

Stability and Nuclear Risks in U.S.-Russian Relations

Discussion Paper for a Track II Dialogue on U.S.-Russian Crisis Stability

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A number of developments in the past year have shown that any hopes that a change of administration in the United States would bring an improvement in U.S.-Russian relations, if they ever existed, have failed to materialize. The new U.S. Nuclear Posture Review contains provisions that challenge Russia and call for development of at least two new systems designed to do exactly that. As the new administration confirmed the allegations of Russia's noncompliance with the Intermediate-Range Nuclear Force (INF) Treaty and Russia reiterated its concerns, an attempt to achieve progress in resolving the dispute through treaty consultation has failed with no prospect of resuming a substantive dialogue. In response to the alleged Russian violation, the United States initiated a research and development program to explore the option of its own intermediate-range system. Although the two countries claim that they remain committed to resolving the dispute diplomatically, neither has made concrete steps in that direction yet.

The New START Treaty, which remains the key bilateral arms control agreement, reached an important milestone in February 2018, when the parties announced that they completed reductions of their strategic forces. Russia, however, expressed concerns about the manner in which the United States converted some of its strategic launchers, indicating that it intends to press the issue and question the viability of the treaty. This does not bode well for the prospects of a New START extension, even if it does not rule out this possibility completely. Another factor that will certainly complicate the extension is that after the New START reductions Russia will probably maintain a sizable "upload potential." Even though it mirrors U.S. policy of maintaining a hedge, it will definitely raise concerns in the United States.

Finally, in his recent address to Parliament, President Putin unveiled a host of new strategic nuclear-capable systems that Russia is currently working on, ostensibly in response to U.S. missile defense deployment. Other systems may be under development as well. Few of these are covered by the existing arms control agreements, which will present another serious challenge for the effort to bring stability to the U.S.-Russian relationship.

This paper attempts to identify some of the issues that are relevant for U.S.-Russian dialogue from the point of view of stability and risks associated with nuclear weapons. The goal of the paper is to provide a starting point for a discussion, rather than to present a detailed analysis of the issues. The paper focuses on three issues—stability of the current and emerging strategic postures, the role of nonstrategic nuclear weapons in Europe, and the inherent risks associated with nuclear weapons.

Strategic Modernization and Stability

Both Russia and the United States are undertaking modernization of all three traditional components of their strategic nuclear forces. In Russia, all three legs of the strategic triad—intercontinental ballistic missiles, strategic submarines, and bombers—are undergoing deep modernization. The key systems currently being deployed are the RS-24 Yars land-based ICBM, deployed on road-mobile launchers and in silos, and Project 955 Borey ballistic missile submarines with Bulava missiles. In the bomber leg of the triad, Russia is actively modernizing its fleet of Tu-160 and Tu-95MS aircraft and introducing a new long-range air-launched cruise missile. Other notable modernization programs underway include the Sarmat heavy ICBM, the Tu-160M2 bomber, and a somewhat more distant PAK-DA bomber. Russia is also investing in the development of early-warning radars and satellites as well as other components of the strategic command-and-control system. As this modernization effort goes forward it should allow Russia to maintain a survivable strategic deterrence force that would ensure strategic parity with the United States—the goal that the Russian leadership apparently values. Moreover, the emerging strategic posture will provide Russia with a hedge, similar to the one maintained by the United States—if necessary, Russia could relatively easily increase the number of deployed warheads above the 1550 limit established by the New START treaty.

From the point of view of crisis stability as it is normally understood, the most problematic part of the Russian program might be the relatively large number of MIRVed (multiple warheads) land-based missiles. Some of them will be based on mobile launchers (mobile version of RS-24 Yars), but Russia is retaining a significant silo-based ICBM force as well—RS-24 Yars and Sarmat. Indeed, Sarmat is being developed as a heavy ICBM that can carry a large number of warheads, probably 10 or more. Silo-based missiles that carry multiple warheads are traditionally considered a destabilizing component of the nuclear triad as their vulnerability creates an incentive to use them in a first strike or in a launch-on-warning scenario. The Soviet Union and Russia, however, never fully accepted this logic. Since Soviet and Russian strategic forces never had true counterforce capability, land-based ICBMs are primarily intended to be used in a retaliatory launch. In this case, the fact that these missiles can carry multiple warheads increases the number of targets that the few missiles that survive or escape a first U.S. strike would reach in retaliation. Although this does not eliminate the instabilities and risks related to the launch-on-warning posture, which Russia has the technical capability to adopt, it does suggest that MIRVing of silo-based missiles in itself is not necessarily a destabilizing factor.

A more important factor that might be responsible for instability in a crisis is the concern about the capability of the missile defense system developed by the United States to counter Russia's retaliatory strike. Even though missile defense is unlikely to be capable of countering Russia's ballistic missiles

and their countermeasures, the perception of vulnerability does matter and it would provide Russia with incentives to act early rather than wait for a full assessment of the situation as would normally be the case.

Russia's missile defense concerns were on full display during the March 2018 presidential address to the parliament that unveiled a host of new nuclear-capable systems developed with the specific purpose of countering U.S. defenses. One of these systems was the Sarmat heavy ICBM mentioned earlier; other strategic systems included a long-range nuclear-powered cruise missile, nuclear-powered autonomous underwater vehicles, and the Avangard hypersonic boost-glide vehicle that can be deployed on an ICBM. (Another system described in the address was an intermediate-range air-launched ballistic missile, Kinzhal. This system, however, does not have an explicit antimissile-defense mission and it should probably be considered together with nonstrategic weapons.)

It is somewhat difficult to estimate the degree to which these new systems could provide a meaningful contribution to the capability of Russia's strategic forces to counter U.S. missile defense. It is also difficult to assess the effect these systems could have on the stability of the U.S.-Russia nuclear balance. As mentioned earlier, Sarmat, despite being a MIRVed silo-based ICBM, is not necessarily a destabilizing weapon system. It is expected to have the throw-weight that would allow it to carry sophisticated decoys and penetration aids along with its multiple warheads. It is also likely that the missile will be using hardening technologies developed for its R-36M2/SS-18 predecessor that allow the missile to be launched from under attack. If this is the case, Sarmat could indeed play the role of a weapon system that can reliably counter missile defense, even if it does not add much to the already existing capabilities of other ICBMs, such as Topol-M and Yars.

The antimissile-defense potential of other new strategic systems is much less clear. While it is correct that missile defense has no capability against nonballistic delivery vehicles, such as the underwater drone or the global cruise missile, if these delivery vehicles are to carry out their declared mission, they would have to be deployed as part of an operationally viable weapon system. This undertaking would require solving a number of problems ranging from survivability of the launchers to integration into the command-and-control system. Once these issues are addressed, Russia is likely to find out that these new systems offer few, if any, advantages over existing land-based ICBMs and submarine-based SLBMs.

In a crisis, these new systems would probably add to the instability and may increase the probability of a miscalculation or an error. Although they were described as retaliatory weapons, that very mission would require these weapons to be highly survivable. Given that none of them are likely to see a large-scale deployment, they could not rely on the "safety in numbers" approach to the extent that ICBMs and SLBMs currently do. At the very least, they will introduce another high-uncertainty element into the already complex interactions in a crisis.

One of the new systems, the hypersonic vehicle of the Avangard system, may deserve a separate consideration. It was also described as a weapon designed to penetrate missile defense, but unlike

other weapons, its role may not be purely retaliatory. The system includes a boost-glide vehicle that can be launched by an ICBM and that reenters the atmosphere after the boost phase, where it continues its flight at an altitude of about 70–80 kilometers. Since most of the flight takes place in the atmosphere, the vehicle can circumvent those missile-defense systems that rely on midcourse intercept. Terminal defenses would probably have limited effectiveness against such a vehicle as well, since its trajectory would complicate detection and tracking. This program, sometimes referred to as Project 4202, goes back to one of the anti-SDI (Strategic Defense Initiative) projects initiated in the late 1980s. Russia conducted tests of the system in the early 1990s and then resumed test flights in 2001. Out of five or six flights conducted since 2011, when the current version of the vehicle, Yu-71, entered tests, probably the last two, in April and October 2016, were successful. (It should be noted that it would probably take more than two successful tests for a system to reach initial operational capability.)

The Avangard system appears similar to the boost-glide vehicles developed in the United States as part of the Conventional Prompt Global Strike program, which is supposed to develop a capability to strike targets anywhere at a very short notice. Unlike the United States, however, Russia has never indicated that it has considered similar mission requirements; neither has ruled out nuclear capability for this system. Given all that is known about the Avangard system, the boost-glide vehicles will be deployed on silo-based Sarmat ICBMs. This means that from the point of view of countering missile defense, the system is unlikely to have an advantage over an ICBM with regular ballistic warheads since its retaliatory mission will critically depend on survivability of the silo. However, if the weapon will be able to deliver the prompt-strike capability, Russia may consider using it in a limited-scale attack against a valuable target, such as a missile defense site in Europe. At least it appears that Russia has considered this kind of mission for its boost-glide system.

Even though these new systems do not have the potential to change the nature of the strategic balance between the United States and Russia in a substantial way, they will seriously complicate the future of bilateral arms control. By unveiling its new capabilities, Russia appears to be inviting the United States to return to a dialogue, which in Moscow's view would have to include a discussion of limits on missile defense. It is somewhat unlikely, however, that the United States would be ready to discuss these limits, at least not in the short term. Still, the two sides should attempt to continue the conversation, if only to establish a common ground for future discussions.

Most importantly, the United States and Russia should use the recently established mechanism of bilateral consultations on strategic stability to discuss the way forward. One immediate step that would help restart the arms control dialogue is an early extension of the New START treaty. This would demonstrate the commitment to address the issues and preserve the legal framework for doing so.

Since the New START treaty provides a mechanism for raising the question of "new kind of strategic arm[s]" in the Bilateral Consultative Commission, the United States should initiate this process. This discussion could be more productive if the United States would be willing to include its own

hypersonic boost-glide systems in the discussion, reversing its previous position that stated that these systems are not covered by the treaty.

As for missile defense, the New START offers a way forward as well. The treaty preamble recognizes the “the interrelationship between strategic offensive arms and strategic defensive arms” and states that the “current strategic defensive arms do not undermine the viability and effectiveness of the strategic offensive arms of the Parties.” These statements could provide a starting point for a discussion that would provide both parties with assurances that any future missile defense system does not undermine the strategic balance. Russia would probably insist on having a legally binding limit on missile defense, but it can be argued that this may not be the best way to approach the issue. In the past, a common understanding of technical limits of missile defense proved the most reliable way of alleviating concerns about the potential impact of missile defense on strategic stability. The Anti-ballistic Missile (ABM) treaty limits played a useful, but secondary, role. There is no reason to believe that this time the situation would be different.

Nonstrategic Nuclear Weapons and Escalation Risks

Developments on the sub-strategic level appear more difficult to control, which turns them into a potential source of misunderstanding and instability. Unlike strategic nuclear forces, most nonstrategic nuclear weapons are not covered by arms-control agreements. Moreover, the only agreement that deals with nonstrategic weapons, the INF Treaty, came under considerable stress after the United States accused Russia of developing and deploying a ground-based cruise missile in violation of the treaty terms. Russia denied the violation and made a series of counteraccusations. At this point it is unclear how the United States and Russia can resolve the dispute or whether they would be willing to undertake a serious effort to do so. This issue has already become a destabilizing factor as the measures that the United States is undertaking to compel Russia to return to compliance—a research program aimed at development of a new intermediate-range system or a plan to reintroduce into the U.S. arsenal a nuclear submarine-launched cruise missile—are likely to introduce additional tension in Europe.

Another source of instability is the apparent misunderstanding of the extent to which NATO and Russia may rely on nuclear weapons in a potential conflict. The U.S. Nuclear Posture Review asserts that Russia considers the option of an early use of nuclear weapons to de-escalate a conflict, while Russia insists that it has no such plans. Even though a number of scholars expressed serious doubts about the existence of the “escalate to de-escalate” strategy, certain steps recommended by the Nuclear Posture Review (NPR), such as the development of a low-yield warhead for the Trident II SLBM, are specifically tailored to counter it.

One reason the risks associated with nonstrategic nuclear weapons deserve special consideration is that a number of recent developments demonstrated that the possibility of a conflict involving Russia and NATO may be not be as remote as it appeared in the years following the end of the Cold War. Even though a deliberate direct confrontation is still extremely unlikely, neither side appears to rule it

out completely. In somewhat more realistic scenarios, the two sides may find themselves pulled into a conflict outside of their borders. The conflict in Syria is the most recent example of such engagement. The most important change in the last few years, demonstrated by Russia's intervention in Ukraine and its involvement in Syria, is Russia's willingness to challenge the United States and NATO in the post-Soviet space and to project power outside of that space.

Russia, of course, has never explicitly brought its nuclear weapons into consideration, even though President Putin made it known that during the annexation of Crimea in 2014, the leadership considered whether it should raise the level of readiness of its nuclear forces (and ruled against it). It is likely that Moscow is counting on the strategy of calculated ambiguity about its readiness to bring nuclear weapons into the equation to deter the United States and its allies from getting involved in the conflict in the first place. This approach appears to work in those cases when the stakes of the conflict are not high enough for the United States and NATO to risk an escalation, even if the possibility of an actual involvement of nuclear forces is extremely remote.

One problem with this strategy is that it relies on a judgment about the stakes of a conflict, which is inherently unreliable. For example, it is difficult to imagine Russia initiating a military conflict that directly affects vital NATO interests, for example by intervening in a NATO member state protected by the alliance's Article 5 obligations. There is nothing that would indicate that the Russian political and military leadership believes that in such a case it could prevail in a conventional conflict and prevent escalation by employing or threatening to employ its nuclear weapons at an early stage. However, there is also a serious risk of miscalculation, as in some scenarios an indirect involvement of Russia in a conflict outside of its borders (for example, similar to that in Eastern Ukraine) would cross the "high stakes" threshold and trigger a direct confrontation with NATO. In this case the nuclear ambiguity maintained by Moscow would indeed bring the risk of nuclear escalation, even if inadvertent. The possibility of a miscalculation or a misinterpretation of incentives and motives would, of course, be present on both sides of the conflict, further increasing the escalation risks.

There are several measures that could help address these risks. Measures aimed at improving communications between the United States and NATO on one side and Russia on the other might help introduce a degree of predictability in an uncertain situation. However, the effectiveness of communication channels in a genuine crisis can be questioned, and in the absence of a certain degree of trust these channels can become counterproductive.

Another option that can reduce the risk is a set of measures that remove nuclear ambiguity by ensuring that nonstrategic nuclear weapons are not part of any conflict that can carry an escalation risk. For example, this can be done by removing all nonstrategic nuclear weapons to a small number of storage sites located away from operational units. Russia has long maintained that all its nonstrategic weapons are already consolidated at central storage facilities. It is possible that if the United States and NATO reciprocate the arrangement (this may or may not involve removal of weapons to U.S. territory) it can be made mutually verifiable. This would ensure that nuclear weapons

are not present at least at the early stages of a conflict and therefore would limit the options that rely on nuclear ambiguity.

It is, of course, difficult to expect that the United States and Russia will reach an agreement on new arms-control measures, especially those affecting their nonstrategic nuclear weapons. But they could take steps to clarify their views on the role of these weapons, for example within the framework of the consultations on strategic stability. Whenever possible, this dialogue should be supported by transparency measures that could provide additional assurances.

The Growing Role of Cruise Missiles

One recent development that would be difficult to resolve within the New START framework or in the potential discussion of nonstrategic weapons is the growing role of cruise missiles. While it is yet to be seen if the nuclear-powered cruise missile unveiled in the presidential address will reach operational capability, it is clear that Russia is investing serious effort into the development of a range of cruise missiles and in integrating this capability into its operations. While New START largely covers air-launched cruise missiles, it does not cover sea-launched cruise missiles.

It is often assumed that nuclear SLCMs were removed from service as a result of the Presidential Nuclear Initiatives (PNI) of the early 1990s. However, Russia has never formally accepted that long-range SLCMs are nonstrategic weapons covered by the PNI obligations. The START treaty did consider long-range nuclear SLCMs in a separate category and required both parties to exchange declarations about the number of deployed nuclear SLCMs. By all indications, Russia did not deploy any nuclear SLCMs when the START treaty was in force (and, in fact, eliminated all its Granat SLCMs in the early 2000s), but this situation changed when the treaty was replaced by New START. The new treaty does not include any limits on nuclear SLCMs and Russia has developed a new missile that is replacing the eliminated Granat.

Development of sea-launched cruise missiles appears an integral part of the effort to provide Russia's armed forces with a long-range conventional strike capability. The system developed for this purpose, Kalibr, was demonstrated in action during Russia's operations in Syria—Russia used SLCMs launched from surface ships and submarines against targets on Syrian territory. The current armament program includes a sustained effort to deploy Kalibr missiles on a range of platforms. As of the end of 2017 these missiles were deployed on 11 surface ships, 2 diesel-electric submarines, and on the new attack submarine of the Project 885 class, Severodvinsk.

It is clear that the primary mission of these missiles is conventional, but it is possible that Severodvinsk can carry nuclear-armed Kalibr SLCMs. A second submarine of this class, Kazan, is under construction. Some official statements also suggest that Kalibr can be deployed on ballistic missile submarines as well. As a result, in a relatively short time Russia may have a sizable nuclear SLCM force on relatively quiet, modern submarines that can be deployed close to U.S. territory. This development will likely introduce a new destabilizing factor into the U.S.-Russian strategic balance, since neither

side has a reliable way of detecting incoming cruise missiles, whether nuclear-powered or not, or of reliably detecting and trailing the submarines that carry them.

Another important aspect of the growing emphasis on cruise missiles is the possibility of deployment of long-range ground-launched cruise missiles. This issue is apparently at the center of U.S. accusations of Russia's noncompliance with the INF Treaty. The missile, identified by the United States as 9M729, appears to have a range capability similar to that of Kalibr. Russia is said to be deploying this missile with its rocket and artillery forces. Even though a ground-launched cruise missile would not add a significant new capability to that provided by SLCMs, its deployment would certainly complicate the effort to control deployment of nuclear-capable cruise missiles at sea. The need to compel Russia to return to compliance with the INF Treaty is one of the key arguments behind the recommendation to bring back the nuclear-armed SLCM made in the Nuclear Posture Review.

There are steps that could help reduce the risks associated with long-range cruise missiles. One option is an arrangement that would prevent reintroduction of nuclear SLCMs. Short of a formal agreement, this can be done through an exchange of data on the number of deployed nuclear cruise missiles, similar to the one that existed in START. Even though this data exchange would not formally prohibit deployment of nuclear SLCMs and the information contained in it would be difficult to verify, it could introduce a degree of predictability in the situation. This proposal, however, has a significant drawback because Russia is today the only party that has the capability to deploy nuclear SLCMs on its ships; it therefore will have few incentives to agree to a data exchange of this kind. The planned introduction of a nuclear SLCM in the United States might, in fact, give Russia an incentive to address the issue, but an agreement would be extremely difficult to reach even in this case.

A more radical approach would seek to establish a verifiable arrangement that would guarantee that all SLCMs are deployed without nuclear warheads. For example, it can be done as part of the "zero-deployed weapons" arrangements described in the section on nonstrategic weapons. Getting to a verifiable agreement, however, would be extremely difficult, especially in the short term. Nevertheless, even a political commitment not to deploy nuclear cruise missiles at sea might provide a meaningful contribution to reducing the risks associated with nuclear weapons.

Risks of a Nuclear Accident

A different category of nuclear risks and the one that is arguably the most difficult to tackle includes the dangers of an accidental or inadvertent use of nuclear weapons. The accident can be a result of a technical or human error; it can also be produced by an unexpected interaction of seemingly unrelated events. There is a strong argument that the nature of the nuclear weapons complex makes accidents virtually inevitable and the historical record tends to support this conclusion. Although we have not seen an accidental nuclear detonation, known accidents that involved nuclear weapons and command-and-control systems that support operations of nuclear forces suggest that the probability of such an event may be unacceptably high, especially given its potentially catastrophic consequences.

There is a certain amount of risk associated with the handling of nuclear weapons during their combat service or maintenance, when warheads are transported between assembly facilities, storage sites, and operational bases, and when they are installed on the delivery systems. One recent example of the dangers inherent to this process is a fire on a Russian strategic missile submarine that was apparently moved to a dry dock with a full complement of missiles on board. While the seriousness of these accidents should not be underestimated, it appears that modern nuclear warheads are designed to withstand extreme conditions, so it is unlikely that accidents of this kind can lead to an unintended nuclear detonation.

A different kind of accident might involve a use of nuclear weapons in response to a false alarm or an event mistakenly interpreted as an attack. These are mostly accidents generated by the nuclear command-and-control system and its components, such as the early-warning system. These systems have been described as “complex and tightly coupled,” which makes it virtually impossible to address their vulnerability to accidents by technical means. A number of accidents that involved early warning or command and control happened in the past, so it is possible that certain lessons were learned and some risks have been reduced. However, today these systems operate in an increasingly more complex environment that involves many independent players who may interact in ways that are difficult to predict, not to mention prepare for.

One example of an interaction of this kind is a situation in which the United States undertakes an attempt to intercept an intercontinental missile launched from a third country. It has been shown that it is possible that if interceptors miss their targets, as they probably would, they would look like missiles attacking Russia’s territory. Although it is possible that Russia would recognize these missiles as failed interceptors, there is no way to know if it would do so. It is worth noting that Russia has several times misidentified ballistic missiles tested by North Korea, even though its early-warning radars were able to detect the missiles. Even if missiles or interceptors are identified properly, it is impossible to know how the Russian command-and-control system would respond to an event like that. Similarly, it is unknown how Russia or the United States might react if their early-warning system detects a launch of a hypersonic boost-glide vehicle with a combat mission.

One additional factor that should be taken into account is the potential interference with the command-and-control process that may be a result of a cyberattack or a similar intervention. Even though the nuclear command-and-control system is believed to be isolated from civilian communication channels, an intervention may not be a result of a direct access to these channels from the outside. It is possible to imagine an interference with unprotected communication networks that could change the way the leadership and operators of the command-and-control system assess the situation resulting in a decision to use nuclear weapons. Depending on circumstances of a particular crisis, this interference does not have to be deliberate or coordinated with other actions.

These kinds of risks are extremely difficult to manage. Improving the capabilities of early-warning systems is unlikely to address these risks and may increase the probability of an accident by introducing additional elements into an already complex system. The same is true for additional

communication channels that could provide notification of missile launches or guard against interference in cyber space. Reducing the readiness level of nuclear forces (or de-alerting) would provide additional time to assess the situation, but it could introduce its own instabilities and may not work in certain crisis scenarios.

At the very least, Russia and the United States (as well as other countries) should be aware of these risks and avoid introducing systems or operational practices that would increase the risk of an accident.

Conclusions

The current status of U.S.-Russian relations presents a serious challenge for managing the risks associated with the introduction of new military capabilities, emergence of new threats, and new sources of instability. The framework of arms-control treaties that focused largely on the numeric parity in the strategic forces proved difficult to adapt to the new circumstances. The dispute over missile defense is one example of the challenges facing U.S.-Russian arms control. The inability of the two parties to agree on a common approach to missile defense has generated significant mutual mistrust and has already resulted in developments that could take strategic modernization programs to uncharted territory. The very structure of bilateral arms control is under stress as well—the INF Treaty is in deep crisis and the prospects for extending the New START treaty seem increasingly distant.

Even though the recent presidential address suggested that Russia is open to negotiations regarding future reductions of strategic forces, parameters of these reductions would be difficult to negotiate, especially if Russia continues to insist on limits on missile defense. Still, the arms-control framework established by New START probably provides the best opportunity for resuming the dialogue.

The situation with nonstrategic nuclear forces would be more difficult to resolve. At this point there is a clear divergence of views between Russia and the United States and its NATO allies regarding the basic principles of the European security architecture and the role that nuclear weapons might play in managing conflicts on the continent. The dispute over alleged violations of the INF treaty may lead to a new round of confrontation that will introduce new nuclear-capable systems to the region. On the other hand, the INF crisis could provide an opportunity for resuming the dialogue—first on the technical issues at the core of the allegations and then on transparency and confidence-building measures that would address concerns about new nuclear and conventional capabilities (including missile defense) being introduced to Europe. The prospects of a dialogue of this kind seem distant at this point, but there seems to be a general agreement on the first steps that are required to begin it.

As a longer-term goal, the discussion of the future of strategic arms control or nonstrategic nuclear weapons and European security should probably lead to a broader conversation about the role of nuclear weapons and nuclear deterrence in maintaining a secure international order. Although recent crises, from North Korea to Ukraine, created a momentum that makes the vision of “peace and

security in a world without nuclear weapons” more distant, a careful examination of these crises may well indicate that nuclear weapons do not provide a useful contribution to peace and security. In any event, a discussion about strengthening stability of existing nuclear postures and reducing the risks associated with nuclear weapons should also consider options that do not include nuclear weapons as their essential component.

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