

# A Way Forward

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*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.)

International 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 nondeployed 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.

There 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.

The 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.