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US President Joe Biden and Russia's President Vladimir Putin meet for a Russia-United States summit at the Villa La Grange. Photo taken June 16, 2021.
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Russia's war of aggression marks the resurgence of an existential geopolitical conflict, comparable only to the early phases of the Cold War. This conflict exacerbates nuclear threats in multifaceted and potentially catastrophic ways, while diminishing the prospects for arms control and nuclear restraint regimes. This report critically examines the transformative impact Russia's war is having on the contemporary nuclear order, focusing on the utility of nuclear weapons in crisis bargaining, the credibility and sources of extended deterrence, and the functions and limitations of arms control.

The war in Ukraine serves as an important case study for reassessment of nuclear strategy. Both Western and Russian experts and decision-makers recognize the evolving nature of nuclear signaling and its utility in conflict situations. Western states have persistently tested and overstepped Moscow's perceived red lines by supplying arms to Ukraine, which has prompted significant reevaluation among Russian strategists. Against this backdrop, Russian policymakers and experts are debating how to restore the deterrent power of nuclear threats, with some advocating for intensified nuclear posturing and others proposing drastic measures such as tactical nuclear strikes on Ukrainian and NATO targets in Europe. Despite differing approaches, both sides acknowledge the diminishing utility of nuclear weapons as instruments of coercion.

In the realm of deterrence, both the West and Russia have reassessed their nuclear policies in light of the reemergence of an existential threat. Before 2014, Western discourse on nuclear doctrines was relatively subdued. However, post-2014 and especially after 2022, these debates have intensified, focusing on counterforce and damage limitation strategies. The modernization of U.S. nuclear arsenals in Europe, along with allied delivery systems, might signal the start of a broader nuclear rearmament process. Similarly, Russia faces shortcomings in its dual-use capable weapon programs, prompting debates on adapting its nuclear doctrine by lowering the threshold for nuclear use and accelerating modernization efforts. Both sides are thus engaged in doctrinal and strategic recalibrations to respond to the new security environment.

Arms control, historically marked by inherent ambiguities, functions effectively during periods of friendly relations but falters amid escalating conflicts. Prior to 2014, arms control was often seen as superfluous. Following the 2008 Georgia conflict, strategic arms reduction efforts such as the New START Treaty were pursued despite underlying tensions. However, post-2014 and particularly after the 2022 invasion, increasing suspicions about Russia's adherence to arms control agreements have led to the dissolution of key treaties including the INF and Open Skies. While Western distrust of Russia has escalated, making negotiated arms control politically unviable, Moscow views arms control less as a path to strategic stability and more as a tactical instrument in its confrontation with the West. These divergent approaches complicate future prospects for arms reduction.

Lessons from history, particularly the Cold War era's Berlin and Cuban crises, offer critical insights into managing contemporary nuclear threats. These historical precedents demonstrate that transformative conflict management and territorial delineation were prerequisites for subsequent arms control successes in the 1960s. Future research must rigorously explore the extent to which these historical experiences can inform and guide current strategies to mitigate nuclear risks and manage threats in the evolving geopolitical landscape. Despite the differences in Russian and Western ap-

proaches, both can benefit from a nuanced understanding of these historical lessons to navigate the complexities of contemporary nuclear diplomacy.

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1. INTRODUCTION

At the onset of its war of aggression against Ukraine, Russia made a series of nuclear threats aimed at deterring the West from providing military support for Ukraine. On declaring the invasion, Vladimir Putin warned Western states that any attempt to interfere would lead to "consequences never seen in history", a threat underscored just three days later when he placed Russia's nuclear forces on "high combat alert" (Putin 2022a; 2022b). In the early fall of 2022, a group of senior Russian generals further heightened global tensions by, purportedly without Putin's direct involvement, deliberating on the potential use of tactical nuclear weapons on Ukrainian territory (Cooper, Barnes, & Schmitt 2022). By May 2024, the situation had escalated with Moscow announcing snap maneuvers near the Ukrainian border, explicitly designed to train procedures for deploying tactical nuclear weapons, which were justified as a necessary response to "provocative statements and threats by certain Western officials" toward Moscow (cf. Peskov 2024). Such blatant employment of nuclear weapons for political and coercive purposes marks the return of the kind of strategic debates, military scenarios, and nuclear risks evocative of the darkest periods of the Cold War.

The era of strategic complacency and nuclear obliviousness in the West effectively ended after Russia's annexation of Crimea and its military intervention in Donbas. That said, how the current war will impact nuclear policies and risks remains a contentious question that has not yet been fully examined. At the societal level, symbolic acts such as the hands of the FAS Doomsday Clock moving closer to midnight or the New York Times graphic series on nuclear threats (Hennigan 2024) contrast with the indifference of Western publics and pundits who downplay the risks of a horizontal escalation in Ukraine or dismiss the possibility that Russia might follow through on its nuclear threats (Snyder 2023).[1] The academic debate also fluctuates between business as usual and apocalyptic scenarios. Lawrence Freedman (2023), for instance, emphasizes the durability of deterrence during the war in Ukraine, arguing that deliberate escalation is unlikely as long as Putin behaves rationally, though unintentional escalation remains a possibility. Others assert, however, that the "moment of truth will come" when Western supplies cross an undefined red line and Putin senses military defeat (Stein 2023).

Beyond the immediate risk of nuclear use, Russia's war will affect the broader nuclear order, understood as a set of practices, norms, and institutions governing the possession of nuclear weapons (Budjeryn 2022: 399). Alexander Bollfrass and Stephen Herzog (2022: 8) present a rather relaxed assessment, suggesting that while Russia's aggression shakes an already fragile nuclear order, the "foundation of international nuclear governance is more robust than often assumed". They argue that the nuclear order has weathered other storms and will also survive this one because it serves the fundamental interests of most states. However, others see a world "slouching towards a nuclear Gomorrah" (Anonymous 2023), with important bilateral and multilateral arms control agreements such as the ABM Treaty of 1972 and the INF Treaty of 1987 already becoming dysfunctional before the war, while other cornerstone treaties such as New START, which provided transparency and limits strate-

1 Timothy Snyder is most outspoken in his critique of a policy of restraint. However, his position is shared by others such as ETH professor Marcus Keupp (2024) and several other peers mentioned below.

gic launchers and deployed warheads, collapsing after Russia's full-scale invasion.[2] More than two years after the outbreak of the war in Ukraine and compliance with agreements that were previously taken for granted, such as the Comprehensive Test-Ban Treaty (CTBT) and the Outer Space Treaty, is increasingly called into question.[3] All the while nuclear-weapon states are embracing destabilizing technologies, the nuclear taboo is eroding, and Russia's policies are undermining the nuclear non-proliferation regime (Horschig 2023).

Against the backdrop of this inconclusive debate, we will combine conceptual reflections on historical lessons and empirical observations in a discussion of the likely consequences of Russia's war for the nuclear order. We draw on historical lessons to identify similar fractures in the nuclear order in the past, in relation to areas such as the role of nuclear weapons as instruments of crisis management, the credibility of (extended) deterrence and its sources, and the contingencies of arms control. In addition, we consider past conflicts involving nuclear states, while analyzing the relationship between great power conflict and the role of nuclear weapons. These historical reflections suggest that the current conflict is creating powerful incentives to use nuclear weapons as coercive instruments in the ongoing competition and is limiting the chances of nuclear restraint and arms control. Historical experience adds nuance and serves not only as a critical source for formulating policy advice for Western decision-makers but also as an analytical tool for tracing the change in the nuclear order brought about by Russia's war of aggression.

In the following chapters, we will briefly revisit Western debates on the role of nuclear weapons during the Cold War. We will then provide an analysis of how Russia and the US/NATO are adjusting their nuclear behavior as a result of the war in Ukraine, focusing on the ruptures identified in the nuclear order informed by historical experiences of bipolar confrontation. Our findings are, of course, preliminary, as the war is still ongoing.

2. LESSONS FROM THE PAST

2.1 FRACTURES IN THE NUCLEAR ORDER

The significance of the atomic bomb only gradually dawned on decision-makers and the public. While, at an early juncture, Bernard Brodie referred to the bomb as the ultimate weapon (Brodie ed.

2 On February 21, 2023, Putin announced the suspension of Russia's participation in the New START Treaty. For the time being, Russia will respect the numerical limits but is refusing to allow inspections. New START is set to expire in 2026.

3 The United States has never ratified the CTBT due to political infighting towards the end of the Clinton administration and the rather high threshold of a two-thirds majority for treaty ratification. However, it was widely taken for granted that the US would adhere to the provisions of the treaty. Russia withdrew its ratification of the treaty in November 2023.

1946),[4] President Truman and many others believed that the bomb, like previous military innovations, would bolster the US and could be used as a political tool. Only after a process of crisis bargaining, learning, and strategic deliberation were perceptions of the bomb and its political functions transformed. In this process, the Berlin and Cuban Missile Crisis marked crucial junctures. Thereafter, the seemingly incontrovertible principle of mutual assured destruction (MAD) heralded the so-called nuclear revolution (Jervis 1989). The core thesis of this nuclear revolution school of thought is that war between superpowers, not to mention crossing the nuclear threshold, entails the risk of nuclear annihilation, making victory in the nuclear age unattainable and providing rational actors with no incentives to intentionally employ these weapons. The risks of inadvertent use during crises and of an arms race could be mitigated by unilateral and bilateral arms control measures. The keywords here were crisis stability and arms race stability (Schelling & Halperin 1961; Cyba 2020: 151). On this basis, the proponents of the nuclear revolution formulated three further theses pertaining to the significance of nuclear weapons as instruments of power during crises, the credibility of (extended) nuclear deterrence, and the role of arms control.

- The value of nuclear weapons as instruments of crisis management is limited. By tilting the advantage away from the offense and toward the defense (Bell 2021: 3), MAD will mitigate the security dilemma. Even as nuclear powers continue to vie for political influence, their coercive efficacy depends on political resolve and willingness to engage in nuclear brinkmanship, as well as on arrangements "that leave something to chance" (Schelling 1960: 187), rather than on any notion of military superiority.
- The credibility of (extended) deterrence rests on second-strike capabilities and the chance of nuclear annihilation. Beyond the requirements for mutual assured destruction, nuclear potentials have little relevance. A state of minimal deterrence is resilient and technological innovations do not jeopardize MAD.
- Arms control is straightforward, as numerical (dis)parities and uncertainties regarding the reliability of verification are of minimal significance.

Starting with Albert Wohlstetter's famous warning in the late 1950s that the US strategic bomber fleet might become vulnerable (Wohlstetter 1958), the core thesis of the nuclear revolution school, namely that victory in a nuclear war has become impossible, has been challenged on numerous occasions. The most notable figures within the Western debate were Colin Gray and Keith Payne (1980). Nevertheless, this core thesis has been corroborated by a succession of studies such as those on what was dubbed the "nuclear winter theory" which predicts a severe global climatic cooling effect as a result of widespread use of nuclear weapons (Turco et al. 1983). Yet, the three additional theses derived from the core nuclear revolution thesis proved to be contentious and elusive.

Alternative theoretical perspectives on nuclear weapons and nuclear strategy diverged from the stability–instability paradox (Snyder 1961). If all incentives for nuclear use were removed at the strategic level, would this perfect strategic stability not create opportunities for traditional conventional

4 Brodie captured the implications of the nuclear bomb in the famous phrase: "Thus for the chief purpose of our military establishment has been to win wars. From now on its chief purpose must be to avert them" (Brodie ed. 1946: 76). The spirit of this axiomatic insight has since been repeated again and again, most prominently in the Reagan and Gorbachev formula that "nuclear war cannot be won and should never be fought".

warfare or even limited nuclear use on substrategic levels in regions which are not part of the territory of the nuclear superpowers?[5] If, on the other hand, the stability of extended deterrence covering these areas is to be preserved and if paralysis on the substrategic level is to be prevented by the introduction of limited nuclear options and credible escalatory strategies (Larsen forthcoming), would this not undermine strategic stability (Lieber & Press 2020)? During the Cold War, this paradox proved particularly challenging for the United States, given that Washington had pledged to guarantee the security of its allies in Western Europe (and East Asia) by threatening the first use of nuclear weapons in the event of an attack by purportedly superior Soviet conventional forces. In essence, the narrow system of strategic deterrence between the nuclear superpowers existed in a rather complex and tension-ridden relationship alongside a larger system of extended deterrence, which covered their broader interests in other regions (van Hooft 2023). In light of these tensions, critics of the nuclear revolution argued that stability in the broader sense rests on additional properties of nuclear arms:

- Nuclear weapons are effective instruments of crisis management. The intensity of the strategic competition of threats and counterthreats depends not only on the relative importance of the stakes involved, but also on superior nuclear capabilities.
- The credibility of (extended) deterrence rests on superior forces. The concept of extended deterrence in particular is predicated on the existence of limited nuclear options, the ability to control escalation, and a quantum of nuclear superiority (Ravenal 1982; these elements were first elucidated by Herman Kahn in 1965).[6] Technological innovations that enhance counterforce options contribute to the perception of superiority.
- Arms control is an ambiguous concept. It may serve to further mutual interests. However, it is also a component of strategic competition and may be used in an instrumental manner to protect military advantages and limit the nuclear options of an adversary (Maurer 2022).

2.2 POLITICAL CONFLICTS AND NUCLEAR CHOICES

This doctrinal debate between proponents and critics of the nuclear revolution is closely connected to a more fundamental paradox. How can states navigate a polarized, existential, and zero-sum geopolitical conflict if military means can no longer be employed as instruments of conflict resolution? Over time, the superpowers toyed with two possible responses to this dilemma. The first proposition was that in the event that military means are no longer viable, the political conflict must be trans-

5 The terms “strategic level” and “strategic deterrence” refer to an imagined relationship between the geographically separated superpowers only. In such a situation, the only function of nuclear deterrence consists in the prevention of the use of nuclear arms against the territory of the other superpower. Extended deterrence refers to a situation in which one or both superpowers promise to retaliate with nuclear weapons in the event that allied states become victims of (conventional or nuclear) attack.

6 The concept of limited nuclear options refers to postures that aim at increasing the chance that nuclear use will not escalate to all-out destruction and that the war can be ended on favorable terms. Closely related to such strategies are ideas of an escalation ladder and of escalation control or intra-war deterrence that rest on superior capabilities, relatively speaking, on each rung of the ladder. Such a posture would rest on a resilient command-and-control structure, counterforce capabilities, and/or defensive options. Ravenal (1982) has summarized this thinking as follows: “Thus, America’s willingness to protect its allies rises or falls with the prospective viability of counterforce and, more generally, with the United States’ ability to protect its own society from nuclear attack.”

formed. The second was that if existential geopolitical conflicts persist, the nuclear revolution must be transformed.

In the late 1940s and early 1950s, both superpowers perceived themselves as being engaged in an existential geopolitical conflict, and Western planning documents assumed that "the peaceful co-existence of the Soviet and non-Soviet worlds is impossible on any permanent basis" (Wiggershaus 1993: 23). The Soviets held a similar view, and both parties believed in the value of nuclear weapons as coercive instruments. This position underwent a transformation in the late 1950s, becoming more pronounced in the wake of the Berlin and Cuban crises. Nowadays, the West is increasingly framing Russia's war in Ukraine as a threat to the existence of the liberal global order and the preponderance of the West in global affairs at large comparable to the perception of the risks emanating from the Soviet Union late 1950s. Similarly, Russian officials today assert that the war in Ukraine is about the survival of Russia as an independent state, which could be compared to the perception that dominated in the Soviet Politburo after the end of the World War II.

Following the demise of Stalin, however, the Soviet leadership faced the challenge of advancing the historical confrontation with its capitalist adversary overshadowed by the looming specter of general nuclear annihilation. While the revolutionary faction, led by Foreign Minister Molotov, sought to maintain the traditional methods of waging the revolutionary struggle, Nikita Khrushchev arrived at a different conclusion: since the absolute weapon could no longer be wielded in a war against the capitalist adversary, it became necessary to reconsider the understanding of conflict itself. The new concept of coexistence ostensibly promised reliance on alternative means in the revolutionary struggle. However, in practice it transformed the revisionist Soviet Union into a status quo-oriented power (Craig 2013: 371ff). Academic observers and decision-makers in the United States reached a similar conclusion, believing that the danger of nuclear destruction would foster an orientation toward the status quo. While the declared objective of liberating European peoples from the Soviet yoke may have been useful for political consumption, all that could be achieved was the preservation of the territorial status quo. The existence of nuclear weapons thus appeared not only to alter the means of conflict resolution but to transform the conflict itself. Indeed, following the Berlin and Cuban crises, both sides consolidated the territorial division in Europe, thereby laying the groundwork for the gradual onset of arms control and détente.

However, this political transformation remained incomplete, and the relationship between military means and political conflicts proved to be nonlinear. In fact, debates on nuclear modernization and arms control in the West and Russia during the 1970s and early 1980s were rather polarized. Those who believed that the relationship was still characterized by geopolitical conflicts typically questioned the nuclear revolution, emphasized the role of nuclear weapons as instruments of crisis management, called for limited nuclear options, and had reservations about the possibilities of arms control. Those who doubted the revisionist intentions of the other side, instead assuming that the security dilemma caused clear tensions, defended the nuclear revolution, called for a restricted role of atomic weapons, and stressed the function of arms control as an instrument to mitigate nuclear instability (Jervis 1993; Lieber & Press 2020).

In sum, the nuclear doctrines of both superpowers were linked to conflict perceptions and oscillated between accepting and denying the notion of a nuclear revolution along with the associated conclusions (Jervis 1984; Cameron 2020; Green 2020; Maurer 2022). Those who disregarded geopolitical conflicts typically called for the role of nuclear weapons to be restricted. Those who proceeded from the assumption of ongoing geopolitical conflicts insisted on a more robust nuclear posture.

3. RUSSIA'S WAR AGAINST UKRAINE AND THE ROLE OF NUCLEAR WEAPONS IN CRISIS MANAGEMENT

In a sense, with Russia's war against Ukraine the conflict relationship has come full circle. Similar to the early 1950s, both parties are now wielding nuclear weapons as coercive instruments, believing that the nuclear superiority will guarantee their victory in the greater geopolitical standoff. Yet, neither side has yet come to the conclusion that the possibility of nuclear destruction necessitates a transformation of the conflict into a more regulated form of deterrence. Moreover, unlike the earlier periods of the Cold War, today's geopolitical landscape is marked by a multipolar world with multiple nuclear-armed states and emerging technologies that further complicate the nuclear order. Finally, while the emphasis on deterrence remains strong, the credibility of threats and the stability of deterrence are increasingly being challenged by new strategic calculations and regional dynamics. Integrating these historical parallels and differences into our analysis is essential to enable us to distinguish where applying an historical approach can be instrumental in providing guidance for policymakers in navigating and understanding the current nuclear risks and strategies, and where it would be better used as a reference point to provide orientation in an increasingly polarized debate concerning modern-day geostrategic conflict.

In the following sections, we will reconstruct how the conflict has altered the behavior of Russia and the US, as well as NATO,[7] with regard to the three critical fractures of the nuclear order. We will explore the lessons both sides have been learning during the war in Ukraine regarding (a) the political utility of nuclear weapons as instruments of crisis management, (b) the credibility of (extended) nuclear deterrence and its sources, and (c) arms control.

3.1 THE RUSSIAN DEBATE: BRING BACK THE FEAR

Russia has traditionally regarded its nuclear arsenal as a valuable political instrument in crisis situations. It has enabled Moscow not only to punch significantly above its weight in world politics, but also to pursue its goals with a certain degree of impunity as other states are disincentivized from directly challenging Russia due to the fear of nuclear escalation.

7 In the West, decisions on nuclear policies are dominated by the US. British and French nuclear weapons play lesser roles and can be dismissed here. America's European allies influence US policies in general and their policies on the nuclear weapons deployed in Europe in particular via NATO's Nuclear Planning Group.

The war in Ukraine has rather radically turned the tables in that regard. As Russia's conventional forces performed quite poorly in the first stages of the invasion (cf. Driedger & Polianskii 2023), Russian decision-makers sought to compensate for these shortcomings by resorting to nuclear weapons and threats to deploy them. At the initial stage, the nuclear threats[8] made by Putin helped him deter Western direct military involvement on behalf of Ukraine and compelled NATO member states to exercise caution in the transfer of arms to Kyiv (cf. Freedman 2023). At the same time, a considerable number of Russian policymakers and experts raised doubts with regard to the efficacy of nuclear threats as the war in Ukraine progressed.

In early 2022, the leading foreign policy thinker Dmitri Trenin lamented: "(...) nuclear deterrence, which many in Moscow depended on as a reliable means of securing the country's vital interests, has turned out to be an instrument of much more limited use" (Trenin 2022). Another prominent specialist in the field and former Russian diplomat Nikolai Sokov (2023) asserted that the war in Ukraine has demonstrated the limited utility of nuclear weapons for Russia, arguing that they have proved sufficient enough to "deter a direct attack [by the West]", but not "much beyond that". Citing a special statement made by the Ministry of Foreign Affairs of the Russian Federation (2022b) issued in early November, Sokov argues that Russian officials tacitly admitted that "nuclear weapons did not have utility beyond deterrence of war and could not yield political benefit".

In response to developments in Ukraine, Russian foreign policy experts and analysts concluded that the West is simply no longer afraid of nuclear annihilation. To prevail in the conflict with Ukraine and the West more broadly, Moscow needs to "put fear back into their minds and hearts" (Suslov 2024). To restore the West's fear, Trenin suggests that Russia would be well advised to undertake "doctrinal changes; military exercises to test them; underwater and aerial patrols along the coasts of the likely enemy (veroyatniy protivnik); issue warnings about preparations for nuclear tests and about the tests themselves; impose no-fly zones over part of the Black Sea" (Trenin 2024a). These actions, he argues, would not only demonstrate Russia's "determination to protect its vital interests", but—most importantly—"bring the enemy [the West] to a halt and encourage it to engage in serious dialogue".

Another prominent scholar and former presidential advisor Sergey Karaganov (2023) makes an even more radical suggestion, asserting that the Kremlin should not only "rapidly move up the deterrence-escalation ladder" but eventually also not shy away from resorting to a nuclear strike. He suggests that if nuclear signaling measures fail to restore the West's fear, Moscow will need to order nuclear attacks on several European cities to bring the "Western elites to their senses". The war in Ukraine, Karaganov charges "cannot end in Russia's decisive victory without forcing a strategic retreat or even surrender on the West", making it necessary to address the core issue of the conflict, the Western resolve to support Ukraine. Ultimately, he asserts "winners are not judged" and the West, particularly the United States, will not engage in an all-out nuclear war with Russia, as they will be reluctant "to sacrifice, say, Boston for Poznan". In short, nuclear threats are still considered by several

8 For a more detailed chronology of Russia's nuclear threats since the outbreak of the full-scale invasion in February 2022, see Kopiika (2024)

prominent Russian experts to be an efficient tool for achieving a negotiated settlement with the West. To increase the credibility of such threats, however, Russia needs to take over the escalation initiative and be prepared for more radical steps that would shock the West into submission.

That said, this assessment is not shared by everyone in Russian academic and policymaking circles. Director of the authoritative Russian International Affairs Council (RIAC), Ivan Timofeev (2023), for one, opined that increased nuclear threats and possible limited nuclear strikes will not only prevent Russia from achieving its goals but may even play into the hands of the West, as it would allow them to significantly ramp up support for Ukraine. Timofeev further asserts that Karaganov probably underestimates the determination of Western elites to climb the escalation ladder with Russia, just as Russian leaders underestimated Western resolve to support Ukraine during the invasion in February 2022. Even Lukyanov, Karaganov's protégé, sides with Timofeev, contending that Russia will not only fail to "bring the West to its senses with a nuclear bomb" but is only likely invite a bigger crisis (Lukyanov 2023).

One of the leading experts in the nuclear field Alexey Arbatov and his colleagues from the IMEMO Institute further argue that a nuclear strike could irreversibly transform the conflict from a proxy war into a direct confrontation as it would most likely "increase the unpredictability and multiply the stakes of the confrontation". Instead of a negotiated settlement, authors insist, in the event that nuclear weapons are used, "it will become virtually impossible to agree on a ceasefire, let alone a peaceful settlement of the conflict [in Ukraine]" (Arbatov, Bogdanov, & Stefanonvich 2023). Rebutting Trenin's views, Arbatov posited that the very idea of using (or threatening to use) nuclear weapons to deter the West from further involvement in the conflict and to solve the strategic problems that conventional forces have failed to address is extremely dubious. On the contrary, he argues, even in the very unlikely scenario that the West does not react to Russian nuclear use, "radioactive ruins" would be a very "poor political basis" for establishing and advancing Russia's interests (Arbatov 2024).

On the official level, the Russian rhetoric with regards to nuclear use, albeit somewhat less polemical, remains equally inconstant. Despite initially threatening to resort to strategic nuclear weapons in an attempt to dissuade the West from helping Ukraine (Putin 2022c), the tone of Russia's official declarations has somewhat softened as the situation on the front stabilized. In April 2022, Foreign Minister Sergey Lavrov contended that Russia is "committed" to the UN resolution with which all nuclear weapons states acknowledge that "a nuclear war cannot be won and must never be fought", later reiterating that a "direct clash between nuclear powers" would inadvertently have "catastrophic consequences" for both NATO countries and Russia (Lavrov 2022a). Several weeks later, however, the Russian foreign ministry published a statement that somewhat contradicted the minister's words as it warned the West "not to underestimate the risks of nuclear war" against the backdrop of its increasing involvement in the conflict in Ukraine (Russian Federation Foreign Affairs Ministry 2022a).

During the meeting of the St. Petersburg Economic Forum in 2024, Vladimir Putin noted, in an equally contradictory manner, that he understands "the patriotic feelings" of those experts that advocate for more radical steps in the nuclear domain, at the same time warning that one should be cautious about "lowering the threshold for nuclear use", assuring that Russia does "not need to use

nuclear weapons to achieve victory in Ukraine" (Putin 2024a). On a different occasion, when discussing the possibility of resorting to nuclear attacks as a response to the West's increased assistance to Ukraine, Putin also argued that "everything [in the nuclear domain] can be changed" very swiftly, should the situation develop to Russia's detriment (Putin 2023b). In short, Russian decision-makers, though proving to be more cognizant the risks of nuclear escalation, remain intentionally ambiguous when it comes to employing nuclear weapons in response to the West crossing Russia's "red lines".

Despite several calls from within the Russian strategic community to use tactical nuclear weapons in Ukraine to aid the troops on the battlefield, the absolute majority of threats involving nuclear weapons were aimed at the United States and its allies, not Ukraine. Putin (2024d) himself repeatedly denied any intention to resort to nuclear weapons against Ukraine, most recently stating in an interview that "there has never been a need (neobkhodimost') to use weapons of mass destruction in Ukraine". The primary target of Moscow's nuclear saber-rattling has thus become the West, as the Kremlin is deeply convinced that the war in Ukraine is a meticulously orchestrated Western plot to destroy Russia as an independent state, and Ukraine is being used as an instrument to achieve this.

In summary, the fact that nuclear weapons lost their utility in attaining Russia's interests is a matter of serious concern within the Russian expert community as well as policymaking circles, since nuclear threats have been one of the few effective means for Russia to articulate its fundamental interests and draw red lines in the great power balancing. With Western countries "losing their fear" of Moscow's saber-rattling, Russian policymakers are faced with a dilemma between finding alternative means to maintain a level playing field with the West and risking ultimate nuclear escalation, in which by their own admission, there will no winners.

3.2 HOW TO AVOID SUBSTRATEGIC PARALYSIS: THE WESTERN DEBATE ON NUCLEAR WEAPONS AS INSTRUMENTS OF CRISIS MANAGEMENT

In the wake of Russia's invasion of Ukraine and in light of Putin's more or less veiled nuclear threats, questions regarding nuclear bargaining and the role of nuclear weapons in crisis situations have returned to the forefront. Can nuclear weapons be employed as instruments of deterrence and coercion? Can they be used in a crisis situation to place pressure on an opponent? And what factors influence this deterrence and coercion effect? In the West, a new wave of academic studies on nuclear crisis behavior which commenced before 2014 gained political traction following the annexation of Crimea and Russia's military intervention in Donbas. In contrast to research conducted during the Cold War, these studies employ quantitative methods and comprehensive datasets (for a detailed examination of the merits and pitfalls of quantitative methods in the field of nuclear crisis behavior, see Gavin 2014).

The state of the art before the 2022 war can be summarized as follows. While scholars agreed that nuclear weapons offer new options for their possessors (Bell 2021), they diverged on the potential efficacy of nuclear threats and the factors that contribute to the likelihood of their success. At one end of the spectrum was a comprehensive quantitative study by Todd Sechser and Matthew

Fuhrmann (2013; 2017), in which the authors concluded that nuclear threats were rarely successful. In their comparison of crises before and after 1945, they found that in the post-1945 history of militarized interstate conflicts involving nuclear-weapon states (NWS) and non-nuclear-weapon states (NNWS), the outcomes were not determined by the possession of nuclear weapons and capacity to issue nuclear threats. The same applies for crisis situations involving two NWS. At the other end of the spectrum there is Matthew Kroenig's large-scale empirical study, based on a dataset of 52 crisis dyads. Kroenig suggests that in a crisis between two nuclear-weapon states, the party with superior nuclear capabilities is more likely to emerge victorious (Kroenig 2013: 2,018).[9]

Those who believed that nuclear threats were generally ineffective argued that the willingness of non-nuclear-weapon states to confront their nuclear-armed adversaries was due to the significant reputational cost of nuclear first use and the limited military utility of nuclear weapons in many situations. Non-nuclear-weapon states can escalate the conflict to the threshold where the (political) costs of nuclear first use by the other side outweigh the (military) benefits (Avery 2019). This argument is equally applicable to a stand-off involving nuclear-weapon states.

Matthew Kroenig's study, on the other hand, offers a causal mechanism that combines two Cold War era considerations. These are (a) that stakes are important and that states play games of brinkmanship and engage in competitive risk-taking and (b) that the nuclear balance of power affects outcomes. His superiority-brinkmanship synthesis theory brings together both strands of thinking to argue "that military nuclear advantages increase a state's willingness to run risks in international conflicts" (Kroenig 2018: 3). According to this theory, a robust nuclear posture, i.e., the ability to limit damage and control escalation, "reduces a state's expected costs of war", increases its resolve, and provides it with a coercive advantage (Kroenig 2018: 3f).

These academic debates influence Western thinking regarding Putin's threats and how to respond to them as much as the lessons of the war are likely to shape future thinking on the utility of nuclear weapons. This innovative impact of academic debates should not come as a surprise. Putin's nuclear threats were directed at Western audiences and closely monitored in the West.[10] Due to the prolonged and varied nature of Russia's nuclear signaling as well as the West's repeated recalibration of its reactions, the experiences gathered during this process are unique and can be condensed into lessons that are likely to endure beyond the war (Stein 2023). The most noteworthy effect so far is a convergence between proponents of the limited utility school á la Sechser and Fuhrmann and those who believe in the coercive advantage of nuclear superiority.

To start with, most observers agree that the Russian nuclear threats had a limiting effect on the responses of Western countries. While Ukraine was to receive military support, the West was reluc-

9 An early study by Beardsley and Asal (2009: 296) is located somewhere between these two ends of the spectrum and offers a nuanced assessment. It suggests that nuclear-weapon states (NWS) have successfully employed nuclear weapons as coercive instruments against states that do not possess such weapons. However, this effect disappears when both states involved in the crisis possess nuclear weapons.

10 For a chronological assessment of Russia's nuclear threats, see the CSIS database on "Nuclear Signaling during the War in Ukraine" (https://nuclearrussiaukraine.csis.org/#top).

tant to become a direct party to the war. Consequently, Russia's threats were by no means ineffective (Arceneaux 2023: 567f; Tannenwald 2023). However, most observers also agree that Western states continuously tested Moscow's red lines, or what were perceived in the West as potential red lines, through the famous "boiling the frog" strategy. The delivery of longer-range ATACMS ballistic missiles and F-16 fighter jets—unimaginable at the beginning of the war—as well as the removal of the restrictions on attacking targets within Russia are just the latest moves in this ongoing process of shifting red lines. According to this logic, even President Macron's proposal to send troops would be no more than another step. The recommendation of former US Ambassador to NATO Alexander Vershbow (2023) represents only the mainstream view on this matter: "While the United States and its allies must manage the risks of nuclear escalation carefully, defeating Putin, restoring Ukrainian sovereignty, and reinforcing the rules-based order must be our priorities."

The realization, based on experience, that nuclear threats must not lead to paralysis on the substrategic level reinforces the views of both the limited utility school and the nuclear superiority school. Building on the assumption of the former, Arndt, Horovitz, and Onderco argue that "Moscow's attempt at nuclear coercion fizzled" (2023: 178). This happened because Putin realized that the military utility of nuclear weapons was limited (174f.), and that the costs to political reputation of a possible first use were significant (176f).

Proponents of the latter school also find confirmation. From their perspective, the superior damage limitation options that the US had at its disposal lent credibility to their retaliatory threats. When Russia was ostensibly contemplating nuclear first use in the fall of 2022, Washington signaled its willingness to take robust countermeasures. The first stage of these countermeasures would probably have involved non-nuclear military responses. Nevertheless, the willingness of the US to advance up the ladder of escalation loomed visibly in the background. Thus, the lessons drawn from the war by both schools point in the same direction: substrategic paralysis can be avoided—both now and in the future. The West must not back off when confronted with Russia's nuclear threats. Historical experiences of the Cold War offered by the Berlin and Cuban crises serve as a useful orientation in that regard. Decision-makers in the countries of the political West should recognize that while nuclear threats must be carefully managed to avoid uncontrolled escalation, it is also necessary not to give in to Moscow's nuclear blackmail and respond to it in kind to prevent further intensification of tensions.

4. DETERRENCE DOCTRINES AND MODERNIZATION

4.1 THE RUSSIAN DEBATE: UP THE ESCALATION LADDER?

Russia's experts and analysts have long debated the ambiguities of the Russian nuclear doctrine and the conditions under which the Russian leadership might actually resort to the use of nuclear weapons. Until February 2022, these debates were largely academic and hypothetical, but Russia's invasion of Ukraine has greatly increased the urgency of these considerations. The post-invasion academic and official debates highlight the additional degree of ambiguity that was introduced into

Russia's already controversial deterrence posture. This (sub)section opens by sketching out some of the key elements of the Russian nuclear doctrine, then going on to highlight the practical deterrence measures that the Russian leadership has pursued to these ends.

In 2020, the Kremlin published its first declassified six-page long nuclear doctrine, titled "Basic Principles of State Policy of the Russian Federation on Nuclear Deterrence" (2020) which explicitly set down the factors that could provoke Russia's nuclear response. First, the document declares that Russia will resort to nuclear use if it receives reliable data on the launch of ballistic missiles against it or its allies, thus declaring a "launch-on-warning" policy (otvetno-vstrechnyi udar). The second condition for nuclear use is if nuclear weapons or other weapons of mass destruction (WMDs) are used against Russia or its allies. Third, Moscow reserves the right to use nuclear weapons in the event of an attack against Russian nuclear command, control, and communications infrastructure. Finally, and most importantly, Russia is prepared to use its nuclear capabilities in the event of aggression against it, by means of conventional weapons, which threatens "the very existence" of the Russian state. In general, the doctrine implies that Russia, like the United States, does not deny the possibility of a first nuclear strike. Despite the intention to clarify some important points in Russian policy on nuclear use, Kofman and Fink (2022) contend that the doctrine remains "intentionally ambiguous on key considerations, substantiating a spectrum of nuclear employment options and strategies".

The full-scale invasion of Ukraine in 2022 became the first serious practical test of the nuclear doctrine. Numerous Russian officials and observers cited nuclear doctrine both to deny the rumors of a possible nuclear use and to call for nuclear escalation against the backdrop of increasing Western involvement in the conflict. For example, Putin's spokesperson Dmitry Peskov said on March 28, 2022: "We have a security concept that very clearly states that only when there is a threat against the existence of the state in our country, can we and will we actually use nuclear weapons", without specifying what these threats actually are (Peskov 2022). On a different occasion, Lavrov noted that "all Russia's doctrines, including the nuclear one, apply on all the territories enshrined in the Russian constitution", hinting that the occupied Ukrainian territories annexed by Russia both in 2014 and later in 2022, fall under the "protection" of Russian nuclear weapons (Lavrov 2022b).

What is more, as the situation on the front worsened for Russian troops, several experts demanded that the nuclear doctrine be amended to lower the threshold for nuclear use. Trenin (2024b), for instance, claimed that the passage in the nuclear doctrine on the "threat to the very existence of the state" should be changed to "threat to the vital interests of the country", arguing for a broader set of scenarios that could allow nuclear use. Although the Kremlin has so far opted for the more pragmatic, albeit in the short term probably more damaging on the domestic front, solution of declaring (partial) mobilization, there are several indicators that similar sentiments regarding the lowering of the threshold for nuclear use are shared among high-ranking Russian military and political top brass. In June 2024, Putin declared that the Russian side "(...) is now thinking about what could be changed in the nuclear doctrine", framing it as a response to Western actions, which he saw as working toward amendments aimed at "lowering the threshold for the use of nuclear weapons". Putin was thus hinting at similar adjustments to the Russian posture (Putin 2024c).

Moscow's recent decision to deploy low-yield nuclear devices on the territory of its ally Belarus should be seen in the light of this worrisome development. As the military advance in Ukraine stalled and Russia's relations with the West rapidly deteriorated, Putin announced, in March 2023, that Russia would deploy tactical nuclear weapons in Belarus. In his explanation as to why he was taking this step, Putin pointed to NATO's ongoing nuclear mission as a precedent: "We're basically doing the same thing they [the US] have been doing for a decade. They have allies in certain countries and they train (...) their forces. We are going to do the same thing" (Putin 2023a). To this end, Russia reportedly refitted ten Su-25 aircraft for readiness to deliver nuclear weapons, provided additional training for Belarussian fighter pilots, and transferred several dual-capable Iskander and Polonez multiple rocket launchers to the territory of its ally (Sputnik 2024). Several open-source indicators suggest that the Lida airbase, located just 40 kilometers from the Lithuanian border and the only Belarusian Air Force wing equipped with the Su-25, is the most likely candidate for Russia's new "nuclear sharing" mission in Belarus (Kristensen, Korda, & Reynolds 2023a). In May 2024, Belarus unexpectedly joined the second leg of Russia's "surprise test", as Belarussian soldiers trained on the deployment of tactical nuclear weapons together with their Russian counterparts. While exercises like this are not the first of their kind and similar maneuvers have been carried out several times before, the scale as well as the practice of nuclear sharing with Belarus during exercises are unprecedented. Many specialists have interpreted this as an escalatory move and a direct signal to the West, testing its resolve and raising the cost of continuing its support to Ukraine (cf. Trevelyan 2024).

This development creates additional room for speculation regarding Russia's logic in the event of nuclear escalation with the West. As Dmitri Trenin argued in his article on restoring fear in the West, "nuclear bombardments of Ukrainian, or even European territory would hardly change a thing", suggesting that nuclear strikes on European territory would be unlikely to result in a direct nuclear attack on Russia by the United States (Trenin 2022). Following this line of thinking, one could assume that should strikes be carried out on Poland or other European states from the territory of Belarus (as Karaganov suggests), in the minds of Russian observers this could only invite retaliatory strikes on Belarus, and not on Russia itself. In short, even though the official commentary by the Russian authorities in this regard has been rather scarce, the belief among Russian political elites that a limited nuclear war is possible and might even be necessary (i.e., "escalate to deescalate") cannot be definitively dismissed as unrealistic.

Another prominent development concerns Moscow's (so far rumored) plans to revisit its program to deploy nuclear weapons in space. In February 2024, Vladimir Putin stated that Russia's position has "always been categorically against the deployment of nuclear weapons in space" urging other countries to comply with all existing agreements in this area, and even offering cooperation in that area. At the same time, he stressed that "Russia's activities in space do not differ from those of other countries, including the United States", implying that Russia does not exclude the possibility of developing ASAT systems should Western countries pursue such plans. In a significant development, Russia vetoed the US-sponsored UN Security Council resolution in April 2024 that foresaw the deployment of nuclear weapons in space, arguing that the resolution did not go far enough and did not cover all other types of weapons, thus fueling speculations about its own space program (Lederer 2024). Indeed, given recent developments in arms control and the expiration of major arms control

treaties, which we discuss in the following section, it comes as little surprise that Russia may be looking for new ways to enhance its deterrent posture in space. Apart from a more intermediate goal of employing space weapon systems as a way of raising the costs and risks for the West, ASAT systems like Zhnets (Reaper) might also be of significant value in Russia's so far fruitless effort to disrupt Ukraine's Starlink-based satellite communication systems (cf. Voennoe Obozrenie 2024).

The rumored revival of Russia's space weapons program goes hand in hand with the overall modernization of Russia's nuclear arsenal[11] and means of delivery (Kristensen, Korda, & Reynolds 2023a). Despite some delays in launching the modernization program, Russia is now in the late stages of a decades-long process of upgrading of the strategic and nonstrategic forces of the nuclear triad to replace the Soviet-era arsenal with more modern and partially autonomous weapons. First, Russia's Strategic Rocket Forces have been steadily replacing the ageing SS-18, SS-19, and SS-25 ICBMs with the more modern SS-27 mod 1 and SS-27 mod 2 (both of which have silo-based and road-mobile variants), as well as the SS-29 ICBM and the Avangard boost-glide vehicle which is designed to evade missile defenses. In April 2022, shortly after the invasion of Ukraine, Russia tested its new intercontinental ballistic missile Sarmat for the first time, which Putin said would "ensure Russia's security against external threats and will be a wake-up call for those who are trying to threaten our country in the frenzy of rabid, aggressive rhetoric" (Putin 2022d). Second, the Russian Navy began replacing its Delta IV ballistic missile submarines (SSBNs) with new Borei-class boats in 2013, and introduced the SS-N-32 SLBM in the same year. Russia is also actively working on developing its nuclear-powered, unmanned, and autonomous underwater vehicle Status-6 Oceanic Multipurpose System "Poseidon", which is reportedly already in production (Congressional Research Service 2022). Third, the Russian Air Force deployed a new model of nuclear-capable air-launched cruise missile (ALCM) in 2012, and is currently in the process of extensively modernizing its fleet of Tu-160 strategic bombers. Several additional delivery systems are currently under development, including a stealth bomber and a nuclear-powered cruise missile.

Despite the heightened attention and newly available resources, Russia's nuclear modernization program is still suffering from significant delays, however. The war in Ukraine has exposed significant shortcomings in this process, especially when it comes to delivery systems. Since the beginning of the war, Russia has carried out a series of missile strikes using long-range dual-capable precision weapons, such as Kh-101 air-launched cruise missiles, sea-launched 3 M–54 Kalibr cruise missiles, 9-A-7760 (X-47M2) Kinzhal hypersonic ballistic missiles, and ground-launched Iskander missiles. All these types of missiles have been shot down by the Ukrainian air defense forces (Interfax 2022), which has become a matter of serious discussion within Russian military circles (Voennoe Obozrenie 2023).

11 As of summer 2023, Russia had an estimated stockpile of approximately 4,489 active nuclear warheads for use on strategic and theater-range delivery systems—1,197 on intercontinental ballistic missiles (ICBMs), 896 on submarine-launched ballistic missiles (SLBMs), 580 on bombers, and 1,816 on a wide range of nonstrategic systems. Russia has approximately 1,816 nonstrategic nuclear warheads. Only 1,674 warheads are, however, currently deployed. "Deployed" warheads are mated to delivery systems and ready for immediate use. "Reserve" warheads are kept in storage, often partially disassembled (Kristinsen et al. 2023).

According to expert on the Russian nuclear arsenal Maxim Starchak (2024), the replacement of Soviet-era systems will take years due to production problems, poor management, and financial difficulties. The war in Ukraine and the general militarization of the Russian economy is likely to accelerate some processes due to newly available financial resources. Russia is now developing various systems that are not covered by current international treaties, and is simultaneously withdrawing from other international obligations in this domain. Against this background, the West would be ill-advised to dismiss developments in the Russian nuclear posture as a bluff. One cannot exclude the possibility that the Russian military and political command would resort to the use of tactical, or under certain circumstances even strategic nuclear weapons, should the conflict in Ukraine and the West's role in it radically change to Russia's disadvantage. Numerous recent shifts in Russia's nuclear posture indicate that the Russian leadership is increasingly coming to the realization that it cannot afford to draw "red lines" for the West and endlessly allow them be crossed without any tangible consequences.

4.2 THE WESTERN DEBATE: MAXIMIZING CREDIBILITY BY LIMITING DAMAGE

Following the annexation of Crimea in 2014 and Russia's intervention in Donbas, the question of the credibility of (extended) deterrence has once again taken center stage in Western strategic debates. Although the balance in capabilities has been reversed—NATO is now conventionally superior and the US even possesses strategic conventional strike capabilities which could inflict considerable military damage—these debates resemble those observed during the Cold War. One scenario that has attracted particular attention in the expert community revolves around a Russian attack on a perceived vulnerability: the so-called Suwałki Gap. In this scenario, Russian troops could sever the connection between the Baltic states and Poland, occupy the Baltics, and then force a politically advantageous end to the military confrontation through the threat or the actual first use of a nuclear weapon (Clark, Luik, Ramms, & Shirreff 2016; Shirreff 2017). According to this view, Russia may perceive this "escalate-to-deescalate" strategy as credible due to Western gaps in an imagined escalation ladder and might thus be tempted to engage in crisis brinkmanship. This gap emerged because the West neglected the modernization of its substrategic nuclear weapons, while Russia invested heavily in this category. In fact, Russia possesses much larger stocks of approximately 2,000 deployed substrategic nuclear weapons and is investing in their ongoing modernization. Western observers also note the importance Russian military doctrine assigns to nuclear weapons in general and to substrategic nuclear weapons in particular (Bruusgaard 2020).

Whether or not Russia is pursuing an escalate-to-deescalate strategy has nevertheless been a highly controversial issue in Western expert debates. While Zysk (2018) identifies this kind of strategic thinking in Russian military debates, other experts offer a much more nuanced view. Kofman and Fink (2020), for example, see the emphasis on nuclear weapons in Russian doctrines as a sign of military weakness, the strategies of war termination as being premised on raising the expected costs above the anticipated gains, Russian doctrinal thinking as not focusing on damage limitation, concepts of fine-grained escalatory ladders, and low-yield weapons, and the actual nuclear threshold as possibly being much higher than Russia's nuclear posturing seems to indicate.

Despite these objections, the Western political debate since 2014 has focused on how Russia can be prevented from exploiting a Western capability gap on the lower rungs of the nuclear escalation ladder. According to Republican congressman Jon Kyl and former Deputy Director of the CIA Michael Morell (2018), the answer is a robust modernization program. Their view is that the dangerous gap in the escalation ladder had arisen because the US nuclear bombs stationed in Europe were considered inadequate, their yields too high and not adjustable, and the delivery aircraft outdated. Moreover, the US strategic nuclear arsenal does not offer enough flexibility and options for damage limitation.

Echoing this assessment, many representatives of the strategic community are calling for a nuclear posture that provides precisely such flexibility and possibilities for damage limitation. At the substrategic level, experts are advocating for the modernization of US nuclear bombs and their delivery systems stationed in Europe, as well as the development and deployment of accurate air- and submarine-launched cruise missiles with low-yield warheads (Binnendijk & Gombert 2019). Others go even further. Matthew Kroenig, for instance, suggests that NATO should deploy tactical nuclear weapons "that could prove useful on the battlefield, with a posture that in combination provides flexibility, survivability, reliability and accuracy. This could include warheads with adjustable yields, nuclear-armed sea and air-launched cruise missiles, and the possible redeployment of gravity bombs (...). Poland would be an obvious candidate for the latter (...)" (Kroenig 2015: 64; see also Schmitt & Cunningham 2017). The strategic arsenal should also be comprehensively modernized and optimized for limited options.

After 2014, the official US nuclear policy did indeed move in this direction. Certainly, US nuclear doctrine and operational planning have traditionally had a "counterforce" orientation. Moreover, the US nuclear arms modernization process has been driven in part by its own dynamics and has even come close to achieving a hypothetical ability to launch a disarming first strike against Russia (Lieber & Press 2006).

The terms counterforce and countervalue have been rather prominent in US nuclear debates. Yet both are somewhat ambiguous. On the level of ideas or general concepts, counterforce implies that US nuclear weapons are directed against military targets and against the opponent's nuclear retaliatory capacity in particular. Countervalue implies that nuclear weapons might inflict unacceptable damage on the opponent's (civilian) infrastructure. When it comes to targeting policy, the US has never relied on a countervalue strategy. Instead, it has always aimed its weapons at military targets. With regard to force requirements, the differences between the two concepts are more significant. Counterforce strategies require certain capabilities, such as the capability to destroy hard targets. As they are sometimes associated with the ability to disarm an opponent in a first strike, counterforce strategies require a certain number of warheads, defined by the capabilities of the opponent. Countervalue strategies imply that the theoretical ability to inflict unacceptable damage answers the "how much is enough?" question.

Despite these continuities and path dependencies, the resurgence of the existential geopolitical conflict with Russia has led to a change in emphasis in the US declaratory policy on counterforce and damage limitation strategies. This is reflected in the 2018 Nuclear Posture Review (NPR) adopted by the Trump administration. The last NPR before 2014, the 2010 version, was still strongly influenced by Obama's Prague speech and his vision of a world free of nuclear weapons. The document highlighted the dangers of nuclear proliferation and terrorism and focused on reducing the role of nuclear weapons in the US national security strategy (U.S. Department of Defense 2010). The 2018 NPR sets a completely different tone. It heralds the comprehensive modernization of the land-, air-, and sea-based elements of the strategic nuclear triad and places a rather strong emphasis on the ability to control escalation, or what Larsen (forthcoming) calls a "tit-for-tat strategy". The NPR's starting point is similar to that of the expert community mentioned above. Russian doctrines and modernization measures, according to the 2018 NPR, "suggest a mistaken expectation that coercive nuclear threats or limited first use could paralyze the United States and NATO and thereby end a conflict on terms favorable to Russia" (U.S. Department of Defense 2018: 30).

To send a clear signal to the Russian leadership that such an approach is doomed to fail, the US needs nuclear capabilities that go beyond mere deterrence: "(...) deterring nuclear attack is not the sole purpose of nuclear weapons" (U.S. Department of Defense 2018: v). Their mission is much broader: They contribute to deterring non-nuclear attacks, reassuring allies, and achieving US objectives should deterrence fail. To these ends, limited and superior options are required. Through the US possessing a greater variety of types, survivable delivery systems, and nuclear weapons with high accuracy and lower yields, opponents such as Russia should be deprived of any hope of gaining a political advantage with a limited nuclear first use in a conflict. Further, the US ability to control escalation should also strengthen allies' confidence in the country's nuclear umbrella (U.S. Department of Defense 2018: ix).

To meet these requirements, the nuclear arsenal must be comprehensively modernized: "Expanding flexible U.S. nuclear options now, to include low-yield options, is important to maintaining a credible deterrent against regional aggression (NPR 2018: ix)." The US strategic bomber fleet of 46 B-52s and 20 B-2A aircrafts is to be replaced by B-21 Raiders, a jet which is difficult for enemy radar to detect and which will be equipped with long-range missiles. The 400 Minuteman land-based intercontinental missiles are to be replaced by new Sentinel missiles and their silos modernized. The Ohio-class strategic submarines will be kept in service longer and then replaced by the Columbia-class. With explicit reference to the credibility of extended deterrence, the NPR called for some of the SLBMs to be equipped with low-yield nuclear warheads (NPR 2018: 34). This step has since been implemented. In addition, the nuclear-capable aircraft used by NATO allies are to be replaced by the stealth-capable F-35. The existing stockpile of free-fall bombs will be replaced with more precise bombs with scalable yields (B61-12). According to the NPR, the US is not seeking to lower the nuclear threshold but to credibly deter Russian nuclear threats across the entire escalation spectrum. However, thinking in terms of nuclear crisis diplomacy and escalation, combined with technological developments such as the greater integration of non-nuclear and nuclear forces in military planning (U.S. Department of Defense 2018: vi), could have precisely this effect.

We argue that the new emphasis on the US nuclear posture is causally linked to the resurgence of the geopolitical conflict with Russia. Admittedly, Trump has placed political staff in the top echelons of the security bureaucracy who were more interested in securing the nuclear dominance of the US than Obama's top staff had been. Moreover, the NPR was also a response to China's growing nuclear arsenal. Nevertheless, two observations point to a causal relationship between conflict perceptions and modernization strategies. First, the reasons for the reorientation, which focus heavily on the need to prevent a Russian nuclear blackmail strategy, point to the nature of the conflict with Russia. Second, and despite Biden replacing those in the DoD's upper echelons, the transition from Trump to Biden is characterized by continuity.

While the war in Ukraine did not prompt the new president and his team to accelerate the modernization programs planned by Trump, it is surprising that despite the Democrats' criticism of Trump's nuclear policy before the war, Biden's 2022 NPR largely confirmed his predecessor's program with just a few exceptions. The only change in the 2022 NPR was to the plans to reintroduce sea-launched nuclear cruise missiles. And even the SLCM program has since been reinstated by Congress (Cummings 2024). Like its predecessor, the 2022 NPR emphasizes the importance of flexible and limited nuclear options to influence Russia's (and China's) risk calculation and lend credibility to extended deterrence (U.S. Department of Defense 2022).[12] This illustrates that geostrategic thinking and the role of nuclear weapons as an instrument of political coercion often precipitate major crises, with heightened geopolitical tensions only accelerating this process. This was the case with the United States and the Soviet Union in the wake of the Cuban Missile Crisis, which served as an additional impetus for the fundamental transformations of conflict perceptions on both sides that were already on the cards in the late 1950s.

5. ARMS CONTROL

Arms control became more difficult after 2014. Since February 2022, the scope for negotiated or formalized arms control has all but vanished (Kühn & Williams 2024). On the one hand, this is due to technological and geostrategic shifts. On the other hand, since 2014, the arms control paradox long diagnosed by experts has prevailed.

Armament programs are increasingly driven by qualitative modernization of electronic equipment, software, cybertechnologies, and artificial intelligence. The development of missile defense, satellite-based intelligence, surveillance and reconnaissance (ISR) technology, and anti-satellite weapons (ASAT) further complicates the picture. In addition, the creation of high-precision and long-range conventional weapons and the mixing of conventional and nuclear options present major demarcation problems (Timbie 2020; Legvold & Chyba 2020).[13] Not only are these technological innovations

12 The 2022 Nuclear Posture Review was not released as a separate document but as part of the 2022 National Defense Strategy.

13 Chyba (2020: 162) highlights new military options that could arise from a combination of technological developments. By deploying numerous satellites for constant real-time Earth observation and analyzing the data using arti-

difficult to control—the enormous lead the US has in all of these fields also removes the incentive for arms control.

The geopolitical shift essentially has one driving force: China. During the Cold War, the nuclear capacities of Britain, France, and China complicated bilateral arms control, but were ultimately not significant enough to prevent agreements being concluded when it was in the interests in both superpowers. Today, the US not only finds itself in a zero-sum conflict with China but also faces a massive nuclear arms buildup by the People's Republic. Although the Chinese armament program starts from a rather low baseline, it will still be able to create a formidable nuclear force (Kristensen, Korda, & Johns 2023b). Accordingly, the 2022 NPR states that by 2030, the US will face "two major nuclear powers as strategic competitors and potential adversaries", posing "new challenges for deterrence, assurance, arms control, and risk reduction". Arms control, according to the widely shared belief in the US even before the war in Ukraine, must reflect this changed geostrategic reality sooner or later. Thus, even before the war, the differences over a follow-on treaty to New START were far-reaching. The US wanted to include Russia's substrategic nuclear weapons as well as China's arsenal. Russia wanted to limit missile defense and conventional global strike weapons (Bollfrass & Herzog 2022: 15).

That said, the changed political conditions are of even greater consequence. Arms control can serve the purpose of constraining the military developments and options that both sides consider destabilizing. This is often difficult, if only because states' geographical locations and military structures differ and what appears destabilizing to one side may appear less destabilizing to the other. Moreover, the requirements of verification and parity often pose insurmountable obstacles. The real stumbling block, however, is the political and strategic challenges, which arise because arms control can also be used in a competitive way. In other words, states can try to use arms control to protect their own military options and constrain those of their opponents (Maurer 2022). If parties are not status quo oriented but find themselves in existential conflicts, this kind of competitive approach becomes almost inevitable. This results in the arms control paradox: arms control works best in a noncompetitive political environment, but is also needed less in such an environment. In contrast, it does not work when it is needed most: that is in a political environment characterized by existential conflicts.

This shift is clearly illustrated by the recent history of the US-Russian arms control process. The US withdrawal from the ABM Treaty in 2002—considered a cornerstone of strategic stability during the Cold War—was justified by the Bush administration on the grounds that the treaty was unnecessary between friends who trusted each other. After 2014 and the resurgence of geopolitical conflicts, both sides scrutinized existing arms control agreements to ascertain whether they limited desirable military options. The Trump administration terminated the INF Treaty because Russia was not addressing long-standing allegations of treaty violations, and because without the treaty, the US at least had the option of responding to the Chinese missile buildup in East Asia with similar systems.

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ficial intelligence, the USA could obtain an accurate picture of Russian and Chinese road-mobile ICBMs and destroy them with conventional precision weapons.

5.1 THE RUSSIAN DEBATE: ARMS CONTROL AS A STRATEGIC LEVER

Russia remains equally skeptical about the prospects for nuclear arms control deals with the West in the foreseeable future. From Moscow's perspective, everything points to a long pause in this domain (Sokov 2023). Even though the strategic dialogue with the United States on the mutual limitation of nuclear arsenals has formerly provided Russia with opportunities to demonstrate its prominence in global affairs, with the outbreak of the war in 2022, Russian officials have increasingly used agreements in the nuclear field as a lever in its confrontation with the Western powers. In one of his recent addresses, Vladimir Putin expressed it as follows: "Our position is clear: if you want to discuss important issues of security and stability for the entire planet, you must do it only in a single complex, including all those aspects that affect our national interests and directly affect the security of our country" (Putin 2024b).

In the past, Russian decision-makers have been open to the possibility and feasibility of nuclear talks with the West, treating them as a matter in their own right. After the invasion of Ukraine, however, nuclear arms treaties, much like other problems in bilateral and multilateral relations, are now increasingly held hostage to a bigger crisis with the West (cf. Polianskii 2021). As one of the leading specialists in the field, Lieutenant General Evgeny Buzhinskiy argues: "Arms control is not an end in itself." The fundamental issue, in his opinion, is "the former system of European security, under which the NATO tumor was able to spread, must be destroyed" (Buzhinskiy et al. 2023). He asserts that the US offers to resume strategic dialogue in the current circumstances, without parallel negotiations on the future of European security, are likely to be futile as they will only address the symptoms rather than the root cause of the problem. This is how the Russian Foreign Ministry's spokesperson Maria Zakharova (2022) described Russia's decision to indefinitely postpone a scheduled meeting of the Bilateral Consultative Commission under the New START Treaty in November 2022, the day before it was supposed to take place: "Such a situation could not but affect the sphere of arms control, which cannot be regarded as something autonomous and existing in isolation from geopolitical realities." Interestingly enough, although Russia later suspended its participation in the treaty, Putin personally announced that Moscow still intended to abide by the central limits set down in New START. Russia's deputy foreign minister Ryabkov (2023) struck a similar tone, declaring that Russia still recognizes a certain utility in maintaining limits on nuclear arsenals, even without treaty obligations, and the necessity of continuing dialogue in this domain. An important caveat, however, which is repeatedly brought up by Russian officials is that the West should eventually abandon its current course in Ukraine and on European security more generally, which remains rather unrealistic under the current circumstances (Polianskii 2022).

Most importantly, while the Western powers emphasize the need to include China in international talks due to its rapidly growing arsenal, stressing Russia's responsibility to bring Beijing to the negotiating table (and vice versa), Moscow responds in kind by calling for the inclusion of France and the United Kingdom in such formats "to make these talks comprehensive and fair" in terms of representation (Chernenko 2023). At the same time, in order to reassure its international partners (above all China), Russia is eager to strike a comparatively reassuring tone when discussing nuclear risks with their non-Western partners. In order to secure the support of these partners in evading sanctions

and overcoming international isolation, Russian elites frequently underline their commitment to not waging nuclear war with the West over Ukraine, demonstrating understanding of their allies' concerns about the consequences of breaking nuclear taboo (cf. Karaganov 2023).

On a more worrying note, however, Russian experts suggest that Moscow should offer expertise in the nuclear domain to their newfound allies in the countries of what has been dubbed the "global majority" as an additional tool in a proxy confrontation with the West. Among several others, Sergey Karaganov (2024) advocated for a limited global supply of nuclear weapons and means of delivery to countries such as Iran and North Korea in order to sow fear in the West and raise the cost of it continuing to support Ukraine. In this vein, addressing the representatives of the Western press in June 2024, Putin argued that should the West allow Ukraine to attack Russia's internationally recognized territories, Moscow reserves the right to supply long-range weapons systems to those of its allies that can "carry out strikes on sensitive objects of those countries" supplying such weapon systems to Kyiv (Putin 2024a). These and several other developments, such as in the field of anti-satellite weapons systems, indicate that Russia is becoming increasingly less risk averse while pursuing destabilizing strategies in the nuclear and other domains in a bid to force the West to change its policy (Driedger 2023).

In sum, Russia currently views the nuclear arms talks as being rooted in a larger crisis, while not generally excluding the more favorable scenario of reaching an arms control agreement but at the same time acknowledging the unpredictable costs of the arms race with the United States. Nevertheless, as Nikolai Sokov (2023) puts it: "(...) shared interest [in preventing the arms race] is not a guarantee that action will be taken, much less that interaction will be successful". Against this backdrop, the nuclear sphere is unlikely to become the driver of a general relaxation of the confrontation between Russia and the West, and at best can be used to support the conflict mitigation efforts elsewhere.

5.2 THE WESTERN DEBATE: THE FUTILITY OF ARMS CONTROL

Although the end of New START was brought about by Russia, the US and the West observed Russia's withdrawal without much regret. Today, negotiated arms control with Russia is out of the question. The proposals occasionally put forward by representatives of the arms control community seem to be out of date (Perkovich 2024). Even multilateral arms control steps, which were in vogue before the war, have since become politically hopeless. This also applies to the Treaty on the Prohibition of Nuclear Weapons (TPNW), which would ban the deployment of nuclear weapons in non-nuclear-weapon states and thus NATO's nuclear sharing arrangements. Before the onset of the war in 2022, broad segments of the public and parts of the political elites in those European countries participating in nuclear sharing did not see the deployment of an atomic bomb on their soil as an advantage, but as a risk and an anachronism.[14] This was especially true for Germany (Dembinski 2021). Here, a majority of the population and a large share of think tankers and political decision-makers were receptive to

14 On public and political decision-makers' attitudes toward nuclear deterrence, arms control, and the Treaty on the Prohibition of Nuclear Weapons before the war, see Rapnouil, Varma, & Witney 2018.

the TPNW. The SPD and the Greens even opposed the procurement of a successor for the nuclear-capable Tornado aircraft. The war changes these attitudes significantly. For the first time, a majority of the population is in a favor of nuclear participation (Onderco 2024).

Criticism from the expert community regarding the stationing of US nuclear weapons has faded into the background, and the political parties in the federal government that took office before the war made a U-turn by opting for the F-35 as a successor to the Tornado, thus laying the foundation for Germany's permanent participation in nuclear sharing. Accordingly, support for the TPNW is eroding. While before the war, the SPD and the Green leadership of the Foreign Office advocated for the Treaty on the Prohibition of Nuclear Weapons and sent observers to the treaty conferences, the focus has now shifted to another issue. The priority is now how to convince the USA to continue stationing nuclear weapons in Europe and whether and how Europe, in the event that Trump returns to the White House and the US withdraws from NATO, could establish an independent nuclear deterrent (see Kunz and Kühn 2024 for a summary of this debate).

The US debate on a unilateral declaration of no first use or at least a declaratory statement that US nuclear weapons serve only to deter a nuclear attack on the country or its allies (sole purpose), has also changed significantly as a result of the war.[15] Before the war, observers were very optimistic that the Biden administration would take bold steps in this direction (Panda & Narang 2021). As a presidential candidate, Joe Biden had repeatedly expressed his interest in a sole-purpose declaration (Biden 2020). With the war, priorities shifted (Woolf 2022). Contrary to prewar expectations that the new Nuclear Posture Review would include a sole-purpose declaration, the 2022 NPR confirmed the traditional declaratory policy of nuclear ambiguity. The government conducted a comprehensive review of nuclear declaratory policy, "including both no-first-use and sole-purpose policies", but found that "those approaches would result in an unacceptable level of risk". (U.S. Department of Defense 2022). Ultimately, it was the heightened concerns about the credibility of extended deterrence caused by the war that tipped the scales against a sole-purpose declaration. This is despite the fact that any scenarios in which the US would use these nuclear weapons first are virtually inconceivable, given its conventional superiority.

6. SUMMARY AND OUTLOOK

This report describes how the resurgence of geopolitical conflict with Russia, and in particular the 2024 war, has changed nuclear threats, risks, and constraints. It focuses on three critical observations: (a) how the conflict is changing the perception of the geopolitical utility of nuclear weapons

15 The distinction between "no first use" and "sole purpose" is fluid and depends on how a sole-purpose declaration would be formulated. Essentially, a no-first-use policy would involve an explicit ex ante declaration that the US would only use nuclear weapons in retaliation to a nuclear attack on the country and its allies. Such a declaration would have stronger implications for nuclear planning policy. In contrast, a sole-purpose statement would explain why the US possesses nuclear weapons but would not restrict their use and deployment plans in the same way. For the difference between no-first-use and sole-purpose declarations, see Panda & Narang 2021.

in crisis situations, (b) how it is influencing the discussion about the credibility and requirements of (extended) nuclear deterrence, and (c) how it is narrowing the scope of arms control.

The result of our analysis can be summarized as follows: the situation is grave and almost hopeless. The return of a zero-sum geopolitical conflict dominates nuclear thinking on both sides. Both see nuclear weapons as crucial instruments to prevent the other from dominating in future crisis and war situations. Both align their nuclear doctrines and modernization programs with this goal—with a view to successfully managing future crises themselves. In this situation, both sides use arms control as an instrument. Russia goes even further and withdraws from or suspends agreements, even if such steps do not open up any military options. Moscow thus signals that it does not need cooperation in this area and fears nuclear risks less than the post-heroic West.

This conflict will not disappear even when the war is over. Nor will the aggressiveness and risk-taking demonstrated by Russia in its war against Ukraine. On the one hand, the West must therefore take into account the importance that Russia attaches to nuclear weapons as a means of intimidation. On the other hand, the changes in the nuclear postures of both parties described above lead to increased tension and instability. In this report, we have broadly sketched out how the West can meet the challenge of confronting Russia while simultaneously containing nuclear risks more broadly. Yet, this pressing issue warrants further detailed research. As negotiated arms control seems to be politically impossible, the US and NATO should explore other options. The early arms control literature referred to unilateral initiatives as a way to strengthen crisis stability. In this vein, steps to reduce the vulnerability of nuclear weapons and thus incentives for first use seem advisable. Another promising way forward is unilateral initiatives that influence Russia via appeals to a global audience, such as further attempts to delegitimize the first use of nuclear weapons. Biden's decision not to engage in the declaratory policy of sole purpose is a missed opportunity. The concept of behavioral arms control (Kühn & Williams 2024) might be another path worth pursuing. One example would be talks on global codes of conduct to curb destabilizing developments such as the integration of artificial intelligence into nuclear command and control arrangements (Reinhold 2024).

On a more general political level, the experiences of the Cold War might provide some guidance. In the early 1950s, both sides found themselves in a situation similar to today's, marked by the Berlin and Cuban crises and a glimpse into the nuclear abyss. These crises catalyzed a transformation in conflict management, leading to territorial delineation that became a precondition for arms control in the 1960s and the 1970s. Learning from these historical lessons today and recognizing mutual patterns in strategic behavior can help the main antagonists of the current conflict adapt their strategies in order to avoid further escalation of tensions. This historical perspective also highlights that even in periods of heightened tensions, when the situation looks almost desperate, opportunities for stabilizing measures and arms control can and indeed do emerge, offering a framework for navigating contemporary nuclear risks. Whether and to what extent we can learn from these historical experiences, however, will remain a question for future research in the years to come, potentially guiding the development of innovative strategies to mitigate current nuclear threats.

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NUCLEAR THREATS, NUCLEAR DETERRENCE, AND THE FUTURE OF NUCLEAR RESTRAINT REGIMES AFTER RUSSIA'S WAR OF AGGRESSION

Matthias Dembinski and Mikhail Polianskii

Russia's war of aggression exacerbates nuclear threats in multifaceted and potentially catastrophic ways, while diminishing the prospects for arms control and nuclear restraint regimes. In this, it is comparable to the early phases of the Cold War. This PRIF report critically examines the transformative impact Russia's war is having on the contemporary nuclear order, focusing on the utility of nuclear weapons in crisis bargaining, the credibility and sources of extended deterrence, and the functions and limitations of arms control. Drawing on lessons from the past, the authors discuss what a future nuclear strategy might look like.

Dr. Matthias Dembinski is an associate fellow and project leader of the "PATTERN: How Does the Past Matter? The Russian War of Aggression Against Ukraine and the Cold War" project at PRIF. Mikhail Polianskii is a doctoral researcher and member of this research project at PRIF.

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