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Revamping Nuclear Arms Control: Five Near-Term Proposals

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Abbreviations

C3I	command, control, communication, and intelligence
EODF	externally observable distinguishing feature
EPAA	European Phased Adaptive Approach
HEU	highly enriched uranium
IAEA	International Atomic Energy Agency
ICBM	intercontinental ballistic missile
INF	Intermediate-Range Nuclear Forces (Treaty)
NATO	North Atlantic Treaty Organization
New START	New Strategic Arms Reduction Treaty
NRRC	Nuclear Risk Reduction Center
NSNW	nonstrategic nuclear weapon
NTM	national technical means
SLBGM	sea-launched boost-glide missile
SLCM	sea-launched cruise missile
SM-3	Standard Missile-3
SSBN	nuclear-powered ballistic missile submarine
START I	Strategic Arms Reduction Treaty I

Preface

In January 2020, the Nuclear Policy Program at the Carnegie Endowment for International Peace initiated a new project to define a more promising future for arms control. We aim to mitigate acute nuclear risks by developing practical, concrete, and innovative ideas for interstate cooperation. In particular, we seek to catalyze the restart of U.S.-Russian risk-reduction efforts and to productively engage third parties, especially China.

This interim progress report lays out five near-term proposals. As a next step, we invite feedback from officials and experts in China, Russia, and the United States and its allies, as well as from all other states—after all, because the consequences of a U.S.-Chinese or a U.S.-Russian nuclear war would be global, every state has an interest in reducing its likelihood. After revising the proposals based on this feedback, we will publish them—along with more ambitious longer-term proposals—in late 2021.

Summary

The governments of China, Russia, and the United States all express support for arms control. They disagree profoundly, however, about its purposes and preconditions. To try to find common ground, this paper presents five practical measures that, implemented individually or as part of a package, would help to address each state's specific security concerns and the shared dangers of arms racing and inadvertent escalation.

A renewed U.S.-Russian nuclear arms race, which has been largely qualitative so far but could soon turn quantitative, is underway. To compensate for perceived conventional inferiority, Russia maintains a much larger force of nonstrategic nuclear weapons (NSNWs) than the United States, is fielding new systems, and may be increasing its overall number of nonstrategic warheads. (Russia and the United States generally use the term "nonstrategic" in describing nuclear weapons that lack the range to reach the other's homeland from their deployment locations.) In response, the United States is developing and deploying its own new types of NSNWs.

At the strategic level, Russia believes that the United States is seeking capabilities—including high-precision conventional weapons and ballistic missile defenses—to undermine its nuclear deterrent. Moscow's response has included the development and deployment of various new kinds of strategic weapons. The 2010 New Strategic Arms Reduction Treaty (New START) helps to manage this competition by limiting all currently deployed U.S. and Russian strategic weapons. Following the inauguration of a new U.S. administration in January 2021, this treaty will likely be extended for five years until 2026.

China's nuclear force is currently much smaller than either Russia's or the United States'. Like Moscow, Beijing believes that the United States seeks to undermine its nuclear deterrent and is rapidly improving its nuclear capabilities while slowly increasing its warhead stockpile—though some U.S. officials fear that China seeks "a form of nuclear parity."

In a deep crisis or a conventional conflict between the United States and China or Russia, the concerns about force vulnerability that drive arms racing could spark inadvertent escalation. This risk is increasing as a result of the growing entanglement between the nuclear and nonnuclear domains. Such entanglement includes nonnuclear threats to nuclear forces and their command, control, communication, and intelligence (C3I) systems and a reliance on dual-use C3I capabilities. Unilateral responses to these dangers typically involve trade-offs between different escalation risks. For example, China's development of a strategic early-warning system that could enable it to launch its nuclear forces before they were destroyed in an incoming attack creates the danger that it might mischaracterize a U.S. missile test as an attack.

Arms control—a term used here in its broad, original sense to mean "all the forms of military cooperation between potential adversaries" intended to improve mutual security—offers a proven and potentially powerful approach to managing these risks. A first step is for Russia and the United States to extend New START and commence negotiations toward a follow-on treaty. To avoid overload and potential collapse of these negotiations, the scope of a New START follow-on should be limited to strategic offensive arms. Such a treaty would not be able to address counterforce threats from nonnuclear sea-launched boost-glide missiles (SLBGMs) and sea-launched cruise missiles (SLCMs), U.S. concerns about Russia's NSNWs and China's growing nuclear forces, Russian concerns about U.S. ballistic missile defenses, and the danger of a missile test being misidentified as a missile attack.

This paper proposes five politically binding transparency and confidence-building measures that would help address these lacunae. These proposals would also help all three states—especially Russia and the United States—demonstrate commitment to their disarmament obligations and hence bolster the nonproliferation regime.

Some proposals would provide concrete benefits to all participants, while others would address the particular concerns of one state and therefore need to be negotiated as part of a mutually beneficial package. Crafting such a package could prove challenging. Russia is skeptical of politically binding agreements. Nonetheless, the hybrid approach advocated here—a treaty that constrains strategic offensive arms implemented alongside separate transparency and confidence-building measures—offers the most practical and plausible way forward. Moreover, politically binding agreements could act as stepping stones to legally binding measures over the long term. China, meanwhile, has failed to indicate whether it believes that its security could be enhanced by arms control measures that do not involve reductions. It should now consider what concessions it would require from Washington in return for addressing U.S. concerns.

Five Proposals to Enhance Stability

The following five proposals are intended to reduce the risks of arms racing and inadvertent escalation:

- A U.S.-Russian data exchange for SLCMs and nonnuclear SLBGMs
- A U.S.-Russian transparency regime for empty actual or suspected warhead storage facilities
- A U.S.-Russian confidence-building regime for European Aegis Ashore ballistic missile defense installations
- A Chinese-U.S. fissile material cutoff and transparency regime
- A trilateral ballistic missile and space launch notification agreement

The first three proposals, which involve Russia and the United States, aim to manage capabilities that cannot realistically be limited in their next bilateral treaty. The fourth and fifth proposals aim to engage China with the objectives, respectively, of heading off a Chinese-U.S. arms race and reducing the danger that a missile test or space launch sparks escalation.

First, Russia and the United States should, twice a year, exchange confidential declarations of the number of deployed nuclear-armed SLCMs, nonnuclear SLCMs, and nonnuclear SLBGMs (disaggregated by two range categories). SLCMs and, in the future, SLBGMs could drive arms racing and crisis instability. These dangers could be heightened if Russia or the United States overestimates the other's current or future deployments. Because limiting SLCMs or SLBGMs in a follow-on to New START would present insurmountable challenges—with the sole exception of making nuclear-armed SLBGMs accountable—transparency is a more practical way forward. Any security risks associated with this exchange should be minimal because it would not reveal a capability that was previously unknown to the other party or the precise mix of weapon types deployed—let alone the armaments on any particular ship.

Second, Russia and the United States should agree, on a politically binding basis, to reciprocal inspections of two to five pairs of empty actual or suspected warhead storage facilities to demonstrate that they do not contain nuclear warheads ("empty" means absent of all nuclear warheads, regardless of type). Ambiguity around the location of NSNWs creates serious risks. The possible presence of nuclear warheads in the Russian enclave of Kaliningrad, for example, exacerbates tensions—potentially unnecessarily if, in fact, none are present. Moreover, in a conventional conflict, ambiguity could prove escalatory by leading to attacks on storage facilities in an effort to forestall nuclear use.

Facilities would be selected on the basis of mutual consent by Russia; the United States; and, for facilities located in North Atlantic Treaty Organization (NATO) member states other than the United States, the host government. Following facility selection, the parties would exchange baseline information, including site diagrams, and negotiate inspection boundaries.

Inspections should occur within sixty days of facility selection. Following preliminary inspection procedures, the duration of the facility inspection should be limited to twelve hours. During that period, the inspection team should be provided with access first to any vehicles designated for inspection and then to any weapon storage containers and rooms that it selects in whatever order it chooses. The host party should have the right to shroud, in advance of the inspection, any items it deems sensitive. The inspection team should have the right to employ radiation detection equipment to confirm that any shrouded objects, warhead storage containers, or other objects do not contain nuclear material.

The technical challenges associated with this proposal appear manageable. From a political perspective, this proposal would not require negotiations over limits on NSNWs, thus respecting a Russian redline, and would build experience and confidence in inspecting warhead storage facilities, thus advancing the U.S. goal of a more comprehensive treaty. Because facilities must be selected by mutual consent, the host state could always veto an inspection request that presented insurmountable difficulties. The 1987 Intermediate-Range Nuclear Forces (INF) Treaty, which permitted Russian inspections in Europe, demonstrates that the challenges of selecting facilities on the territory of U.S. allies can be overcome.

Third, Russia and the United States should agree to a package of measures on European Aegis Ashore ballistic missile defense installations:

- Russia should, at the invitation of the United States, observe one flight test of a Standard Missile-3 (SM-3) Block IB interceptor and one of an SM-3 Block IIA interceptor in order to measure, with its own equipment, each interceptor's burnout speed (the maximum speed reached immediately after a rocket's motors have cut off or burnt out).

- The United States should commit to (1) notifying Russia in advance of the first European deployment of any type of missile defense interceptor with a burnout speed greater than 3 kilometers per second (1.9 miles per second) that is not currently deployed there and (2) inviting Russia to observe, at least sixty days prior to the interceptor's first deployment in Europe, a flight test in order to measure the interceptor's burnout speed.

- The United States should reaffirm to Russia the exclusively defensive purpose of European Aegis Ashore installations and commit to refraining from (1) loading offensive missiles into European Aegis Ashore launchers and (2) modifying such launchers so they become capable of launching offensive missiles.

Russia is concerned that the United States' deployment of SM-3 interceptors in Europe to defend against Iranian ballistic missiles may threaten its ability to target the United States with intercontinental ballistic missiles (ICBMs). Moreover, the launchers for these interceptors are adapted from the U.S. Navy's MK 41 Vertical Launch System, which is used on ships equipped with the Aegis air and missile defense system to launch SLCMs and other missiles as well as SM-3s. The possibility that so-called Aegis Ashore launchers could also be used to fire offensive missiles, particularly cruise missiles—in spite of U.S. statements to the contrary—is a second concern for Moscow.

These concerns could motivate Moscow to attack Aegis Ashore installations preemptively in a crisis or conflict. They also complicate the development of arms control agreements—including measures to manage the new kinds of strategic weapons that Russia is developing to penetrate U.S. missile defenses.

Russia could monitor U.S. interceptor flight tests by positioning its missile range instrumentation ship on the high seas adjacent to the U.S. test site in Hawaii. The approach to verifying the exclusively defensive nature of Aegis Ashore installations would depend on whether Russia and the United States could jointly identify externally observable distinguishing features between such installations and their sea-based equivalents that would preclude the former from launching offensive missiles. If they could, verification would be based on national technical means (NTM) or inspections of external features. If not, the United States could permit Russian inspectors to select and view the inside of an agreed number of Aegis Ashore launchers to check that they are loaded with missile defense interceptors. Any form of on-site access would require the consent of the host state.

Domestic critics would probably argue that disclosing burnout speeds to Russia could compromise national security. This information, however, would not meaningfully assist Russia or any third party to defeat U.S. defenses.

Moscow, meanwhile, demands legally binding guarantees on missile defenses. It cannot, however, force the United States to accept a treaty (just as Washington cannot force Moscow to accept a treaty that covers NSNWs). As a result, any viable approach will have to be politically binding, at least initially. This proposal should, however, be the first step in a process that could address a wider range of concerns and perhaps include the development of legally binding instruments.

Fourth, China and the United States should declare a joint cutoff in the production of weapon-usable fissile material. There is a fairly broad consensus within the U.S. national security community about the importance of engaging China in arms control—not least to prevent China from challenging the United States in warhead numbers. Washington, however, cannot force China to negotiate. Moreover, even if good-faith three-way negotiations were to commence, a meaningful arms-limitation agreement would likely take years to conclude.

There are widespread but unconfirmed reports that China has ceased the production of weapon-usable fissile material, at least for military purposes. Moreover, the U.S. Defense Intelligence Agency assesses that China's extant fissile material stockpile is not large enough for China to challenge the United States in warhead numbers. A credible cutoff in fissile material production should therefore be sufficient to address U.S. concerns.

After declaring a cutoff, China and the United States should exchange confidential declarations about their stockpiles of weapon-usable fissile material and discuss any compliance concerns they might have, with the aim of developing targeted verification measures.

In verifying a cutoff, the primary challenge would be confirming the nonproduction of highly enriched uranium at enrichment facilities, which could require physical access. To be politically palatable, reciprocity would be required. By contrast, the comprehensive verification of stockpile declarations would be functionally impossible; ultimately, China and the United States would have to decide whether or not they were better off receiving additional information, even if they could not verify it.

This proposal would benefit the United States more than China. The former has an excess of fissile material and has long ceased production. The latter probably wants to retain the option to produce more material. Nonetheless, Beijing has three potential motivations to explore this proposal. First, it would have to be adopted as part of a mutually beneficial package. Second, the proposal would help China gain deeper insight into the U.S. fissile material stockpile. Third, it would presumably be more acceptable to China than the United States' preferred alternative of binding limits on nuclear forces.

Finally, China, Russia, and the United States should agree to notify one another of (1) all space launches and (2) all tests of ballistic or boost-glide missiles—whether conducted from air, land, or sea—that meet defined conditions. If mistaken for an attack, a missile test or space launch could spark escalation. Similarly, if preparations for a test launch were mistaken as preparations for an attack, they could invite preemption. While these risks may be low in peacetime, they could rise significantly during times of heightened tensions and, because of technological developments, could soon arise in a U.S.-Chinese crisis as well as a U.S.-Russian one.

Notifications before missile tests or space launches can help reduce these risks. Indeed, U.S-Russian and Chinese-Russian notification agreements are in place but have three particularly notable gaps. First, China and the United States have not agreed to exchange any launch notifications. Second, no state has made any commitment to provide notifications about tests of boost-glide missiles. Third, the missile range thresholds that trigger notification requirements are too large.

Compared to other concepts for trilateral arms control, the political obstacles facing this proposal are small—though three challenges that are significant in absolute terms would have to be overcome. First, both China and the United States are more concerned about deliberate aggression than they are about inadvertent escalation. That said, both have recognized the possibility that escalation might not be deliberate. Second, they may disagree about what steps, if any, should follow this proposal—but this should not prevent them from supporting it if they believe it would enhance their security. Finally, there may be concern that launch notifications could cue espionage activities to monitor missile tests. Such cueing, however, would not significantly enhance the effectiveness of the intelligence-collection capabilities that each state already has or is developing.

Prospects

Given fraught international relationships and divisive internal politics that create incentives for leaders not to cooperate with rivals, it will be a challenge to generate the necessary political will to turn these proposals into reality. There may be no simple fix, but history demonstrates that political barriers are not immutable. While it is impossible to predict when opportunities for arms control will arise, China, Russia, and the United States and NATO should consider and refine proposals now to enable rapid progress when political conditions allow.

Each state should also ask itself whether its interests would be better served by a broader conception of its security goals that encompasses both the need for effective deterrence and the importance of reducing the risks of arms racing and inadvertent escalation. Arms control can be a powerful tool for navigating this trade-off and hence better managing the risks inherent to enhancing security through threats of catastrophic destruction.

Introduction

The governments of China, Russia, and the United States all express support for arms control.[1] However, they disagree profoundly about its purposes and preconditions. At the root of this disagreement is each state's very different threat perception. These differences manifest themselves in two growing dangers that arms control could, in turn, help to address: nuclear arms racing, which exacerbates security dilemmas and interstate tensions, and inadvertent escalation, which could spark nuclear use should tensions spill over into war.

The New Nuclear Arms Race

To date, the renewed U.S.-Russian nuclear arms race has been largely qualitative but could soon turn quantitative. One driver is an imbalance in conventional forces. Russia views itself as conventionally inferior to the United States and NATO. In response, it relies heavily on nuclear weapons—especially NSNWs—for deterring large-scale aggression. (In unhelpful language inherited from the Cold War, Russia and the United States generally use the term "nonstrategic" in describing nuclear weapons that lack the range to reach the other's homeland from their deployment locations.[2]) The U.S. Department of Defense assesses that Russia has "up to 2,000" nonstrategic warheads and may be increasing their number.[3] By contrast, the United States is believed to possess about 230 such warheads.[4] Moreover, Moscow is developing and deploying various new types of NSNWs, including, most controversially, the 9M729—a dual-use ground-launched cruise missile that the United States assesses (almost certainly correctly) was developed in violation of the INF Treaty.

Washington believes that these developments reflect a growing willingness in Moscow to use nuclear weapons early in a conflict in the hope of compelling the United States to stand down.[5] Russian officials have strenuously denied that their nuclear doctrine embraces this concept, which is often called "escalate to de-escalate" in Western discourse.[6] These denials have not assured Washington. Indeed, to correct the "mistaken Russian perception" that its advantage in NSNWs would provide it with "a coercive advantage," the United States has deployed low-yield warheads on Trident D5 sea-launched ballistic missiles and started the process of acquiring a nuclear-armed SLCM.[7] Meanwhile, the United States' withdrawal from the INF Treaty, ostensibly because of Russia's deployment of the 9M729 cruise missile, has opened the door to a competition in medium- and intermediate-range ground-launched missiles (though only Russian weapons are likely to be nuclear-capable).

The U.S.-Russian competition is also playing out with strategic nuclear weapons. Russia believes that the United States is seeking capabilities—particularly nonnuclear ones—to undermine its nuclear deterrent. Moscow fears that the United States could launch preemptive strikes on Russia's nuclear forces with nuclear weapons or high-precision conventional munitions and then use ballistic missile defenses to mop up any surviving Russian weapons that were fired in retaliation, thus leaving Russia vulnerable to U.S. coercion backed by unused nuclear weapons. Russia's defense spending suggests that these concerns are acute. In 2018, for example, Russian President Vladimir Putin announced the development of three new kinds of strategic nuclear weapons as a way of preserving Russia's ability to defeat U.S. defenses.[8] Russia has since deployed one of these systems—an intercontinental hypersonic glider, Avangard. The other two—a nuclear-powered cruise missile, Burevestnik, and a nuclear-powered torpedo, Poseidon—remain under development.

New START helps to manage this competition by limiting all currently deployed U.S. and Russian strategic weapons, including Avangard. Following the inauguration of a new U.S. administration in 2021, this treaty will likely be extended for five years—the maximum permitted by its terms—until 2026. However, the prospects for negotiating a follow-on agreement are unclear. Without a strategic arms limitation agreement in place, the qualitative competition in strategic weapons could easily turn quantitative.

China's nuclear force is currently much smaller than either Russia's or the United States'. The United States estimates that China's nuclear warheads number in the "the low-200s."[9] By comparison, the United States has about 3,800 nuclear warheads, and Russia likely has more than 4,000.[10] Like Moscow, Beijing believes that the United States seeks to undermine its nuclear deterrent.[11] Motivated at least in part by these concerns, China is rapidly improving its nuclear capabilities while slowly increasing its warhead stockpile. In fact, the U.S. Department of Defense expects China to "at least double" its warhead stockpile over the next decade.[12] Other U.S. officials have gone even further. For example, Marshall Billingslea, the U.S. special presidential envoy for arms control, has claimed that China seeks "a form of nuclear parity" with the United States and Russia and therefore risks sparking a three-way arms race. "We know how to win these races," he threatened, "and we know how to spend the adversary into oblivion."[13]

Growing Escalation Dangers

In a deep crisis or a conventional conflict between the United States and China or Russia, the concerns about force vulnerability that drive arms racing could spark inadvertent escalation. Crisis instability is perhaps the most acute danger.[14] If Beijing or Moscow concluded that a U.S. attack on its nuclear forces—by nuclear or nonnuclear means—was imminent, it might issue nuclear threats or engage in limited nuclear use to try to terrify the United States into backing off. In extreme circumstances, Russia might even try to attack U.S. nuclear forces preemptively to protect itself.

The growing entanglement between the nuclear and nonnuclear domains is increasing the risk of inadvertent escalation yet further.[15] Both China and Russia, for example, worry about the possibility that the United States might employ nonnuclear cruise missiles and, in the future, nonnuclear hypersonic boost-glide missiles to attack their nuclear forces. Meanwhile, although it would be impossible for Russia, let alone China, to eliminate the United States' nuclear forces in their entirety, the United States' nuclear C3I system is more vulnerable. Many C3I assets, including ground-based radars and communication transmitters, support both nuclear and nonnuclear operations. In a conventional conflict, an adversary might launch nonnuclear attacks on these assets to degrade the United States' ability to wage a conventional war. However, Washington might interpret such attacks as the prelude to nuclear use and escalate the conflict in an attempt to coerce the adversary into backing down.

Unilateral efforts to enhance the resilience and survivability of states' nuclear forces and their C3I systems can enhance security but typically involve trade-offs between different escalation risks. For example, China is currently developing a strategic early-warning system that could enable it to launch its nuclear forces before they were destroyed in an incoming attack.[16] While a launch-under-attack capability could increase Beijing's confidence in the survivability of its nuclear forces, it could also lead to China's mischaracterizing a U.S. missile test in the Pacific as an attack and potentially launching a nuclear response.

Cooperative Risk Reduction

Arms control offers a complementary, proven, and potentially powerful approach to managing the risks of both arms racing and inadvertent escalation and, more generally, to reducing the risk of conflict. The term "arms control" is used here in its broad, original sense to mean "all the forms of military cooperation between potential adversaries."[17] Such cooperation includes treaty-mandated limits on nuclear forces with intrusive verification activities but extends to confidence-building, transparency, and behavioral norms.

A first step is for Russia and the United States to extend New START and commence negotiations toward a follow-on treaty. Two authors of this paper recently set out a detailed concept for such a treaty.[18] To avoid overloading negotiations and thus risking their collapse, the scope of a New START follow-on should be limited to strategic offensive arms, including new kinds of such weapons (nuclear and nonnuclear) developed since New START's entry into force. Even so, because of verification difficulties, such a treaty could likely not regulate nonnuclear SLBGMs—even though they, along with SLCMs, which are not considered to be strategic, could drive arms racing and be used in counterforce strikes. Even more significantly, it would be politically and temporally infeasible for a follow-on treaty to address U.S. concerns about Russia's NSNWs and China's growing nuclear forces or to address Russian concerns about the United States' ballistic missile defenses. Because of China's noninvolvement, follow-on treaty negotiations would also not be the right forum to manage the danger of a missile test being misidentified as an attack.

This paper proposes five politically binding transparency and confidence-building measures that would help to address these lacunae and supplement a treaty to reduce and constrain strategic nuclear forces:

- A U.S.-Russian data exchange for SLCMs and nonnuclear SLBGMs
- A U.S.-Russian transparency regime for empty actual or suspected warhead storage facilities
- A U.S.-Russian confidence-building regime for European Aegis Ashore ballistic missile defense installations
- A Chinese-U.S. fissile material cutoff and transparency regime
- A trilateral ballistic missile and space launch notification agreement

The first and last proposals would provide concrete benefits to each participant; the others are intended to address the particular concerns of one state and would need to be negotiated as part of a mutually beneficial package.

Crafting such a package could prove challenging. Moscow is skeptical of politically binding agreements, dismissing them as "verification for the sake of verification, transparency for the sake of transparency" (though, in practice, it has sometimes shown flexibility).[19] Washington, by contrast, is generally supportive of at least the principle of transparency and confidence building (though, in practice, it has sometimes shown a lack of willingness to elaborate or explore such proposals).

The hybrid approach advocated here—a treaty that constrains strategic offensive arms implemented alongside transparency and confidence-building measures—offers the most practical and plausible way forward. Politically binding measures represent, at least for the time being, the only viable way to address issues that, for technical or political reasons, cannot be managed through treaties. That said, historically, such measures have helped to facilitate the development of legally binding ones. For example, the entry into force of the Threshold Test Ban Treaty in 1990 was facilitated by a joint experiment two years earlier in which the United States and the Soviet Union measured the yield of a nuclear test conducted by the other. In this spirit, the development of politically binding confidence-building measures should be the start of a process, not the end of one.

China has been very clear about its lack of interest in negotiations over nuclear limitations—at least until the United States makes deep reductions in its nuclear forces.[20] Beijing has failed, however, to indicate whether it believes that China's security could be enhanced by other forms of arms control—beyond expressing a general concern that greater transparency would undermine the survivability of its nuclear forces. Yet the benefits and risks of transparency, as an abstract principle, are not at issue; the effects of specific proposals on Chinese security are. Chinese officials and analysts should consider what to ask of Washington to create a mutually beneficial package and to explore the trade-space with their U.S. counterparts in unofficial and then official dialogues.[21]

One final consideration for all three states—but particularly Russia and the United States—is their commitment, under Article VI of the Nuclear Non-Proliferation Treaty, "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." The proposals in this paper would advance the goals of Article VI in various ways. Some would advance a world without nuclear weapons directly. For example, inspections of storage facilities to verify the absence of nuclear warheads would be needed as part of any credible regime to verify the elimination of nuclear weapons. Other proposals would help to curtail arms racing—an explicit objective of Article VI. Member states have also agreed that the purpose of Article VI can be advanced through "policies that could . . . lessen the danger of nuclear war."[22] At a time when many nonnuclear-weapon states are deeply skeptical of the nuclear-weapon states' willingness to live up to their disarmament commitments—and when there is little prospect of any major breakthrough in efforts to achieve a world without nuclear weapons—the proposals set out here offer a way to make visible progress and thus bolster the nonproliferation regime.

Filling a Legal Lacuna: A U.S.-Russian Data Exchange for Nonaccountable Missiles

Modern SLCMs are highly capable. They are accurate, difficult to detect and track, and have sufficient ranges—up to about 2,500 kilometers (1,600 miles)—to reach targets deep within an adversary's interior.[23] Both Russia and the United States deploy large forces of conventional SLCMs, creating escalation risks. Russia is concerned that U.S. weapons threaten its nuclear forces, particularly mobile ICBMs but also docked nuclear-powered ballistic missile submarines (SSBNs), heavy bombers on the ground, and perhaps even silo-based ICBMs.[24] Meanwhile, Russian nonnuclear SLCMs threaten critical U.S. military assets, including ground-based C3I capabilities that support nuclear operations, and potentially national and military leadership.

SLCMs also feed arms racing. The United States is developing a nuclear-armed SLCM in response to its concerns about Russian NSNWs, which include SLCMs. This plan, if completed, will likely further exacerbate Moscow's concerns about the survivability of its nuclear forces, potentially catalyzing a Russian response.

Looking forward, SLBGMs, which have not yet been deployed, could be as accurate as SLCMs, while traveling much faster and over potentially greater distances (though the technical challenges are considerable).[25] As such, they could exacerbate both escalation risks and arms racing. The United States is also currently developing nonnuclear SLBGMs.[26] There is no public evidence of an equivalent Russian effort—though it would come as no surprise to learn that Moscow is also developing SLBGMs, which would most likely be nuclear-armed or dual-use.

These dangers will be heightened if either Russia or the United States overestimates the other's current or future deployments of SLCMs or SLBGMs. This kind of threat inflation could result from the very real difficulties associated with estimating the current size of an adversary's SLCM or SLGBM force—let alone its future size.

Estimating current SLCM deployments is challenging because modern vertical launching systems can launch various types of missiles, including air and missile defense interceptors and anti-ship and anti-submarine weapons, in addition to land-attack SLCMs. As a result, surface ships (and perhaps submarines) may carry fewer SLCMs than the maximum possible in order to facilitate the deployment of other types of weapons. The United States faces the additional challenge of estimating how many of Russia's deployed SLCMs are nuclear-armed. Russia will face the same problem if the United States deploys nuclear-armed SLCMs of its own.

The challenges of estimating future deployments are even greater because states could change the number of SLCMs they deploy surreptitiously and relatively quickly. The probable deployment of nonnuclear SLBGMs, which will likely share a launching system with SLCMs and other missile types, will complicate matters further. There may also be some uncertainty in each state's estimates of how many ships the other is likely to deploy. To be sure, this uncertainty is limited by the difficulty of hiding shipbuilding activities and of changing construction plans. Even so, the uncertainty could be significant, particularly four or five years into the future.

Of course, without access to both Russian and U.S. classified information, it is impossible to determine whether deployment estimates are indeed prone to exaggeration. It is perhaps significant, however, that well-connected Russian experts have used estimates of the United States' future force of "strategic conventional warheads"—including sea-based systems—that turned out to be inflated.[27] If there is a similar bias in official Russian and U.S. estimates, then the resulting increase in danger is entirely unnecessary (unless it is the result of a deliberate policy, and there is no evidence that it is). Moscow and Washington, therefore, should have a shared interest in greater transparency.

Solution Concept

In theory, limiting SLCMs and SLBGMs in a follow-on to New START would probably be the optimal solution. However, the challenges to doing so would be insurmountable—with the sole exception of making nuclear-armed SLBGMs accountable.[28] Given the military importance of nonnuclear SLCMs, in particular, neither the United States nor Russia would likely accept limits. Moreover, there would be daunting practical challenges. Most SLCMs are deployed on attack submarines and surface ships, and nonnuclear SLBGMs will likely be too. Neither Russia nor the United States has any interest in opening these vessels up to inspection.[29]

Ensuring transparency about current and planned future deployments of nuclear and nonnuclear SLCMs and nonnuclear SLBGMs is a more practical way forward.[30] The transparency arrangement outlined below is an expanded version of a U.S.-Soviet data exchange, which was negotiated as a side agreement to the Strategic Arms Reduction Treaty I (START I) and expired with that treaty in 2009.[31]

Proposed U.S.-Russian Data Exchange on Sea-Launched Cruise Missiles and Nonnuclear Sea-Launched Boost-Glide Missiles

On April 1 and October 1 of each year, Russia and the United States should exchange confidential declarations of the number of missiles in each of the following categories that were deployed on, respectively, March 1 and September 1 of the same year:

- Long-range nuclear-armed SLCMs
- Long-range nonnuclear SLCMs
- Long-range nonnuclear SLBGMs
- Nuclear-armed SLCMs with ranges between 300 and 600 kilometers (between 190 and 370 miles)
- Nonnuclear SLCMs with ranges between 300 and 600 kilometers
- Nonnuclear SLBGMs with ranges between 300 and 600 kilometers

The declaration covering deployments for March 1 should also include the following:

- The maximum number of missiles, in each category, that are anticipated to be deployed as of March 1 each year for the following five years
- All types of currently deployed surface ships and submarines, any one of which has ever been equipped with at least one SLCM or SLBGM launcher

In implementing these provisions, these definitions would apply:

- "Boost-glide missile" means a weapon-delivery vehicle that sustains unpowered flight through the use of aerodynamic lift over most of its flight path.
- "Cruise missile" means an unmanned, self-propelled weapon-delivery vehicle that sustains flight through the use of aerodynamic lift over most of its flight path.
- "Deployed SLBGM" means a boost-glide missile that is contained in any surface ship or submarine that is equipped with at least one SLBGM launcher.
- "Deployed SLCM" means a cruise missile that is contained in any surface ship or submarine that is equipped with at least one SLCM launcher.
- "Long-range SLCM (or SLBGM)" means a SLCM (or SLBGM) with a range in excess of 600 kilometers.
- "SLCM (or SLBGM) launcher" means a device intended or used to contain, prepare for launch, and launch an SLCM (or SLBGM).

Verification

The proposed transparency arrangement, which would lack legally binding verification provisions, would probably not be as effective as a treaty in building confidence in the current and future size of SLCM and SLGBM forces. It would, however, represent a significant improvement over the status quo (no regulation at all).

Importantly, Russia and the United States would not need to take the exchanged information purely on the basis of trust. If intelligence information available to either party confirmed at least some parts of the other's declaration, without contradicting other parts, it would boost the credibility of the declaration as a whole. Discussions could help to address any concerns—though they would not be easy. If one state had intelligence information suggesting the other's declaration was incorrect, it might not be able to explain the basis for its concerns without compromising the sources and methods used to collect the intelligence. Nonetheless, a constructive dialogue might still be possible. For instance, a state might be able to build confidence in the planned size of its future navy by providing unclassified information about shipbuilding plans and potentially even allowing occasional visits to shipbuilding facilities.

Assessment

Technical feasibility. From a technical perspective, the proposed transparency regime should be straightforward to negotiate and implement. The exchange of data would be facilitated by the long-established U.S. and Russian Nuclear Risk Reduction Centers (NRRCs).

Political feasibility. Although Russia is generally skeptical of politically binding confidence-building measures, its participation in an earlier SLCM transparency arrangement sets a helpful precedent. A secondary benefit for Moscow would be the possibility of using U.S. data to better estimate the number of sea-launched SM-3 interceptors deployed on U.S. ships (those interceptors share launchers with SLCMs), thus helping to address Russian concerns about missile defenses.

The primary political challenge to implementing this proposal would probably be the concern that exchanging classified data would undermine national security. The security risks, however, should be minimal. This proposal is narrowly tailored to mitigate one particular risk. It would not reveal a capability that was previously unknown to the other party or the precise mix of weapon types deployed—let alone the armaments on any particular ship. Therefore, unless either state seeks to use uncertainty about the scale of SLCM or SLBGM deployments to enhance deterrence, this data exchange should enhance the security of both parties.

First Steps on a Tough Problem: A U.S.-Russian Transparency Regime for Empty Warhead Storage Facilities

The United States and NATO have various concerns about Russia's large force of NSNWs, including the opacity surrounding those weapons' locations. Moscow has stated that the warheads for its NSNWs are "stored in centralized storage facilities," which means that they are consolidated at facilities located away from delivery systems, not that those facilities are centrally located within Russia.[32] While the United States appears to accept this claim—a Russian commitment under the 1991–1992 Presidential Nuclear Initiatives—the exact locations of Russia's nonstrategic nuclear warheads remain unverified.[33]

The United States' only NSNWs are gravity bombs, which are reportedly held at six air bases in Europe and various additional locations in the United States.[34] The U.S. government has never confirmed these locations—not least to avoid drawing public attention to weapons whose presence the host states' populations generally oppose—and influential Russian analysts have sometimes expressed concern that U.S. nuclear gravity bombs may be stored at other European locations.

Russia may believe that ambiguity surrounding the locations of its NSNWs enhances its ability to deter NATO. Ambiguity, however, also creates real risks. NATO states, for example, have long been concerned about the possible presence of nonstrategic nuclear warheads in the Russian enclave of Kaliningrad. It remains unclear, however, whether the recently renovated storage facilities there currently house such warheads or whether Russia wants the option to introduce them at short notice.[35] When coupled with associated concerns that Russia might use NSNWs early in a conflict, the possible presence of nuclear warheads in the enclave is threatening and exacerbates tensions—potentially unnecessarily if, in fact, none are present.

Moreover, in a conventional conflict, ambiguity could prove escalatory. If NATO wrongly believed that nuclear warheads were present in Kaliningrad, it might attack their storage facilities and potential dual-use delivery systems to forestall Russian nuclear use. Moscow, however, might conclude that such attacks represented the start of a broader conventional campaign against Kaliningrad, which is surrounded by NATO states and could be difficult to defend without resorting to nuclear use.

These risks suggest the value of a cooperative effort to reduce uncertainty and misperceptions about the locations of nonstrategic nuclear warheads by conducting inspections of empty actual or suspected storage facilities to verify that they are indeed empty. In this context, "empty" means absent of all nuclear warheads, regardless of type (because of the difficulty of distinguishing strategic from nonstrategic warheads, it would be infeasible to inspect facilities at which only strategic warheads were present). The goal here would be to provide transparency around a limited number of pairs of facilities—say, two to five—of particular concern to NATO or Russia, *not* to create a comprehensive verification regime intended to cover every facility that has stored warheads or could do so.

That said, inspections of empty storage facilities would certainly further the long-term goal of a more comprehensive management regime for NSNWs—an idea long supported by Washington in one form or another. Such a regime would face various practical difficulties, as Billingslea acknowledged in calling for Russia and the United States to undertake joint experiments to overcome verification obstacles.[36] This proposal would contribute to the development of a verification regime for a treaty, say, that prohibited NSNWs from being located anywhere except declared facilities, or more ambitiously, one that imposed a single limit on all warheads—strategic and nonstrategic, regardless of their deployment status. This latter concept would require counting nondeployed warheads inside storage facilities.[37] Inspections of empty facilities would advance this goal by creating joint understandings about, for example, how to prevent inspectors from learning classified information about storage facilities (such as security features) and how to reach agreement on which areas of military bases should be open for inspections.

Solution Concept

Inspections of actual or suspected warhead storage facilities—even empty ones—would represent a new departure for arms control but would build on experience from previous agreements. An iterative process, in which lessons from one round of inspections were applied to the next, would be particularly advantageous.

Overview of an Ad Hoc Process to Verify the Absence of Nuclear Warheads at Selected Empty Actual or Suspected Warhead Storage Facilities

Russia and the United States should agree, on a politically binding basis, to reciprocal inspections of between two and five pairs of empty actual or suspected warhead storage facilities to demonstrate that they do not contain nuclear warheads.

The parties should negotiate a generic verification protocol to verify the absence of nuclear warheads at an empty storage facility.

Each party should, on the basis of its own intelligence information, propose candidate facilities that it wishes to inspect. From these lists, the parties should then jointly select one pair of facilities—one on NATO territory (including the United States) and one on Russian territory—for inspection. Facilities must be selected on the basis of mutual consent by Russia, the United States, and, for a facility located in a NATO state other than the United States, the host government.

In permitting a facility to be inspected, the host government would formally notify the inspecting party that nuclear warheads are not present at the facility.

The United States and the host government would jointly facilitate all implementation activities for an inspection of a facility on NATO territory outside the United States.

Inspections to verify the absence of nuclear warheads should take place within sixty days of facility selection, following the baseline information exchange and negotiations over site-specific implementation arrangements.

After the first round of inspections, the parties should consult to discuss any issues and, on this basis, refine the generic verification protocol. They should then repeat this process at one or more additional pairs of facilities.

There would be some risk of nuclear warheads' being removed from a facility in the time period between facility selection and inspection—though the inspecting party would certainly monitor the facility closely with NTM. While this risk might not be acceptable in a more comprehensive treaty-based arrangement, it should be tolerable in a politically binding confidence-building measure. Indeed, a comprehensive regime could solve this problem by permitting inspectors to notify the host state of the inspection site only after their arrival in country, as is standard practice.

Verification

Baseline information exchange. A necessary prerequisite to on-site inspections would be the exchange of baseline information about the selected facilities and the negotiation of site-specific implementation details. A key challenge here would be reaching agreement on the boundaries for inspection activities. Inspections would be feasible only if the parties could agree where in a facility nuclear warheads might conceivably be stored—thus precluding the need to inspect highly sensitive areas, such as communication centers, and avoiding very disruptive inspections of, say, barracks or offices.

Verification Regime: Baseline Information Exchange

Within ten days of facility selection, each party should provide the other with simplified site diagrams, showing the boundaries of the military base or other site on which the selected facility is located, all fixed structures within that boundary, and the prospective boundaries for inspection activities. The states should then negotiate, by mutual consent, any changes to the prospective inspection boundaries.

Within twenty-five days of facility selection, the parties should exchange the following detailed baseline information about the selected facilities:

- A detailed inspection site diagram, conveying the agreed inspection boundaries, the locations of any fixed structures within the inspection boundaries, and diagrams of each fixed structure's interior, denoting all rooms (above- and below-grade) and interior and exterior access points
- A list of any weapon storage containers at the facility (including those for nonnuclear munitions) and the type of containers and their locations
- The physical dimensions and a photograph of each type of weapon storage container at the site

After the exchange of information, the parties should address any questions regarding the selected facilities and inspection procedures.

In implementing these provisions, the following definitions would apply:

- "Fixed structure" means a unique structure that was previously used to store nuclear warheads, is designed to store nuclear warheads, or has an access point that is large enough for a weapon storage container to pass through.
- "Room" means an interior subdivision within or underneath a fixed structure with an interior that is not visible from outside of the fixed structure and that has an access point that is large enough for a warhead storage container to pass through.

On-site inspections. The data exchange would enable each state to plan and conduct its inspection. One complication is the potential presence of weapon storage containers—whether empty storage containers for nuclear warheads or containers used to store nonnuclear munitions. Additionally, nonnuclear munitions outside of containers and other sensitive equipment, such as components for security systems, may also be present. The following inspection protocol seeks to balance the intrusive access needed for credible verification with the protection of classified information that is not germane to the task of verifying the absence of nuclear warheads. Specifically, it gives inspectors access rights to any location where a warhead could be hidden—as determined by the use of a cylindrical test object, representing the smallest plausible storage container for a nuclear warhead. Meanwhile, the protocol gives the host party the right to shroud any objects it deems to be sensitive and the inspectors the right to use radiation detection equipment to verify that shrouded objects and weapon storage containers do not contain nuclear material. Such technology has been used successfully pursuant to various previous U.S.-Russian arms control agreements.

Verification Regime: On-site Inspection Procedures

Inspections should occur within sixty days of site selection. The inspecting party should inform the host state of the inspection date at least forty-eight hours in advance of the inspection team's arrival in country. All movement of vehicles and objects into or out of the inspection boundaries must cease twenty-four hours in advance of the inspection team's arrival in country.

Preliminary Inspection Procedures

After the inspection team's arrival at the facility, all vehicle traffic within the inspection boundaries must cease.

The host nation escort team should provide the inspection team with all changes that have occurred since facility information was last provided, as well as updated inspection site diagrams (though the inspection boundaries must not be altered). The escort team should also provide the inspection team with the locations of any inspectable vehicles situated within the inspection boundaries, up to two of which could be designated by the inspection team for inspection.

The escort team should provide the inspection team with the test object. The inspection team should have the right to measure the test object to ensure that it conforms to the agreed length and diameter dimensions.

If any weapon storage containers are present at the facility, the inspection team should be permitted to view one of each type to verify their dimensions and to compare them to the photographs provided in the baseline information exchange.

Once preliminary inspection procedures are complete, vehicle traffic within the inspection boundaries may resume with the exception of any inspectable vehicles designated for inspection.

Facility and Designated Vehicle Inspections

The duration of the facility inspection should be limited to twelve hours. During that period, for the sole purpose of verifying the absence of warheads, the inspection team should be given access first to any inspectable vehicles designated for inspection and then to any weapon storage containers and rooms that it selects in whatever order it chooses. The escort team should be permitted to accompany the inspection team at all times.

The host party should have the right to shroud, in advance of the inspection, any items it deems sensitive. The inspection team should have the right to employ radiation detection equipment to confirm that any shrouded objects, warhead storage containers, or other objects do not contain nuclear material.

Undeclared Structures, Objects, and Vehicles

Should the inspection team observe, within the inspection boundaries, an undeclared fixed structure, warhead storage container, room, or inspectable vehicle, the escort team should be required to perform measurements to verify whether it is large enough to contain a nuclear warhead. If it is, inspectors must be provided with access. The duration of such access should not count toward the twelve-hour time limit for the inspection.

Access Point Characterization

An access point should be deemed large enough for a warhead storage container to pass through if the test object, in any orientation, can pass through it. The test object is a cylinder with a length of 1 meter (3.3 feet) and a diameter of 0.5 meters (1.6 feet) constructed of lightweight materials.

In implementing these provisions, the following definitions would apply:

- "Inspectable vehicle" means a vehicle that has an access point large enough for a warhead storage container to pass through.
- "Weapon storage container" means a container whose linear dimensions, when measured at their widest points, are equal to or exceed the dimensions of the test object.

Assessment

Technical feasibility. In crafting a verification protocol, Russia and the United States could draw upon their considerable experience of conducting inspections at sensitive facilities and using radiation detection equipment for verification purposes. Moreover, they would not have to address the various complications associated with inspecting facilities at which nuclear warheads are present. Meanwhile, the NRRCs could facilitate the exchange of all needed information. That said, significant challenges—such as the need to agree on inspection boundaries—would remain. These challenges appear manageable, but the only way to know for sure would be for Russia and the United States to try to negotiate and implement the proposed agreement.

Political feasibility. Although inspections of empty storage facilities would be only a modest—though useful—confidence-building measure, they would still face significant political challenges.

First, the proposed agreement may go too far for Russia and not far enough for the United States. The United States wants Russia to commit to negotiating a comprehensive regime for managing NSNWs. However, Moscow has repeatedly rejected this proposal; indeed, it appears to be sticking to its long-standing position that U.S. nuclear weapons based in Europe must be returned to the United States and their storage infrastructure permanently dismantled before negotiations on limiting NSNWs can begin.[38] This proposal could help to break the logjam. It would not require negotiations over limits on NSNWs but would build experience and confidence in inspecting warhead storage facilities, thus advancing the goal of a more comprehensive treaty. Moreover, each party would benefit directly from enhanced transparency. Even if Moscow does not currently have concerns about the locations of U.S. NSNWs in Europe, it could easily become concerned in the context of a reinvigorated arms race.

Second, it could be challenging for Russia and the United States to select facilities for inspection. It would presumably be impossible to accommodate an inspection request at every empty warhead storage facility—some are likely too sensitive and others, such as former warhead storage facilities now in private hands, may present insurmountable bureaucratic difficulties. Because facilities must be selected by mutual consent, the host state could always veto an inspection request. This veto power represents an important safeguard—though if it were used too often, the proposed agreement would likely fall apart amid reciprocal accusations of bad faith.

Inspections in Europe could create particular legal, diplomatic, and political complications. While navigating these difficulties would not be entirely straightforward, they have been successfully tackled before. Specifically, to verify U.S. obligations under the INF Treaty, Russia conducted inspections at various bases in NATO states. These inspections were facilitated through politically binding memoranda of understanding, for which domestic ratification procedures were not required. A similar approach should be adopted here.

Breaking the Logjam: A U.S.-Russian Confidence-Building Regime for European Missile Defenses

Within the broader U.S.-Russian dispute over missile defense, a particular point of contention is the United States' European Phased Adaptive Approach (EPAA). This initiative seeks to defend NATO against Iran.[39] To this end, the United States has deployed SM-3 Block IB interceptors in Romania. It now plans to deploy more capable SM-3 Block IIA interceptors at the same site and at a second site in Poland. The launchers at each of these Aegis Ashore installations are adapted from the U.S. Navy's MK-41 Vertical Launch System, which is used on ships equipped with the Aegis air and missile defense system to launch SLCMs and other missiles as well as SM-3 interceptors.

Russia believes that the EPAA may threaten its ability to target the United States with ICBMs. The United States' November 2020 test of an SM-3 Block IIA interceptor against an ICBM-class target has added to Moscow's unease.[40] The U.S. Department of Defense contends that this interceptor "has the potential" to contribute to the defense of the homeland against "rogue states'" ICBMs, which have less capability to penetrate defenses than Russia's.[41] Moreover, to be useful for homeland defense, SM-3 Block IIA interceptors would need to be deployed near the United States; systems located in Europe would be unable to catch a Russian ICBM. These considerations do not seem to have assured Moscow, however, which may have overestimated the capabilities of the SM-3 interceptor—in particular, its burnout speed (that is, its maximum speed, reached immediately after its motors have cut off or burnt out).

Russia's concerns about the EPAA extend beyond the interception of its ICBMs to the possibility that the launchers could be used to fire offensive missiles, particularly cruise missiles. In response, the U.S. Department of State has indicated that the "Aegis Ashore Missile Defense System" (a term that appears to include more than just the launchers themselves) "lacks the software, fire control hardware, support equipment, and other infrastructure" required for launching offensive missiles.[42] It has also stated that "the defensive nature of the Aegis Ashore sites is documented in U.S. basing agreements" with Romania and Poland.[43] Russia has made clear that it places little value on these assurances, noting, for example, that the United States has conducted a test launch of a cruise missile from a land-based MK-41 test launcher.[44]

The United States and its NATO allies have compelling reasons to try to address Russian concerns. Most importantly, such concerns could spark inadvertent escalation. Moscow has threatened to attack Aegis Ashore installations preemptively in a crisis or conflict—presumably both to ensure the effectiveness of its nuclear deterrent and to prevent cruise missile attacks that could undermine its ability to wage a conventional war effectively.[45] Meanwhile, in peacetime, Russian concerns complicate the development of arms control agreements, including measures to manage Poseidon and Burevetsnik—systems Russia is developing to penetrate U.S. missile defenses. Indeed, if Russian concerns about missile defense are not successfully managed, it may develop additional exotic strategic delivery systems (that is, new strategic weapons of kinds other than ICBMs, sea-launched ballistic missiles, or heavy bombers—the three categories that are limited by New START), adding yet more fuel to the incipient arms race.

Solution Concept

Efforts to manage the dispute over Aegis Ashore should focus on the development of a transparency regime to demonstrate that (1) SM-3 interceptors located in Europe cannot threaten Russian ICBMs because they have insufficient burnout speed and (2) European Aegis Ashore installations cannot launch offensive missiles or do not contain missiles other than SM-3 interceptors. Success would not resolve the entire missile defense dispute or even address all of Russia's concerns about the EPAA.[46] However, it should ameliorate an acute part of the problem and could also catalyze a process for managing additional Russian concerns, as well as U.S. ones. Specifically, Washington should indicate that if the transparency regime for Aegis Ashore installations is implemented successfully and if Russia is willing to start addressing U.S. concerns on NSNWs (by, for example, agreeing to inspections of empty storage facilities), then the United States will be willing to negotiate additional steps to manage the missile defense dispute.

Key Elements of a Transparency Regime for European Aegis Ashore Installations

At the invitation of the United States, Russia should observe one flight test of an SM-3 Block IB interceptor and one of an SM-3 Block IIA interceptor in order to measure, with its own equipment, the interceptors' burnout speeds.

The United States should commit to (1) notifying Russia in advance of the first European deployment of any type of missile defense interceptor with a burnout speed greater than 3 kilometers per second (1.9 miles per second) and (2) inviting Russia to observe, at least sixty days prior to the interceptor's first deployment in Europe, a flight test in order to measure, with Russian equipment, the interceptor's burnout speed.

The United States should reaffirm to Russia the exclusively defensive purpose of European Aegis Ashore installations and commit to refraining from (1) loading offensive missiles into European Aegis Ashore launchers and (2) modifying such launchers so they become capable of launching offensive missiles. The United States should further commit to engaging in good-faith negotiations with Russia over practical transparency measures, including inspections and/or the use of remote monitoring equipment.

In 2011, the administration of then president Barack Obama invited Russia to measure an SM-3 interceptor's burnout speed—though the proposal appeared to apply to just one flight test.[47] Moscow rejected that overture as "propagandistic."[48] This proposal here will hopefully be more attractive because it is more comprehensive. It would apply to each interceptor type that has been or will be deployed in Europe unless its burnout speed is lower than 3 kilometers per second, in which case it could not meaningfully contribute to strategic missile defense operations—as Russia and the United States previously agreed.[49] Meanwhile, the confidence-building measures relating to offensive missiles aim to operationalize U.S. commitments already made to Poland and Romania about the exclusively defensive purpose of Aegis Ashore installations.

Verification

Interceptor burnout speed. The United States generally conducts interceptor flight tests from the Pacific Missile Range Facility in Hawaii. Russia could use its missile range instrumentation ship, the *Marshal Krylov*, to measure the interceptor's burnout speed.[50] Given that this ship's radar likely has a range in excess of 600 kilometers (370 miles), the vessel could be positioned on the high seas (that is, in international waters) at a site of Russia's choosing. As such, Russia could try to monitor U.S. interceptor flight tests even without an invitation—though cooperation would have two advantages. First, the United States would inform Russia of the test in advance, giving it time to position the ship. Second, the United States would commit to refrain from using any denial and deception practices that would interfere with Russian measurements of the interceptor's speed.

Exclusively defensive purpose of European Aegis Ashore installations. The first step in developing any verification approach would be meetings between U.S. and Russian officials, including technical experts, so that the United States could identify some or all of the "fire control hardware, support equipment, and other infrastructure" that is missing from European Aegis Ashore installations and thus renders them incapable of launching cruise missiles.[51] As part of this process, the United States should provide Russia with commercial satellite imagery and internal and external photographs that highlight differences between these installations and their sea-based equivalents. The United States could also consider offering Russia a one-off exhibition of the land-based MK-41 test launcher in California—which has been used to launch a cruise missile—and, with the permission of the host state, an Aegis Ashore installation in Europe.

Based on this information, the two sides should then attempt to jointly identify externally observable distinguishing features (EODFs) between the land- and sea-based launchers. The outcome of this exercise would determine the optimal verification approach.

The most straightforward case would arise if the two sides jointly identified EODFs that could be detected with satellite imagery. Verification could then be facilitated by a U.S. commitment not to interfere with Russian NTM—a common feature of many arms control agreements that would be generally helpful in addressing Russian concerns about the EPAA.

A second possibility is that EODFs are identified but are visible only from the ground. In this scenario, periodic on-site inspections, with the host nation's consent, would be needed so Russian inspectors could verify the absence of one or more components needed to launch cruise missiles.

The third and most challenging case would arise if the United States and Russia were unable to jointly identify any EODFs. The most direct approach to verification would then be for the United States to permit Russian inspectors to periodically select and view the inside of an agreed number of Aegis Ashore launchers to check that they are loaded with missile defense interceptors (a similar process to New START inspections of the missiles inside ICBM silos or SSBN launch tubes). To facilitate such inspections, which would again require the host government's consent, the United States should provide Russia with identifying characteristics for each type of missile defense interceptor deployed in European Aegis Ashore launchers (fortunately, SM-3 interceptors look very different from Tomahawk cruise missiles).

Under any scenario, Russia could use NTM to try to detect the loading of offensive missiles into launchers. It could be helpful, therefore, for U.S. technical experts to explain to their Russian counterparts how the loading of interceptors and offensive missiles can be distinguished—if, indeed, they can. Such cooperation would be particularly important if Russia and the United States failed to identify any EODFs and if the United States were unwilling to allow Russian inspectors to view the interceptors inside launchers. In this case, to enhance Russia's ability to detect any loading of offensive missiles, the United States could (1) permit Russian inspectors to install and use remote monitoring video equipment so Russia could continuously observe specified areas of European Aegis Ashore installations and (2) commit to notifying Russia at least twenty-four hours in advance of the loading or unloading of European Aegis Ashore launchers.

On-site access of any kind would require Russia and the United States to negotiate a politically binding verification protocol. From a U.S. perspective, a key consideration would be ensuring that Russian inspectors could not learn classified information other than that officially disclosed pursuant to the implementation of the inspection agreement. To this end, the shrouding of equipment not subject to inspection could be helpful. A separate politically binding agreement between the United States and each host nation would also be needed.

Assessment

Technical feasibility. Designing a regime to verify the exclusively defensive nature of Aegis Ashore installations could prove tricky. The primary challenge would probably be the joint identification of EODFs—an issue that Russia and the United States have frequently disagreed on in other contexts. If the two states failed to agree on EODFs, it might nonetheless be possible for Russia to ascertain that the launchers are configured for defense purposes by verifying they are loaded with interceptors.

Measuring the burnout speed of an interceptor should be straightforward for Russia, which would rely on its own equipment. This speed is probably the single most important parameter for determining the extent of any threat posed by European Aegis Ashore installations to Russian ICBMs—but it is not the only one. As a result, Russia's gaining confidence in this speed should reduce the scope for disagreement between Moscow and Washington but might not eliminate it entirely. This proposal would be best implemented, therefore, as part of a broader U.S.-Russian dialogue over missile defense, in which the two sides could discuss how to determine whether defenses threaten ICBMs.

Political feasibility. This proposal would stir up controversy within both the United States and NATO. Domestic critics would probably argue, as they did in 2011, that permitting Russia to measure the burnout speed of a U.S. interceptor would disclose classified information that could compromise national security. Yet, as the Obama administration concluded back then, this information would not meaningfully help Russia or any third party to defeat U.S. defenses. Critically, to protect against Russia's learning much more sensitive information—about the performance of the interceptor's sensors, for example—the United States could continue to use denial and deception techniques, such as the encryption of telemetry data, that did not interfere with Russian speed measurements. Meanwhile, orchestrating Russian inspections on the territory of a U.S. ally would be politically sensitive, but, as history demonstrates, hardly infeasible.

All these difficulties, however, pale compared to the long-standing acrimony between Russia and the United States on missile defense. The two states approach this issue with seemingly irreconcilable positions. Moscow demands legally binding guarantees without giving any indication that it is willing to offer the United State anything in return. Washington insists that it can offer nothing more than politically binding confidence-building measures—when, that is, it is prepared to engage at all.

Ultimately, Russia cannot force the United States to accept a treaty on missile defense (just as Washington cannot force Moscow to accept a treaty that covers NSNWs). As a result, any viable approach will have to be politically binding, at least initially. The United States, however, should frame this proposal as the first step in a long-term process that could address a wider range of concerns and could perhaps include the development of legally binding instruments. In this spirit, this proposal would not be a one-off exercise; it would permit Russia to measure the burnout speed of each interceptor type deployed in Europe and would provide Russia with an ongoing and verified commitment about the exclusively defensive purpose of European Aegis Ashore installations.

Beyond (Traditional) Bilateralism: A Chinese-U.S. Fissile Material Management Regime

There is a fairly broad consensus within the U.S. national security community about the importance of engaging China in arms control—not least to prevent China from challenging the United States in warhead numbers. There is, however, considerable disagreement on when and how to do so. For its part, U.S. President Donald Trump's administration sought to constrain China's nuclear forces through a trilateral treaty with Russia and the United States.[52] Beijing, meanwhile, has consistently rebuffed the United States' entreaties, suggesting—without making a commitment—that it will join multilateral disarmament negotiations if the United States first reduces its nuclear arsenal to close the "huge gap" with China.[53]

Washington faces two stark realities. First, it cannot force China to negotiate. Indeed, the Trump administration's fruitless call for Moscow to "bring China to the negotiating table" and its discussion of conducting a nuclear test to pressure China—a step that would likely have ended up fueling arms racing—demonstrated this lack of leverage.[54] Second, even if good-faith three-way negotiations were to commence, a meaningful arms-limitation agreement would likely take years to conclude. One example illustrates this point perfectly: China is believed to store its warheads and land-based missiles separately; therefore, under New START's counting rules, it has no deployed warheads associated with its ICBM force. As a result, an arms control agreement involving China would have to manage individual warheads—a daunting challenge. Thus, while a trilateral limitation treaty is a worthy long-term goal, it does not provide the United States with a practical short-term way to manage its concerns about a Chinese nuclear buildup.

Solution Concept

There are widespread but unconfirmed reports that China has ceased the production of weapon-usable fissile material—separated plutonium and highly enriched uranium (HEU)—at least for military purposes.[55] Moreover, the U.S. Defense Intelligence Agency assesses that China's fissile material stockpile could yield only "several hundred[]" warheads—perhaps double Beijing's current arsenal—leaving China in no position to compete numerically with the United States, which has almost 4,000 warheads. [56]

As a result, U.S. concerns about a Chinese nuclear buildup could be addressed without limits on Chinese warheads. Instead, it should be sufficient for China and the United States to jointly declare a cutoff in fissile material production—a step the United States has already taken unilaterally—and for the two states to adopt transparency measures to enhance this cutoff's credibility.

A Joint U.S.-Chinese Fissile Material Cutoff and Associated Transparency Arrangements

China and the United States should declare a joint cutoff in the production of weapon-usable fissile material for any purpose and commit to talks about mutual confidence building.

If China is unwilling to agree to a complete cutoff because, for civil purposes, it is still producing HEU or plans to separate plutonium, it should agree to a cutoff in production for military purposes and to place all newly produced HEU and separated plutonium under International Atomic Energy Agency (IAEA) safeguards.

After agreeing to a cutoff, China and the United States should exchange confidential declarations about their stockpiles of weapon-usable fissile material. Specifically, for each of the following categories, each state should make annual declarations of its total holdings of (1) separated plutonium (unless it contains more than 80 percent plutonium-238) and (2) uranium-235 contained in uranium enriched to more than 20 percent:

- Military material—material (other than excess military material) that has been fabricated, or reserved for potential future fabrication, into nuclear weapon components
- Excess military material—former military material that a state has committed not to use for military purposes
- Naval fuel—irradiated or unirradiated fuel for military naval reactors
- Other military material—material used for other military purposes (such as fresh or irradiated fuel for military research reactors)
- Civil material—material involved exclusively in civil nuclear activities

This proposal would build on steps that China and the United States have already taken. The United States published comprehensive declarations of its plutonium and HEU stockpiles in the mid-1990s but has since provided only one update (which was only to the HEU declaration).[57] Meanwhile, pursuant to an IAEA transparency initiative, both China and the United States already declare their civil plutonium holdings—though China last provided an update in 2017 and it is unclear whether it is still participating.[58]

Verification

After committing to a bilateral cutoff in the production of weapon-usable fissile material, China and the United States should discuss any compliance concerns they might have, with the aim of developing ad hoc verification measures targeted at alleviating those specific concerns.

Verifying a cutoff in plutonium production should be unproblematic. Indeed, the United States surely already uses NTM to monitor the nonoperational status of China's reprocessing plants (two military facilities and one pilot-scale civil facility) and plutonium-production reactors.[59] Similarly, China must currently use NTM to verify that U.S. military plutonium-production reactors and reprocessing plants are being decommissioned.[60]

China has ambitious plans to develop one or more large-scale civil reprocessing facilities. The United States has previously indicated that it is not concerned that plutonium separated in these plants could be diverted to a military program. Nevertheless, the credibility of a cutoff would be enhanced by placing such facilities under IAEA safeguards.[61] (The United States has never had an operational civil reprocessing facility and has no plans to develop one.)

Verifying a cutoff in HEU production could be slightly more challenging. The United States and China operate enrichment facilities for civilian production and for research and development purposes, and these could produce HEU.[62] Indeed, China's Heping facility, in which HEU for nuclear weapons was produced, may currently produce HEU for research reactors. If so, under a cutoff, such production would have to cease or be placed under IAEA safeguards.[63]

Confirming the nonproduction of HEU at enrichment facilities would require physical access, which, to be politically palatable, would have to be reciprocal. While inspections conducted by either the IAEA or national inspectors would be intrusive, they should encounter few technical difficulties.

To verify that HEU is not being produced in an operational enrichment plant that has never produced such material, swipe samples could be analyzed to confirm the absence of HEU particles. If such a plant has produced HEU, it might be possible to check that production has now ceased by determining the minimum age of HEU particles.[64] Failing that, the enrichment level of product streams could be measured through online enrichment monitors or periodic sampling. Finally, if either state were concerned that the other had built a secret enrichment plant to produce HEU for military purposes, swipe samples could again be used to confirm the absence of HEU particles at the suspect facility (if needed, the host state could use extensive shrouding to protect unrelated classified information).

In contrast to verifying a cutoff, the comprehensive verification of stockpile declarations would be functionally impossible. One reason is that classification rules around weapon components would prevent inspectors from measuring their fissile material content. That said, each state could compare the other's declarations to its own intelligence estimates and commit to discussing inconsistencies. In particular, the past production of fissile material is a less sensitive subject than its subsequent use or current disposition. It might, therefore, be possible to address discrepancies over production with transparency into the operational histories of relevant facilities and potentially the use of nuclear archeology (which involves analyzing components in facilities and waste streams to estimate past production).

Assessment

Technical feasibility. Verifying a cutoff should be relatively straightforward, even if potentially intrusive. By contrast, verifying stockpile declarations, at least in any comprehensive way, would be impossible. Ultimately, China and the United States would have to decide whether or not they were better off receiving additional information, even if they could not verify it.

Political feasibility. This proposal would benefit the United States more than China—at least if implemented on a stand-alone basis. The United States produced far more fissile material for nuclear weapons than it could use and ceased production almost three decades ago. China, by contrast, has a much smaller stockpile. While it may not be producing more fissile material for nuclear weapons right now, it has probably not yet foreclosed the option to do so. Indeed, behind the scenes, China likely opposes a multilateral fissile material cutoff treaty (though because Pakistan has blocked negotiations, Beijing has been able to continue paying lip service to that goal).[65] Moreover, a bilateral approach may be more problematic for Beijing than a multilateral treaty because a bilateral treaty would not cover those countries besides the United States that affect China's fissile material requirements: India, Russia, and perhaps even Japan. Nonetheless, Beijing has three potential motivations to explore this proposal.

First, in practice, this proposal would not be implemented by itself. Inevitably, it would have to be adopted as part of a mutually beneficial package that required significant concessions by the United States. To facilitate negotiations over such a package, Beijing should start considering what it would ask of Washington. Meanwhile, U.S. and Chinese experts could explore the potential trade space informally.

Second, in private, some Chinese officials and experts question the accuracy of the United States' fissile material declarations. This proposal would help China gain deeper insight into the U.S. stockpile.

Third, while fissile material is unquestionably a sensitive issue for Beijing, this proposal would presumably be more acceptable to China than many, if not all, of the alternatives—binding limits on nuclear forces, in particular. Such limits would reveal the exact size of China's nuclear arsenal and the locations of its weapons, exacerbating Beijing's concerns about their vulnerability. By contrast, stockpile declarations would reveal only an approximate upper bound on the size of China's nuclear arsenal and nothing about weapon locations. To be sure, Beijing does not need to choose any of the alternatives; it could simply continue not to engage. Yet Chinese leaders should ponder the advice of scholar Tong Zhao, who has argued that arms control could enhance China's interests by preventing competition with the United States from becoming dangerously destructive, by bolstering China's image as a responsible power, and by reducing defense spending.[66] If they agree with this argument in principle, this proposal could be part of a practical way forward.

Preventing the Spark: A Trilateral Ballistic Missile Notification Agreement

If mistaken for an attack, a missile test or space launch could spark escalation. This risk is not hypothetical. In January 1995, Russia mistook a sounding rocket launched off the Norwegian coast for a U.S. nuclear-armed ballistic missile. Because Moscow feared that the first wave of a U.S. campaign to destroy its nuclear forces might comprise a small number of ballistic missiles—perhaps just one—fired against key command-and-control nodes, the result was a cascade of warnings that reached Russian president Boris Yeltsin within four minutes.[67] Only after he activated his "nuclear briefcase" and ordered the Strategic Rocket Force to prepare to launch ICBMs did the Russian military determine that the launch was benign.

Twenty-five years later, notwithstanding subsequent improvements in Russia's early-warning capabilities, there remains a real risk that escalation could result from either a mischaracterized launch or, relatedly, from preparations for a test launch being mistaken as preparations for an attack—a scenario that would invite a preemptive strike against the launch site. There are two reasons to take these dangers seriously.

First, while the risks of escalation may be low in peacetime, they could rise significantly at times of heightened tensions. During such periods, national and military leaders might be more inclined to interpret an ambiguous event in the worst possible light because they were expecting or, at least, concerned about an attack.[68] Moreover, a state that feared that an attack might be underway or imminent would be more likely to respond precipitously in a crisis than in peacetime. Second, because of Chinese efforts to acquire the capability to rapidly detect and respond to ballistic missile launches, these dangers could soon arise in a U.S.-Chinese crisis as well as U.S.-Russian one.

Notifications before missile tests or space launches can help reduce these risks. There are two operative notification agreements involving Russia and the United States: the 1988 U.S.-Soviet Ballistic Missile Launch Notification Agreement, which was made legally binding through its incorporation into New START, and the multilateral 2002 Hague Code of Conduct Against Ballistic Missile Proliferation, a politically binding document that calls for notifications of space launches (among many other provisions). Separately, in 2009, China and Russia concluded their own legally binding notification arrangement, the Agreement on Notifications of Launches of Ballistic Missiles and Space Launch Vehicles, which will expire in late 2020 absent a decision to extend it. (See table 1 for a comparison of the notification commitments.)

This patchwork of agreements has three particularly notable gaps. First, China and the United States have not agreed to exchange any launch notifications.[69] Second, no state has committed to providing notifications about tests of boost-glide missiles. Because boost-glide missiles are maneuverable, their tests are actually more likely to be misinterpreted as attacks than tests of ballistic missiles, which fly along predictable trajectories after burnout. Third, as set out in table 1, the range thresholds that trigger notification requirements are generally quite long. Yet tests of shorter-range missiles could also spark escalation if conducted from ships or aircraft close to an adversary's borders or from the territory of, or in the direction of, a U.S. ally.

TABLE 1

Comparison of Launch Notification Regimes

Notification Requirement	China–Russia (2009 agreement)	Russia–United States (1988 agreement)	China-United States
Minimum range of ground-launched ballistic missile	2,000 kilometers (1,200 miles)	5,500 kilometers (3,400 miles)	No notifications required
Minimum range of submarine-launched ballistic missile	2,000 kilometers	600 kilometers (370 miles)	
Minimum range of air-launched ballistic missile	2,000 kilometers	No notification required	
Boost-glide missile test	No	No	
Direction of test	Toward the other state[a]	Any	
Post-launch notification	Yes	No	
Space launch	Yes	Yes[b]	
Exemption for special cases	Yes	No	

[a] China is required to notify Russia of launches to the west, northwest, north, and northeast. Russia is required to notify China of launches to the northeast, east, southeast, and south.
[b] Pursuant to the Hague Code of Conduct.

Solution Concept

These deficiencies, paired with China's increasing capability to detect missile launches, suggest that China, Russia, and the United States should share an interest in developing a more comprehensive approach to launch notifications.[70] The proposal for a trilateral regime described below includes elements from the 1988 U.S.-Soviet and 2009 Chinese-Russian agreements, as well as from a never-implemented 2000 memorandum of understanding between Russia and the United States to enhance their notification regime. Helpfully, all these agreements contain various identical or almost identical definitions and rules (such as the instructions for describing the planned impact area of a missile test).

Key Elements of a Trilateral Missile Launch Notification Regime

China, Russia, and the United States should notify one another of (1) all space launches and (2) all tests of ballistic or boost-glide missiles, whether conducted from air, land, or sea, that meet the following conditions:

- For tests of ballistic missiles: The planned distance betweeen the launch point and the impact point exceeds 500 kilometers (310 miles) or the planned apex altitude exceeds 500 kilometers.
- For tests of boost-glide missiles: The planned distance between the launch point and impact point exceeds 500 kilometers or the planned maximum speed exceeds 2 kilometers per second (1.2 miles per second).

Both pre-launch notifications and post-launch notifications (or, if a launch did not take place, a cancellation notification) should be provided.

Pre-launch notifications should be provided at least twenty-four hours before the start of the launch window and should include the following:

- The type of launch (ballistic missile test, boost-glide missile test, or space launch) and the basing mode (ground-launched, sea-launched, or air-launched)
- The number of missiles or space launch vehicles to be launched
- Launch area (for ground-based or air-based launches, the site, facility, or range; for sea-based launches, the ocean quadrant or body of water, such as a sea or bay)
- The time and date for the start and end of the launch window (which may last no longer than seven days, unless extended through a notification)
- The planned payload impact area, if there is one; otherwise the launch azimuth (the size of the impact area may be determined by the notifying party at its discretion)

A single pre-launch notification may be used for multiple launches only if the last launch in the sequence is planned to occur less than sixty minutes after the first launch.

A post-launch notification should be provided no more than forty-eight hours after the launch and should include the following:

- The number of missiles or space launch vehicles that were launched
- The date and time of the launch or launches

In implementing these provisions, the following definitions would apply:

- “Ballistic missile” means a weapon-delivery vehicle that has a ballistic trajectory over most of its flight path.
- “Boost-glide missile” means a weapon-delivery vehicle that sustains unpowered flight through the use of aerodynamic lift over most of its flight path. A reaction control system designed to change a vehicle’s attitude is not considered capable of powering flight.
- “Ocean quadrant” means a ninety-degree sector encompassing approximately one-fourth of the area of the ocean.
- “Space launch” means a rocket launch for the purpose of delivering an object into earth orbit or outer space.

Verification

A verification system would not be needed for this proposal. In fact, this proposal is valuable precisely because Russia and the United States have sophisticated capabilities to detect ballistic missile and space launches and China is rapidly and significantly improving its own capabilities, creating the risk of a launch being detected and misinterpreted.

Assessment

Technical feasibility. This proposal should be straightforward to negotiate and implement. The one required innovation would be a mechanism by which China and the United States could exchange notifications. (Russia and the United States would use their existing NRRCs. China and Russia were required to establish a communication channel pursuant to their 2009 agreement, but there is no publicly available information about it.) While Beijing and Washington could use standard diplomatic channels, a dedicated system would be useful in facilitating further cooperation, both bilaterally and trilaterally.

Political feasibility. The political obstacles facing this proposal are relatively small—at least compared to other concepts for engaging China. No limits would be placed on any capabilities or activities. Moreover, China, Russia, and the United States have each accepted the principle that launch notifications can help to prevent inadvertent escalation. Nonetheless, when it comes to trilateral arms control, even relatively small barriers are large in absolute terms—primarily because of the poor state of U.S.-Chinese relations.

First, both China and the United States are more concerned about deliberate aggression than they are about inadvertent escalation, increasing the difficulty of generating political traction. That said, both states have recognized the possibility that escalation might not be deliberate; for example, they both participate in the 2014 Code for Unplanned Encounters at Sea, which aims to reduce the risks associated with ships operating in proximity to one another. An even more relevant precedent was set when China announced its missile tests in advance during the 1995–1996 Taiwan Strait Crisis.[71]

Second, even if Beijing does not object to the principle of providing launch notifications to Washington, it may fear that doing so will lead to more pressure to engage in further steps. Meanwhile, domestic critics in the United States may not view a launch notification regime as a meaningful step toward the goal of limiting China's nuclear forces. Ultimately, however, decisionmakers in each state should ask themselves whether the proposed regime would, in itself, enhance their state's security; if it would, they should support it, even if they disagree about future steps. After all, U.S. participation would not reduce Washington's leverage to push for further steps, and Chinese participation would not reduce Beijing's ability to resist them.

Finally, there may be concern that launch notifications could cue additional espionage activities to monitor missile tests. This concern is likely to be most acute in Beijing because of its distrust of Washington and because it can currently avoid notification requirements, pursuant to its agreement with Russia, by launching away from Russia or by invoking an exemption permitted in "special cases."[72] Cueing, however, would not significantly enhance the effectiveness of intelligence-collection activities. China, Russia, and the United States already have, or are acquiring, early-warning satellites, which can monitor ballistic missile tests on a persistent basis without the need for cueing. Similarly, visual reconnaissance satellites are likely to observe test preparations without cueing, even though the coverage they provide is episodic. States could try to take advantage of a launch notification by pre-positioning ships or aircraft. However, for safety reasons, tests over the ocean are already preceded by safety warnings. Meanwhile, aircraft are unlikely to be able to get close enough to monitor a test over land without violating other countries' airspace.

Final Thoughts

The five proposals in this paper speak for themselves; what does not is the challenge of generating the "political will"—to use a term beloved by diplomats—that will be needed to turn these proposals into reality. Part of the difficulty stems from the fraught relationships between the United States and China and the United States and Russia. Additionally, divisive internal politics create incentives for leaders not to seek cooperation with rivals, even when all parties may enjoy security benefits from arms control.

While there is no simple fix, it would be wrong to assume that political barriers are immutable. On October 14, 1962, the day before Soviet missiles were discovered in Cuba, it would have been unthinkable that, within a year, Washington and Moscow would establish a hotline intended to reduce the risk of nuclear war. In early 1985, when U.S.-Soviet negotiations on the INF Treaty had been suspended for almost eighteen months and hundreds of nuclear-armed missiles were deployed in Europe, it would have seemed far-fetched to suggest that a treaty would be concluded by 1987. It is impossible to predict when opportunities for arms control will arise, but China, Russia, and the United States and NATO should consider and refine proposals now to enable rapid progress when the political conditions allow.

The key to making progress will be to craft arms control approaches that each party believes will benefit its own interests—a requirement that is obvious but challenging to implement given the asymmetries and tensions among Chinese, Russian, and U.S. interests. One potential solution is to package two or more measures together. An obvious combination, for example, would be to link a proposal on ballistic missile defenses to one on NSNWs, thus catering to both Russian and U.S. concerns. In this context, Beijing, in particular, should undertake the internal work needed to define what it might want from Washington (and Moscow too, perhaps).

At the same time, each state should ask itself whether its interests would be better served by a broader conception of its security goals that encompasses both the need for effective deterrence and the importance of reducing the shared risks of arms racing and inadvertent escalation. Nuclear deterrence requires there to be some risk of escalation—otherwise a nuclear threat could never be credible. Calibrating this risk to optimize a state's security can be difficult, however. Indeed, in today's world, the risks of escalation seem unnecessarily high. An incipient global nuclear arms race is only likely to add to the costs yet further. Arms control—undervalued and underexplored today—can be a powerful tool for better managing the risks inherent to enhancing security through threats of catastrophic destruction.

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