, deployment, and delivery of nuclear weapons. Through a campaign of grassroots organizing, it grew into a vast coalition of major religious denominations, academic associations, women's organizations, and physicians' groups. Numerous city councils and state legislatures passed symbolic freeze resolutions.<sup>34</sup> The freeze offered a cogent critique of the nuclear rhetoric and policy of the Reagan administration, and "even became a plank of the Democratic Party platform in 1984."<sup>35</sup> While an actual nuclear freeze was never put in place, the movement was highly successful in putting pressure on Congress and the president to rein in the arms race and engage in nuclear restraint.<sup>36</sup>

Following the end of the Cold War, nuclear weapons fell off the public's radar and arms control became largely an inside-the-beltway, elite-driven process. In recent decades, the lack of a widespread grassroots antinuclear movement helps explain the lack of pressure on nuclear-armed governments to engage in disarmament and arms control. While polling shows that publics tend to support the goal of nuclear disarmament, only a small minority takes part in activism that raises awareness about the dangers of nuclear weapons, lobbies for arms control, or contributes to the goal of abolition.<sup>37</sup> This suggests the importance of, and need for, education for a public often woefully uninformed on nuclear issues.

The major exception to this picture in recent years is the Nuclear Weapon Ban Treaty. This treaty – a total prohibition on possession or use of nuclear weapons by any state – was the outcome of nearly a decade of mobilizing by a coalition of civil society organizations and non-nuclear states. The coalition sought to highlight the devastating humanitarian consequences of any use of nuclear weapons as a way to mobilize support for disarmament.<sup>38</sup> Remarkably, the treaty was achieved over the objections of nuclear-armed states, which boycotted the negotiations, while the International Campaign to Abolish Nuclear Weapons (ICAN), the civil society organization leading the campaign, was recognized for its work with the Nobel Peace Prize in December 2017.

Coming thirty-five years after the freeze, the humanitarian campaign benefited from new antinuclear organizations such as Global Zero, the Nuclear Security

Project, and Beyond the Bomb, along with a whole new world of social media that tremendously facilitated grassroots and transnational organizing. Supporting these were funders such as the Ploughshares Fund and the Stanton and MacArthur Foundations. As with the earlier freeze movement, the ban treaty is inspiring action at the regional and municipal levels that seeks to put pressure on national governments. More than thirteen hundred active members of parliaments in Europe have pledged their support for the treaty, while a growing number of city councils have joined the ICAN Cities Appeal, including Washington, D.C., Baltimore, Los Angeles, Melbourne, Toronto, Geneva, Berlin, Munich, Sydney, Oslo, Manchester, Hiroshima, and Nagasaki. The state legislatures in California, Oregon, and New Jersey have called on the United States to join the ban treaty, while the EU parliament has called on all EU member states to do so. Meanwhile, the “don’t bank on the bomb” campaign urges companies not to be involved in the financing or production of nuclear weapons. These actions are mostly symbolic, of course, and cannot force nuclear powers to join the treaty or to disarm. But they are mobilizing antinuclear activism that can eventually put pressure on governments, especially those of NATO allies in Europe, to do more to reduce nuclear dangers.

Will these civil society movements actually help to reinstate norms and restrain the arms race? Skeptics argue that civil society activism has a largely one-sided effect, influencing democracies but with no evident impact on nondemocratic nuclear-armed states, which are largely immune to such pressure.<sup>39</sup> It is therefore unclear how civil society pressure will motivate the needed global responsibility and lead to universal norms.

It is true that civil society pressure has mostly been focused on democracies: the ban campaign, for example, has focused its demands for disarmament disproportionately on the United States and European allies, while seemingly letting the other nuclear powers off the hook. Yet the asymmetry is not as sharp as some may think. It is true that a large grassroots movement for the ban treaty will not be organized in Russia or China (and does not currently exist in the United States, either). Yet the Russian government has been outspoken against the ban and clearly does not see it as posing a problem only for democracies. Officials in both Washington and Moscow seek to diminish the significance of the treaty, and they would not be happy if it is eventually ratified by most of the 122 countries that have signed it and publics press some of the major governments that have resisted it to join them. This would delegitimize nuclear weapons in the eyes of a large portion of people everywhere. Russian President Vladimir Putin, for example, would not be pleased to see a weapon that he likes to wave about regarded as anathema by the rest of the world.

Moreover, were this to become the dominant view in most of the countries without nuclear weapons and even a few with such weapons, Russian authorities – including the military – would be concerned that the attitude would soon cross Russian borders. This does not mean that they would fear, let alone permit, a large

organized groundswell. But as with climate change and environmental issues, Russian leaders are sensitive to broad public sentiments, even if amorphous.<sup>40</sup> Nevertheless, in the immediate future, the United States and other democracies are likely to feel most acutely the pressure of pro-ban activists. I have suggested several ways they might engage the movement constructively.

Formal arms control has been an important tool of nuclear restraint and its loss will be felt. Likely someday, it will revive. In the meantime, even without treaties, nuclear-armed states can take numerous steps, both unilaterally and cooperatively, to reduce the risk of nuclear war. In the end, it is in the fundamental interest of the United States to pursue measures of nuclear restraint and responsibility, jointly with Russia and China if possible, and unilaterally if necessary. The United States could usefully begin by publicly reaffirming the importance of the seventy-four-year tradition of nonuse. U.S. leadership in demonstrating restraint and responsibility might help nudge the world toward a retreat from nuclear confrontation. Of course, it might not work, but the alternative, an unrestrained nuclear arms race, seems worse.

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#### ABOUT THE AUTHOR

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#### ENDNOTES

- <sup>1</sup> This notion explicitly invokes the concept of the responsibility to protect, adopted by the UN Security Council in 2005, which promoted a global dialogue to develop criteria for military intervention to prevent mass atrocity crimes.
- <sup>2</sup> Oxford English Dictionary, “Restrain,” <https://en.oxforddictionaries.com/definition/restrain>.
- <sup>3</sup> Scott D. Sagan, “Shared Responsibilities for Nuclear Disarmament,” *Daedalus* 138 (4) (Fall 2009): 157–168.
- <sup>4</sup> A State Department official commented to me in 2014 regarding the humanitarian campaign, “Who are they to delegitimize OUR nuclear weapons?”
- <sup>5</sup> Michael J. Mills, Owen B. Toon, Julia Lee-Taylor, and Alan Robock, “Multidecadal Global Cooling and Unprecedented Ozone Loss Following a Regional Nuclear Conflict,” *Earth’s Future* 2 (4) (2014): 161–176.
- <sup>6</sup> Raymond Jeanloz, “Long-Range Effects of Nuclear Disasters,” in *The Nuclear Enterprise: High-Consequences Accidents: How to Enhance Safety and Minimize Risk and Nuclear Reactors and*

*Weapons*, ed. George P. Shulz and Sidney D. Drell (Stanford, Calif.: Hoover Institution Press, 2012), 107–126.

<sup>7</sup> Beth A. Simmons, *Mobilizing for Human Rights: International Law in Domestic Politics* (Cambridge: Cambridge University Press, 2009), 24–36.

<sup>8</sup> Elaine Scarry, *Thermonuclear Monarchy: Choosing between Democracy and Doom* (New York: W. W. Norton, 2014).

<sup>9</sup> See Rebecca K. C. Hersman and William Pittinos, *Restoring Restraint: Enforcing Accountability for Users of Chemical Weapons* (Washington, D.C.: Center for Strategic and International Studies, 2018).

<sup>10</sup> Michael Krepon, ed., *Nuclear Risk Reduction in South Asia* (London: Palgrave MacMillan, 2004).

<sup>11</sup> These norms are discussed in greater detail in Nina Tannenwald, “The Great Unraveling: The Future of the Nuclear Normative Order,” in *Meeting the Challenges of the New Nuclear Age: Emerging Risks and Declining Norms in the Age of Technological Innovation and Changing Nuclear Doctrines*, by Nina Tannenwald and James M. Acton (Cambridge, Mass.: American Academy of Arts and Sciences, 2018).

<sup>12</sup> UN Secretary-General António Guterres has endorsed the joint statements by Reagan and Gorbachev that “a nuclear war cannot be won and must never be fought,” adding that “any effort to expand the possible range of situations in which nuclear weapons are designed to be used could be destabilizing and jeopardizes the 72-year practice of non-use.” United Nations Office for Disarmament Affairs, *Securing Our Common Future: An Agenda for Disarmament* (New York: United Nations Office for Disarmament Affairs, 2018), [https://front.un-arm.org/documents/SG+disarmament+agenda\\_1.pdf](https://front.un-arm.org/documents/SG+disarmament+agenda_1.pdf).

<sup>13</sup> “Unlocking Disarmament Diplomacy through a ‘Stepping Stone’ Approach,” working paper presented by Sweden to the Preparatory Committee for the 2020 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, Third Session, New York, April 25, 2019, NPT/CONF.2020/PC.III/WP.33.

<sup>14</sup> Wilfred Wan, *Nuclear Risk Reduction: A Framework for Analysis* (Geneva: United Nations Institute for Disarmament Research, 2019).

<sup>15</sup> For this suggestion, see Lewis Dunn, “The Strategic Elimination of Nuclear Weapons: An Alternative Global Agenda for Nuclear Disarmament,” *The Nonproliferation Review* 24 (5–6) (2017): 427–428.

<sup>16</sup> International Institute of Strategic Studies, James Martin Center for Nonproliferation Studies, and Vienna Center for Disarmament and Nonproliferation, *Improving the Security of All Nuclear Materials: Legal, Political, and Institutional Options to Advance Institutional Oversight* (London: International Institute of Strategic Studies, 2016), 34–35.

<sup>17</sup> Lyndon Burford, “A Risk-Driven Approach to Nuclear Disarmament,” European Leadership Network, June 25, 2019, <https://www.europeanleadershipnetwork.org/commentary/a-risk-driven-approach-to-nuclear-disarmament/>.

<sup>18</sup> U.S. Department of Defense, Office of the Secretary of Defense, *Report on Nuclear Employment Strategy of the United States Specified in Section 491 of 10 U.S.C.* (Washington, D.C.: Office of the Secretary of Defense, 2013).

<sup>19</sup> Ministry of Foreign Affairs of Japan, *Bridges to Effective Nuclear Disarmament: Recommendations for the 2020 Review Process for the Treaty on the Non-Proliferation of Nuclear Weapons*

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- <sup>20</sup> For an extended discussion, see Nina Tannenwald, “It’s Time for a U.S. No-First-Use Policy,” *Texas National Security Review* 2 (3) (2019).
- <sup>21</sup> Bruce G. Blair, Jessica Sleight, and Emma Claire Foley, *The End of Nuclear Warfighting: Moving to a Deterrence-Only Posture: An Alternative U.S. Nuclear Posture Review* (Princeton, N.J.: Program on Science and Global Security, Princeton University, 2018).
- <sup>22</sup> Vince Manzo, *Nuclear Arms Control without a Treaty? Risks and Options After New START* (Arlington, Va.: CNA, 2019), 4, 80. These limits would not preclude replacement systems.
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# Conclusion: Strategic Stability & Nuclear War

*Christopher F. Chyba & Robert Legvold*

If the fear of nuclear war has faded as the Cold War recedes into the misty past, we may need to remind ourselves of what these weapons can do. At least five of the nine countries that currently possess nuclear weapons can deliver thermonuclear warheads, each with the explosive equivalent of several hundred thousand tons of TNT, nearly halfway around the Earth.<sup>1</sup> The intercontinental ballistic missiles (ICBMs) and submarine-launched ballistic missiles (SLBMs) that would deliver them at this range are called “strategic” because they can reach into an adversary’s homeland to destroy leadership, military, infrastructure, or civilian targets. Warheads on different missiles are characterized by their yield (explosive energy) and their accuracy. Estimates in the open literature suggest that the United States, for example, can deliver a 455 kiloton warhead launched from a Trident ballistic missile submarine over six thousand miles to detonate within the length of a football field of its target.<sup>2</sup> The yield of 455 kilotons means that the energy released would equal the explosive energy of 455,000 kilograms (about one million pounds) of high explosive (TNT), which would be more than thirty times the energy released by the nuclear weapon detonated by the United States over Hiroshima during World War II. Depending on the relative location of the submarine launching the SLBM and its intended target, the time between the launch and the detonation of the warhead could be as short as six to ten minutes.<sup>3</sup> An adversary might have only that much warning time to recognize that an attack was underway and react.

Some Russian and Chinese strategic missiles are thought to carry warheads of even larger explosive yields. For example, the Russian SS-19 Mod 3 ICBM carries six independently targetable warheads (MIRVs) that reportedly have a yield as high as 750 kilotons.<sup>4</sup> Figure 1 shows the effects of one such 750-kiloton warhead exploding 1 mile (1.6 kilometers) above New York City, centered on Midtown Manhattan.<sup>5</sup> The four concentric rings in the figure illustrate the effects of the explosion. Moving outward from the point of detonation: Within the first ring



Figure 1  
Nuclear Blast above Midtown Manhattan



The map illustrates the immediate consequences of the hypothetical explosion of a 750-kiloton warhead that detonated 1 mile (1.6 kilometers) over Midtown Manhattan. More than 1.8 million people would be killed nearly instantly, and over 2 million more immediately wounded. The effects of likely massive urban fires are not included in these casualty estimates, nor are later deaths from radiation exposure. Source: Alex Wellerstein, NUKEMAP, <https://nuclearsecrecy.com/nukemap/>. Map data © OpenStreetMap contributors, published under a Creative Commons Attribution-ShareAlike 2.0 Generic (CC BY-SA 2.0) license; and Imagery © Mapbox.

(radius 2.5 kilometers) the blast is so strong that even heavily built concrete buildings are demolished. Virtually every person within this area is killed in the blast. This ring extends entirely across the island of Manhattan from the East River to the Hudson. The second ring (radius 5.7 kilometers) reaches into New Jersey and the boroughs of Brooklyn and Queens. It marks the distance out to which residential buildings collapse. At this distance, “injuries are universal and fatalities are widespread.” The third ring (radius 11 kilometers) shows the effects of the immediate thermal radiation (high intensity ultraviolet, visible, and infrared light emitted by the explosion). Out to this distance, anyone with a line of sight to the detonation suffers third-degree burns to exposed skin. Finally, the fourth ring (radius 15 kilometers) marks the distance out to which windows shatter, with resulting injuries from flying glass. Overall, more than 1.8 million people would be killed nearly instantly, and over 2 million more immediately wounded. These numbers ignore the effects of firestorms – massive urban fires driven by hurricane-force winds that may result from the nuclear detonation<sup>6</sup> – as well as longer-term radiation and fallout. Of course, many hospitals and firehouses would be destroyed, and many medical personnel immediately killed, limiting the life-saving potential of first-responders.

These results are for a single large strategic warhead. Under the 2011 New START arms control treaty, Russia and the United States agreed to reduce their numbers of deployed strategic warheads to 1,550 on each side.<sup>7</sup> China, France, and the United Kingdom have smaller numbers of warheads on missiles, estimated at about 290, 300, and 225 warheads, respectively.<sup>8</sup> In a nuclear war, or a conventional war that escalated to the use of strategic nuclear weapons, many – perhaps hundreds or more – such detonations might take place.

**T**his must never be allowed to happen. One way to try to ensure that it never does is to threaten nuclear-armed adversaries with nuclear retaliation from forces that would credibly survive an initial attack (the “first strike”). Potential attackers would then presumably be deterred from launching a first strike because they would feel certain to suffer devastating nuclear retaliation.<sup>9</sup> Yet this deterrent posture carries with it an inescapable, perhaps small but difficult to quantify, possibility of inadvertent or mistaken nuclear war.<sup>10</sup>

Another way to try to ensure that the worst never happens is to eliminate all nuclear weapons worldwide. But this approach raises its own challenges. One is how to reduce and then eliminate nuclear weapons with sufficient verification that all countries could feel confident that no weapons were hidden in violation of the disarmament agreements. A second is that weapons know-how cannot be unlearned and relevant capabilities fully undone, so that in a major war or political crisis, there could be pressure to recreate rapidly and perhaps preemptively use nuclear weapons. That is, a world of zero nuclear weapons could prove

dangerously unstable. Experts have dedicated much attention to these challenges, but they are far from solved.<sup>11</sup> At the same time, as this volume of *Dædalus* has highlighted, a future world in which stability is preserved through nuclear deterrence also faces considerable known and unknown challenges.

But there are other possible security catastrophes that states also wish to prevent: for example, full-scale conventional war among the major powers. World War II resulted in the deaths of over sixty million people.<sup>12</sup> The major powers have not waged total war against one another since 1945, even if many other smaller conflicts have been fought. There is more than one reason for this “Long Peace,” but it is likely that the existence of nuclear weapons has induced caution on the part of the major powers over being drawn into major war.<sup>13</sup> The successful mating of fusion warheads to ICBMs or SLBMs has for this reason been termed the “nuclear revolution,” because the likelihood of major war among states equipped with these weapons has been, some argue, greatly reduced by removing any doubt in the minds of national leaders about the horrific outcome of such a war.<sup>14</sup> Ballistic missile defense systems remain all but useless against more than a small number of incoming strategic warheads, so there is no reliable defense.<sup>15</sup> Therefore, in a face-off among nuclear-armed states, rational leaders provided with competent technical information must recognize that their country lies open to destruction. There is no denying the devastating consequences of thermonuclear war. Since full-scale conventional war could escalate to nuclear war, rational leaders would not risk waging full-scale war on another ICBM- or SLBM-wielding thermonuclear power.<sup>16</sup> And so, as some have argued, peace at this level has endured.

Various countries at various times have claimed other vital uses for nuclear weapons. Before it gave up its small, indigenous nuclear weapons arsenal, apartheid South Africa imagined that threatening the use of its weapons would force the great powers to negotiate an end to any conflict that menaced it.<sup>17</sup> Pakistan’s senior generals have been clear that Pakistan would use nuclear weapons first if needed to repel a purely conventional Indian invasion.<sup>18</sup> It seems likely that North Korea’s Kim Jong-un views the threat to use his country’s nuclear weapons as his ultimate guarantor of regime and personal survival.<sup>19</sup> Finally, some countries, at least under certain leaders, may have pursued nuclear superiority (more nuclear missiles, with more nuclear warheads, say, than one’s adversary) under the belief that this putative superiority in itself would confer other advantages or intimidate adversaries away from certain courses of action.<sup>20</sup> Not unrelatedly, some countries may pursue nuclear weapons to protect themselves against the possibility of nuclear blackmail or coercion.<sup>21</sup>

**A**nd so, we find ourselves in our current dilemma. Countries desire the security afforded by their own or their allies’ nuclear weapons, but as long as these weapons exist, there remains a chance that they could be used in

limited or even vast numbers. This could result from escalation in the context of an ongoing conventional war, with one side concluding it had no choice but to strike first; or it might result from an erroneous conclusion made under time pressure that another state has launched a nuclear attack; or from a miscalculation by a leader who is not realistically informed or who has rebuffed efforts to be so informed; or even via an irrational leader coming to power and making heinous decisions. It is sobering that since the end of World War II, nuclear adversaries have considered the use of nuclear weapons in preventive war, have explicitly or implicitly threatened the use of nuclear weapons, and, in the Cuban missile crisis, have come close to misjudgments that would have led to nuclear war.<sup>22</sup> Concerns over escalation to the use of nuclear weapons are therefore justified by the historical record. At the same time, there has been no wartime use of nuclear weapons and no full-scale war between major powers since 1945.

Nuclear-armed states have aimed to reduce the likelihood of the various pathways to nuclear weapons use by seeking to create conditions of *strategic stability*. Strategic stability is usually taken to include both crisis stability and arms race stability. *Crisis stability* means that even in a conventional war or faced with a possible nuclear attack, states would not use nuclear weapons for fear that such escalation would bring certain disaster. Crisis stability must be robust even against inadvertent or mistaken nuclear escalation. *Arms race stability* means that nuclear powers do not have incentives to pursue weapons or weapon deployments resulting in action-reaction cycles that undermine crisis stability.

The goal of this volume has been to examine whether current directions in international affairs and a concomitant technological evolution are eroding strategic stability and placing the world at greater risk of nuclear weapons use – and if so, what might be done about it. In particular, this volume had its genesis in three particular concerns that appear to threaten strategic stability: the increasing complexity of nuclear relationships in a world of multiple and increasingly capable nuclear powers; the near-collapse of bilateral strategic arms control between the United States and Russia; and the development and possible deployment of new technologies whose characteristics overall seem likely to be destabilizing. Separately or combined, each of these trends could make escalation to nuclear weapons use more likely. These are wide-ranging multilateral challenges, but this volume has focused primarily on the triangular relationship among China, Russia, and the United States, with only occasional discussion of other nuclear powers. This reflects a practical decision to begin with these core relationships, not a belief that only those relationships matter. Subsequent work will expand this focus.<sup>23</sup>

During the Cold War, countries looked to a variety of means to prevent escalation to nuclear war, without forsaking what they perceived as the security benefits of their nuclear arsenals. The dream of a successful defense against a large-scale nuclear attack never ended, but the technical reality remained that warheads

launched from ICBMs and SLBMs were extremely difficult to intercept, and that an attacker's countermeasures were technically simpler and less expensive than a defender's interceptors.<sup>24</sup> Absent a credible defense against strategic missiles, other approaches came to the fore.

The least subtle of these was deterrence. In broad terms, deterrence in the nuclear context seeks to alter an adversary's cost-benefit calculation with respect to the use of nuclear weapons.<sup>25</sup> Its most stark realization was in the condition of mutual assured destruction (MAD) between the United States and the Soviet Union. Once secure second-strike systems were in place, each side understood that full-scale nuclear war would mean mutual annihilation, regardless of who struck first. Each country was deterred, they hoped, from reaching for the nuclear trigger by a recognition that no conceivable benefit was worth this level of "assured destruction."

In less stark manifestations of deterrence, countries sought to supplement the threat of punishment with steps that would deny an adversary's efforts to achieve their goals in launching an attack: so-called deterrence by denial. For example, an adversary might imagine that small-scale nuclear weapons could be employed in limited fashion to secure a desired objective without leading to unacceptable further escalation. Deterrence by denial meant fashioning capabilities that would dissuade an adversary from trying, thus cutting off a dangerous path to even greater nuclear weapons use. If nuclear weapons were nevertheless used in a limited way, some theorists argued that adversaries, faced with an opponent whose escalatory options were superior, might still be deterred from moving to higher levels of nuclear destruction.<sup>26</sup>

Beyond deterrence, the United States and the Soviet Union, and then Russia, engaged in a variety of arms control measures that were intended to reduce the incentives either side might have for escalating to nuclear weapons use.<sup>27</sup> Arms control sought to improve the adversaries' knowledge of one another, both through technical transparency into each other's military capabilities and by enhancing leadership communication in crisis. Consequently, escalation through fear, misunderstanding, or worst-case analyses would be less likely. Jon Wolfsthal, in his essay for this volume, highlights several major U.S.-Soviet arms control treaties that embodied these objectives.<sup>28</sup> The 1972 Anti-Ballistic Missile (ABM) Treaty sought to limit strategic missile defense deployments to spare each side a costly defensive arms race that could, at its worst, provide the false impression that launching a first nuclear strike was credible due to an effective defense against an adversary's reply. The 1987 Intermediate Nuclear Forces Agreement (INF) stabilized the U.S.-Russian nuclear relationship by eliminating the two countries' intermediate-range nuclear missiles in Europe and elsewhere, thereby freeing Moscow and European capitals from the fear of nuclear destruction from a nonstrategic missile that, because of the shorter ranges involved, could eliminate leadership, command and

control, or other targets with warning times much shorter than those of ICBMs. The second Strategic Arms Reduction Treaty (START II), signed by the United States and the Russian Federation in 1993, required the removal of MIRVed warheads from ICBMs. This would have reduced incentives for a first strike against vulnerable land-based missiles hosting multiple warheads. (The treaty, however, never entered into force.) All these agreements instantiate a view of arms control motivated by the desire to enhance strategic stability, rather than the intention to reduce the size of nuclear arsenals as such. Yet there were also arms control agreements that seemed more concerned with simple measures of parity than with enhancing stability.<sup>29</sup>

As the archives open, we are learning that the impulses prompting leadership in the two countries to turn to arms control were as broadly political as they were an effort to manage nuclear risks. James Cameron, in his essay in this volume, stresses this larger geopolitical context for arms control. Perhaps this should be unsurprising, since such a long-lasting foreign policy tool might be expected to serve many constituencies in order to survive over many decades. Cameron argues in particular that arms control, including the 1970 Treaty on the Non-Proliferation of Nuclear Weapons (NPT), was used by the United States and the Soviet Union “to preserve their dominance of global politics at the expense of their allies’ military options.”<sup>30</sup> Similarly, as he and other historians have shown, bringing U.S. allies under the protection of its nuclear umbrella was a powerful way to avert nuclear proliferation among those allies. In particular, both the United States and the Soviet Union valued the 1963 Limited Test Ban Treaty as a barrier to Germany pursuing a nuclear option. The crucial interplay between deterrent practices and arms control in the pursuit of broader objectives did not cease with the end of the Cold War. Looking ahead, if nuclear arms control is to have a future not only between the United States and Russia but among the other major nuclear powers, it will only be if leaders see it as a way to achieve larger geopolitical objectives as well as a safer nuclear world.

Another view of the nuclear threat, one whose roots reach back to some of the scientists who produced the first atomic bomb, was that measures such as deterrence and arms control could not guarantee strategic stability in perpetuity, and that international security ultimately would require the elimination of nuclear weapons.<sup>31</sup> The recognition that nuclear weapons bring peril as well as stability was one motive behind Article VI of the NPT, which calls for their ultimate elimination.<sup>32</sup> Throughout the Cold War, there was an ebb and flow of efforts by elements of civil society or on the part of non-nuclear-weapon states to pursue international security through nuclear disarmament.<sup>33</sup> The focus in this volume on relations among and strategic approaches of the three leading nuclear-weapon states – the United States, Russia, and China – risks paying too little attention to the views of non-nuclear-weapon states who find the continuing strategic face-off (claims for

the efficacy of deterrence or no) to be deeply troubling. Harald Müller and Carmen Wunderlich, in their essay discussing the Treaty on the Prohibition of Nuclear Weapons, trace the ways in which the apparent lack of attention on the part of the nuclear-weapon states to their Article VI NPT commitments and their backtracking on past commitments have encouraged 122 nations to negotiate – though not yet bring into force – a treaty to ban nuclear weapons altogether.<sup>34</sup>

All these approaches to maintaining strategic stability have been affected by the transition from the largely bilateral nuclear rivalry of the Cold War to today's more complicated nuclear world. Disturbingly, the trends we identify here – increasingly complex relations among increasingly capable nuclear-armed states, the collapse of formal arms control, destabilizing technological advances – are not merely moving in parallel, but may reinforce one another in powerful ways. Steven Miller, in his lead essay for this volume, argues that the effects of the transition from a predominantly U.S.-Russian nuclear weapons relationship to a Chinese-Russian-U.S. nuclear triangle can already be seen in important outcomes.<sup>35</sup> Miller argues that while accusations of treaty noncompliance were the proximate cause of U.S. withdrawal from the INF, strategic calculations reflecting the more complicated three-way Chinese-Russian-U.S. relationship undergirded this decision: because of the bilateral INF treaty, neither Russia nor the United States could match China's growing missile capabilities in the 500 – 5,500 kilometer range. A bilateral treaty was no longer well suited for a trilateral military relationship.

Miller gives a second example of increasing complexity due to multilateral nuclear decision-making. In the case of ballistic missile defense, steps taken by the United States to defend itself against small numbers of North Korean ICBMs or (possible future) Iranian ICBMs are seen by China and Russia as laying the groundwork for a more extensive and effective system to counter their own strategic nuclear forces. (And, Miller argues, the Trump administration has given them additional cause for this interpretation.) Steps taken in response by China will potentially affect India's decisions about its own nuclear forces. Beijing sits at an apex of two nuclear triangles, one with the United States and Russia, the other with India and Pakistan. At a minimum, as Miller approvingly quotes former Ambassador Steven Pifer, "Strategic stability appears increasingly a multilateral and multi-domain construct."<sup>36</sup> Miller is doubtless correct when he concludes that formal treaty-based bilateral arms control, a classic tool for managing strategic stability, is less and less suited for the world in which we now live. Nor is multilateral arms control likely to fill the void. As Miller warns: "Bilateral arms control is collapsing but seems in any case insufficient; trilateral arms control seems necessary but so far remains impossible; multilateral arms control is comatose; and regional arms control is desirable but is as yet nonexistent."<sup>37</sup>

Any successful path forward will depend on the United States, Russia, and China finding some measure of common ground. If the essays in this volume by Anya Loukianova Fink and Olga Oliker, Li Bin, and Brad Roberts make one thing clear, that will not be easy. Reconstructing the perspectives of Russia, China, and the United States, respectively, the authors each describe a set of concerns fundamentally at odds with those of at least one of the other two. For Roberts, striving to pursue an approach to nuclear deterrence that lowers the risk of nuclear war remains key for the United States, but the context in which the United States must conduct this pursuit is altogether different. Russia, he argues, is no longer a potential partner in seeking to reduce nuclear risks, but a dangerous adversary striving to create a nuclear posture serving its aggressive foreign policy agenda.<sup>38</sup> The risk to be averted, therefore, is first and foremost that U.S. deterrence will fall short. By Fink and Oliker's retelling, Russia, in contrast, sees the situation in reverse: Russia's nuclear forces are designed to deter the primary threat posed by the United States. As its once dominant role in a shifting global setting fades, Russia's leadership contends, the United States counts on its military power, underpinned by nuclear weapons, to threaten and coerce others. It seeks nuclear superiority and now focuses on new technologies and weapons systems intended to degrade the Russian nuclear deterrent and make nuclear weapons more usable.<sup>39</sup>

Not only have U.S. and Russian views on what threatens strategic stability sharply diverged, making preserving, let alone extending, the nuclear arms control process a fading prospect, but the way each side now both defines the specific threat that it sees in the other side's weapons programs and doctrinal shifts and prepares to counter them seems likely to increase the chance of inadvertent escalation across the nuclear threshold. In the meantime, Li argues, the disparity between the size of the U.S. and Russian nuclear arsenals and those of all other countries means that the numerical aspects of U.S.-Russian arms control treaties "cannot apply to China."<sup>40</sup> In other words, formal multilateral arms control is, as Miller suggested, not currently an available option. As the United States begins to treat China as a rising geopolitical threat and its enhanced nuclear forces as a source of concern, China's changing perceptions of global trends, the nature of the nuclear world, and the challenges it faces, according to Li, widens the gulf.

Complicating all issues of mutual understanding and potential escalation is the arrival – likely in the absence of any related arms control measures – of a set of new technologies that overall will probably make nuclear forces and their associated command and control appear more vulnerable. The most immediate of these is cyberspace operations. In his essay, James Acton systematically describes the ways in which cyber weapons differ from traditional weapons and, in particular, those aspects of cyber operations that seem especially destabilizing.<sup>41</sup> He acknowledges, however, that credible approaches to mitigate this threat are



inadequate to the need. Christopher Chyba, in his essay, examines a wide range of new technologies, and proposes a framework to think through a given technology's impact on strategic stability. The intent of his framework is to help ensure that consideration (by any country) of new technologies systematically confronts the variety of ways in which destabilizing effects may result, so that possible mitigating steps can at least be considered.<sup>42</sup>

How, then, are we to work within this world to lessen the chances of escalation to the use of nuclear weapons? Most of our authors propose elements of a response, but Linton Brooks, James Timbie, and Nina Tannenwald, in their essays, take this question as their primary focus. There is consensus that the United States and Russia should take advantage of New START's provision that allows the two parties to extend the treaty by five years beyond its looming 2021 expiration deadline. Brooks emphasizes that the transparency and predictability measures implemented in New START benefit the United States more than Russia because the United States is inherently the more open of the two countries. Moreover, while much of the information exchanged between the two sides *could* be obtained by national intelligence, this would require the diversion of these resources away from other intelligence requirements. And still, some of the information provided by New START, Brooks warns, "cannot be obtained in any other way."<sup>43</sup>

Yet Brooks – in agreement with other authors in this volume – acknowledges that a replacement treaty is nevertheless unlikely.<sup>44</sup> Timbie is clear about why further arms control treaties of any kind between Russia and the United States seem improbable. "Russia," he notes, "has taken the position that further agreements must address third-country forces, missile defense, and precision conventional systems."<sup>45</sup> But it is unlikely that China will agree to enter a formal treaty process, and the United States is unlikely to negotiate treaty commitments limiting missile defense. To this, one might add the seeming unwillingness of the current U.S. Senate to ratify treaties of nearly any kind, and arms control treaties in particular.

With the end of New START, bilateral arms control between the United States and Russia in the sense of formal legally binding treaties comes to an end. Brooks emphasizes that it is important to analyze carefully what the consequences of this loss of information and restraint will be, and to understand what mitigating steps may be taken to compensate for at least some of what will be lost. To this end, Timbie proposes an extensive list of transparency measures, numerical limits, and constraints on behavior that could be agreed upon as political, rather than legal, agreements. Verification would of necessity be weaker than with New START, but perhaps some limited verification measures could nevertheless be put in place. This would circumvent the U.S. treaty-ratification problem, even if the agreements are more fragile, more easily repudiated by incoming presidential administrations, and less well verified. Given the Russian concerns that Timbie

himself identifies, it is unclear how realistic these proposals may be. But at the least, they should be vigorously explored.

With the decline of treaty-based arms control among the nuclear-weapon powers, Tannenwald calls for all nuclear-armed states to move toward a “regime of nuclear restraint and responsibility.”<sup>46</sup> Restraint, in her view, should “primarily take the form of reciprocal commitments and unilateral measures to avoid an arms race and reduce nuclear dangers.” And responsibility means committing to “responsible deterrence,” which not only prioritizes strategic stability and the immediate goal of preventing nuclear war but retains the ultimate goal of disarmament. Nuclear disarmament is, after all, a treaty requirement that the United States accepted when it ratified the NPT for, as Article VI of the U.S. Constitution states, ratified treaties are “the supreme law of the land.”<sup>47</sup> Nevertheless, the willingness of the United States publicly to embrace this obligation has varied greatly from administration to administration, and in the current state of affairs, this “ultimate” goal may seem very distant indeed. In the meantime, Tannenwald suggests a series of measures that could be pursued absent formal treaties, some by all nuclear-armed states, some by the United States, Russia, and China, and some unilaterally by the United States. One challenge is to ensure that unilateral measures would be effective beyond just the United States, France, and the United Kingdom. We see Tannenwald’s suggestions as reinforcing the calls by Müller and Wunderlich for the advocates of the Treaty on the Prohibition of Nuclear Weapons and the advocates of deterrence to work harder to find common ground to prevent the worst outcomes from coming to pass.

**T**he authors of this volume bring a diversity of views to the issue of strategic stability in this new multipolar world. Nevertheless, there is broad, albeit not universal, agreement on several points:

- 1) Russia and the United States should extend New START’s expiration date from 2021 to 2026. They should then use that time to pursue a successor treaty that would further extend the transparency, predictability, and numerical limits (and ideally, lower limits) that New START provides. Yet most authors of this volume fear that extension is not likely, and that even if the treaty were extended, a formal successor treaty is unlikely to be realized.

- 2) If formal bilateral arms control treaties prove impossible, Russia and the United States should work to put in place politically binding agreements to capture much of the security and stability benefits that will be lost with the formal treaty process. However challenging such agreements may prove to be, the two states should vigorously explore these options.

- 3) On a bilateral or a multilateral basis, the United States, Russia, and China should pursue discussions intended to improve understanding of one another’s strategic concerns and views on which actions by an adversary would be especially concerning or dangerous. Until that happens, the widening gap in the outlook

and actions of these three major actors will only make this new nuclear environment less manageable and more dangerous.

4) China, Russia, and the United States should also actively work to see whether and where common ground can be found concerning efforts to mitigate arms spirals and restrain the development, deployment, or use of destabilizing technologies. They should then pursue politically binding agreements to advance these goals, albeit with a clear eye to the limits of verification that would exist in this format.

In addition, we embrace certain recommendations that were made by individual or a few authors:

5) The United States should strengthen *resilience* in its many forms – including to early warning, command and control, and communications – as a key mechanism both for deterrence (by denial) and for mitigating the risk of escalation of nonconventional attacks (such as cyber- or bio-attacks) or conventional warfare (including attacks in space) to the use of nuclear weapons.<sup>48</sup>

6) While military intelligence and operations will increasingly incorporate artificial intelligence (AI) into the interpretation of large amounts of empirical data, AI should nevertheless not be allowed, either intentionally or inadvertently, to enter or creep into actual decision-making for nuclear weapons use.

7) Little is to be gained, and perhaps much lost, by insisting on the opposition between those who emphasize deterrence as the central element of strategic stability and those who see a necessity for nuclear disarmament. In the U.S.-Russian-Chinese context, steps that would enhance stability by constraining weapons numbers or deployment of specific destabilizing technologies, or by improving communication regarding concerns about, and likely responses to, an adversary's possible strategic or tactical actions, could serve both causes.

**T**he world has lived with nuclear weapons for seventy-five years. Although the number of states with nuclear weapons has grown slowly, the weapons themselves, while being used for many purposes, have not been detonated in war since the end of World War II. But the new era we have entered is more complex, both politically and technically, and seems likely to be less constrained by treaty, and therefore less transparent and less predictable, than any time in the past half-century.

It remains possible that New START can be extended and continue to serve as one basis for bilateral stability between the United States and Russia. In this future, there would remain many dangers, and the United States, Russia, and China would still need to engage in extensive dialogue to mitigate and manage them. Absent New START, the challenges would prove much greater. This volume has attempted, first, to help us understand what this coming world may look like and, second, to present recommendations that may provide a modest beginning to avoiding the worst outcomes in these possible futures.

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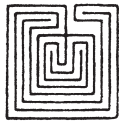
ENDNOTES

- <sup>1</sup> First-generation nuclear weapons split the nuclei of either high-enriched uranium or plutonium to produce a million times more energy per kilogram than is the case for chemical high explosives. These are called *fission* weapons. Even greater amounts of energy per kilogram, by perhaps another factor of one hundred, is produced in *fusion* weapons. These weapons (also called hydrogen or thermonuclear weapons) use a fission weapon trigger (or “primary”) to create the pressures and temperatures needed to fuse hydrogen nuclei together (in the “secondary”) to produce helium, releasing even greater amounts of energy and typically driving additional fission as well. See, for example, Kosta Tsipis, *Arsenal: Understanding Weapons in the Nuclear Age* (New York: Simon & Schuster, 1983).
- <sup>2</sup> Hans M. Kristensen and Matt Korda, “United States Nuclear Forces, 2020,” *Bulletin of the Atomic Scientists* 76 (1) (2020): 46–60.
- <sup>3</sup> See Tsipis, *Arsenal*, chap. 7.
- <sup>4</sup> See *ibid.*, chap. 5; and Center for Strategic and International Studies Missile Defense Project, “SS-19 ‘Stiletto,’” Missile Threat, August 10, 2016, <https://missilethreat.csis.org/missile/ss-19/> (last modified June 15, 2018); compare to Hans M. Kristensen and Matt Korda, “Russian Nuclear Forces, 2019,” *Bulletin of the Atomic Scientists* 75 (2) (2019): 73–84.
- <sup>5</sup> Alex Wellerstein, NUKEMAP, <https://nuclearsecrecy.com/nukemap/>. Nuclear weapons effects based on E. Royce Fletcher, Ray W. Albright, Robert F. D. Perret, et al., *Nuclear Bomb Effects Computer (Including Slide-Rule Design and Curve Fits for Weapons Effects)*, CEX-62.2 (Washington, D.C.: U.S. Atomic Energy Commission Civil Effects Test Operations, 1963); and Samuel Glasstone and Philip J. Dolan, *The Effects of Nuclear Weapons* (Washington, D.C.: U.S. Department of Defense and U.S. Department of Energy, 1977).
- <sup>6</sup> Such as was created at Hiroshima, and also by conventional bombing of cities such as Dresden, Hamburg, and Tokyo. See Lynn Eden, *Whole World on Fire: Organizations, Knowledge, and Nuclear Weapons Devastation* (Ithaca, N.Y.: Cornell University Press, 2006).

- <sup>7</sup> The actual numbers are somewhat higher, since the counting rules under New START treat each strategic bomber as delivering only one warhead. See The Treaty between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START Treaty), Article III, <https://2009-2017.state.gov/t/avc/newstart/c44126.htm>.
- <sup>8</sup> Hans M. Kristensen and Matt Korda, "Chinese Nuclear Forces, 2019," *Bulletin of the Atomic Scientists* 75 (4) (2019); Hans M. Kristensen and Matt Korda, "French Nuclear Forces, 2019," *Bulletin of the Atomic Scientists* 75 (1) (2019): 51–55; and Robert S. Norris and Hans M. Kristensen, "The British Nuclear Stockpile, 1953–2013," *Bulletin of the Atomic Scientists* 69 (4) (2013): 69–75.
- <sup>9</sup> The essays in this volume have focused (albeit not exclusively) on nuclear deterrence among the United States, Russia, and China. Not every nuclear power has adopted a posture of assured retaliation. See Vipin Narang, *Nuclear Strategy in the Modern Era: Regional Powers and International Conflict* (Princeton, N.J.: Princeton University Press, 2014).
- <sup>10</sup> Barry R. Posen, *Inadvertent Escalation: Conventional War and Nuclear Risks* (Ithaca, N.Y.: Cornell University Press, 1991).
- <sup>11</sup> See, for example, Joseph Rotblat, Jack Steinberger, and Bhalchandra Udgaonkar, *A Nuclear-Weapon-Free World: Desirable? Feasible?* (San Francisco: Westview Press, 1993); George Perkovich and James M. Acton, eds., *Abolishing Nuclear Weapons: A Debate* (Washington, D.C.: Carnegie Endowment for International Peace, 2009); and George P. Shultz, Sidney D. Drell, and James E. Goodby, eds., *Deterrence: Its Past and Future* (Stanford, Calif.: Hoover Institution Press, 2011).
- <sup>12</sup> Antony Beevor, *The Second World War* (New York: Little, Brown & Co., 2012).
- <sup>13</sup> John Lewis Gaddis concludes: "It seems inescapable that what has really made the difference in inducing this unaccustomed caution has been the workings of the nuclear deterrent." See John Lewis Gaddis, "The Long Peace: Elements of Stability in the Postwar International System," *International Security* 10 (4) (1986): 99–142, and references therein. Ward Wilson is skeptical of this conclusion; see Ward Wilson, "The Myth of Nuclear Deterrence," *Nonproliferation Review* 15 (3) (2008): 421–439. See also Robert Rauchhaus, "Evaluating the Nuclear Peace Hypothesis: A Quantitative Approach," *Journal of Conflict Resolution* 53 (2) (2009): 258–277.
- <sup>14</sup> Robert Jervis, *The Meaning of the Nuclear Revolution: Statecraft and the Prospect of Armageddon* (Ithaca, N.Y.: Cornell University Press, 1989).
- <sup>15</sup> Dietrich Schroeer, *Science, Technology, and the Nuclear Arms Race* (Hoboken, N.J.: John Wiley & Sons, 1984), chap. 10.
- <sup>16</sup> Confidence in the unwillingness of nuclear powers to go to full-scale war might, however, encourage these same powers to risk lower levels of conflict or violence: the "stability-instability paradox." See Glenn Snyder, "The Balance of Power and the Balance of Terror," in *Balance of Power*, ed. Paul Seabury (San Francisco: Chandler, 1965); and Rauchhaus, "Evaluating the Nuclear Peace Hypothesis."
- <sup>17</sup> Anthony Liberman, "The Rise and Fall of the South African Bomb," *International Security* 26 (2) (2001): 45–86.
- <sup>18</sup> Sadia Tasleem, *Pakistan's Nuclear Use Doctrine* (Washington, D.C.: Carnegie Endowment for International Peace, 2016), <https://carnegieendowment.org/2016/06/30/pakistan-s-nuclear-use-doctrine-pub-63913>.

- <sup>19</sup> Scott D. Sagan, “The Korean Missile Crisis: Why Deterrence Is Still the Best Option,” *Foreign Affairs* 96 (6) (2017): 72–82; and Patrick McEachern, “More than Regime Survival,” *North Korea Review* 14 (1) (2018): 115–118.
- <sup>20</sup> See Matthew Kroenig, “Nuclear Superiority and the Balance of Resolve: Explaining Nuclear Crisis Outcomes,” *International Organization* 67 (1) (2013): 141–171. For a contrary argument, compare with Todd Sechser and Matthew Fuhrmann, *Nuclear Weapons and Coercive Diplomacy* (Cambridge: Cambridge University Press, 2017).
- <sup>21</sup> Major General Yang Huon, former deputy commander of China’s strategic rocket forces, has written that “China’s strategic nuclear weapons were developed because of the belief that hegemonic power will continue to use nuclear threats and nuclear blackmail.” Yang Huon, “China’s Strategic Nuclear Weapons,” <https://fas.org/nuke/guide/china/doctrine/huan.htm>.
- <sup>22</sup> See, for example, Lyle J. Goldstein, *Preventive Attack and Weapons of Mass Destruction* (Stanford, Calif.: Stanford University Press, 2006). See also William Perry, “The Risk of ‘Blundering’ into Nuclear War: Lessons from the Cuban Missile Crisis,” *Arms Control Today*, December 2017, <https://www.armscontrol.org/act/2017-12/features/risk-blundering-into-nuclear-war-lessons-cuban-missile-crisis>; and Graham Allison, “The Cuban Missile Crisis at 50: Lessons for U.S. Foreign Policy Today,” *Foreign Affairs* 91 (4) (2012): 11–16, <https://www.foreignaffairs.com/articles/cuba/2012-07-01/cuban-missile-crisis-50>.
- <sup>23</sup> American Academy of Arts and Sciences, “Deterrence and the New Nuclear States,” project chairs Scott D. Sagan and Vipin Narang, <https://www.amacad.org/project/deterrence-and-new-nuclear-states>.
- <sup>24</sup> Schroerer, *Science, Technology, and the Nuclear Arms Race*; and David Hafemeister, *Physics of Societal Issues: Calculations on National Security, Environment, and Energy* (New York: Springer, 2007), chap. 3.
- <sup>25</sup> Glenn H. Snyder, “Deterrence and Defense,” in *The Use of Force: Military Power and International Politics*, 3rd ed., ed. Robert J. Art and Kenneth N. Waltz (New York: University Press of America, 1983), 25–43.
- <sup>26</sup> Herman Kahn, *On Escalation: Metaphors and Scenarios* (Westport, Conn.: Greenwood Press, 1965).
- <sup>27</sup> Thomas C. Schelling and Morton H. Halperin, *Strategy and Arms Control* (New York: Twentieth Century Fund, 1961); and “Arms Control,” *Daedalus* 89 (4) (Fall 1960)
- <sup>28</sup> Jon Brook Wolfsthal, “Why Arms Control?” *Daedalus* 149 (2) (Spring 2020).
- <sup>29</sup> Thomas C. Schelling, “What Went Wrong with Arms Control?” *Foreign Affairs* 64 (2) (1985): 219–233.
- <sup>30</sup> James Cameron, “What History Can Teach,” *Daedalus* 149 (2) (Spring 2020).
- <sup>31</sup> See, for example, Dexter Masters and Katherine Way, eds., *One World or None: A Report to the Public on the Full Meaning of the Atomic Bomb* (New York: McGraw-Hill, 1946).
- <sup>32</sup> Article VI of the NPT reads, in its entirety, “Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.” See “Treaty on the Non-Proliferation of Nuclear Weapons (NPT),” <https://www.un.org/disarmament/wmd/nuclear/npt/text>.

- <sup>33</sup> Matthew Evangelista, *Unarmed Forces: The Transnational Movement to End the Cold War* (Ithaca, N.Y.: Cornell University Press, 1999).
- <sup>34</sup> Harald Müller and Carmen Wunderlich, “Nuclear Disarmament without the Nuclear-Weapon States: The Nuclear Weapon Ban Treaty,” *Dædalus* 149 (2) (Spring 2020).
- <sup>35</sup> Steven E. Miller, “A Nuclear World Transformed: The Rise of Multilateral Disorder,” *Dædalus* 149 (2) (Spring 2020).
- <sup>36</sup> As quoted in *ibid.*
- <sup>37</sup> *Ibid.*
- <sup>38</sup> Brad Roberts, “On Adapting Nuclear Deterrence to Reduce Nuclear Risk,” *Dædalus* 149 (2) (Spring 2020).
- <sup>39</sup> Anya Loukianova Fink and Olga Olikier, “Russia’s Nuclear Weapons in a Multipolar World: Guarantors of Sovereignty, Great Power Status & More,” *Dædalus* 149 (2) (Spring 2020).
- <sup>40</sup> Li Bin, “The Revival of Nuclear Competition in an Altered Geopolitical Context: A Chinese Perspective,” *Dædalus* 149 (2) (Spring 2020).
- <sup>41</sup> James M. Acton, “Cyber Warfare & Inadvertent Escalation,” *Dædalus* 149 (2) (Spring 2020).
- <sup>42</sup> Christopher F. Chyba, “New Technologies & Strategic Stability,” *Dædalus* 149 (2) (Spring 2020).
- <sup>43</sup> Linton F. Brooks, “The End of Arms Control?” *Dædalus* 149 (2) (Spring 2020).
- <sup>44</sup> *Ibid.*
- <sup>45</sup> James Timbie, “A Way Forward,” *Dædalus* 149 (2) (Spring 2020).
- <sup>46</sup> Nina Tannenwald, “Life beyond Arms Control: Moving toward a Global Regime of Nuclear Restraint & Responsibility,” *Dædalus* 149 (2) (Spring 2020).
- <sup>47</sup> “This Constitution, and the Laws of the United States which shall be made in Pursuance thereof; and all Treaties made, or which shall be made, under the Authority of the United States, shall be the supreme Law of the Land.” Constitution of the United States of America, Article VI, <https://www.archives.gov/founding-docs/constitution-transcript#toc-article-vi>.
- <sup>48</sup> The U.S. Department of Defense has defined *resilience* as “The ability of an architecture to support the functions necessary for mission success with higher probability, shorter periods of reduced capability, and across a wider range of scenarios, conditions, and threats, in spite of hostile action or adverse conditions.” A recent study suggests that the resilience of potentially targeted systems can be improved in many ways, including disaggregation, distribution, diversification, protection, proliferation, and deception. See Office of the Assistant Secretary of Defense for Homeland Defense & Global Security, *Space Domain Mission Assurance: A Resilience Taxonomy* (Washington, D.C.: Office of the Assistant Secretary of Defense for Homeland Defense & Global Security, 2015), <https://fas.org/man/eprint/resilience.pdf>.



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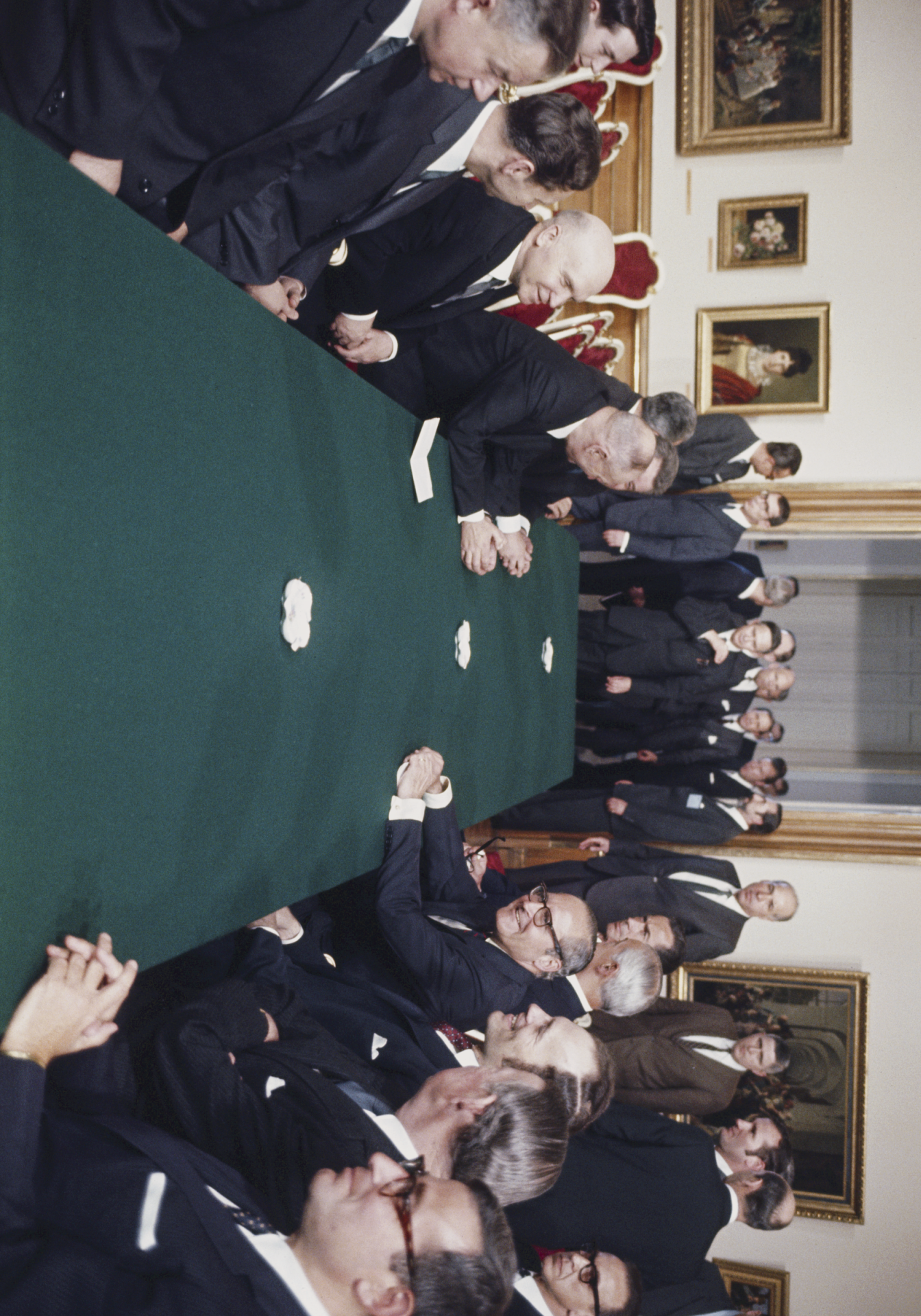
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*Inside back cover*: Fifty-one years ago, negotiators began the process leading to the first strategic arms control treaty. The Soviet delegation is on the left; the U.S. delegation is on the right. Photo by Rolls Press/Popperfoto/Getty Images.



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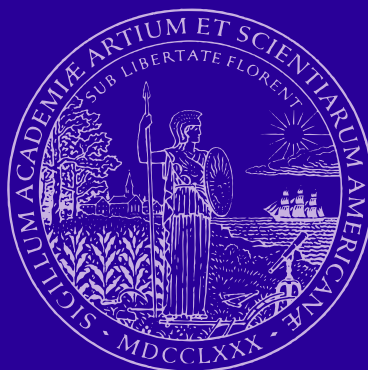
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