frontiers | Frontiers in Political Science

TYPE Conceptual Analysis
PUBLISHED 03 January 2025
DOI 10.3389/fpos.2024.1504361

OPEN ACCESS

EDITED BY
Sharyl Cross,
St. Edward's University, United States

REVIEWED BY
Marcin Kaczmarski,
University of Glasgow, United Kingdom
Teodor Lucian Moga,
Alexandru Ioan Cuza University, Romania

*CORRESPONDENCE
Paul J. Bolt
✉ paul.bolt@afacademy.af.edu

RECEIVED 30 September 2024
ACCEPTED 05 December 2024
PUBLISHED 03 January 2025

CITATION
Bolt PJ (2025) Strategic stability in a new era. *Front. Polit. Sci.* 6:1504361. doi: 10.3389/fpos.2024.1504361

Strategic stability in a new era

Paul J. Bolt*

Department of Political Science, United States Air Force Academy, Colorado Springs, CO, United States

Numerous factors are undermining strategic stability in the contemporary world, making the prospects of nuclear war more dangerous. This article reviews the concept of strategic stability and provides an overview of the nuclear forces of the United States, Russia, and China to offer some understanding of the nuclear hardware that shapes strategic stability. It next explores new challenges to strategic stability. These include uncertainty about the reasoning behind China's nuclear buildup and the strategic challenge this buildup presents to the United States, the shift to a tripolar nuclear "balance" as China's nuclear forces continue to grow, Russian threats to use nuclear weapons in Ukraine, enhanced Russian-Chinese ties overall and specifically in the nuclear arena, and challenges posed by smaller nuclear powers. The article concludes by discussing important implications of changes in the strategic environment and hence strategic stability. These include pressures on the United States to upgrade its nuclear posture, greater challenges for the US in convincingly providing extended deterrence to its allies, and the need to shift focus in arms control from limiting the number of weapons to more modest but achievable goals.

KEYWORDS

China, Russia, United States, strategic stability, nuclear weapons

Introduction

It is popular to refer to current international rivalries as a new Cold War. This is apt in that geopolitical tensions are at their highest level since the United States and Soviet Union faced off in a manner that threatened the world with nuclear destruction. However, the comparison is also misleading as the current situation is more complex. For example, the American economy is intertwined with China's economy in ways it was never integrated with the Soviet economy. Many American allies are even more dependent on China and desperately hope to avoid having to choose between the two countries. More importantly, the nuclear balance today is becoming more complicated and less stable than the Cold War. The Cold War entailed all-out strategic competition between the United States and Soviet Union as each side amassed thousands of nuclear warheads and delivery systems. While Britain, France, and China also developed nuclear weapons during this era, their arsenals played relatively minor roles in the conflict.

The Cold War was undoubtedly dangerous. The United States and Soviet Union came close to nuclear war during the 1962 Cuban missile crisis and again in 1983 during NATO's Able Archer 83 military exercise that the Soviet Union believed might be a prelude to US nuclear strikes (Munton and Welch, 2011; Jones, 2016). There were also serious nuclear accidents, such as the 1966 collision between an American B-52 bomber and KC-135 tanker that released four unarmed thermonuclear bombs near Palomares, Spain (Moran, 2009). However, ultimately the bilateral structure of the competition was a stabilizing factor. The United States and Soviet Union learned through experience, and to achieve strategic stability eventually agreed to a series of arms control limitations and communications mechanisms that made the risk of nuclear war less dangerous. Eventually domestic issues within the Soviet Union led to the peaceful end of the Cold War.

The current world situation is more complex because China is both modernizing and rapidly increasing the size of its nuclear arsenal, bringing it closer to Russian and American capabilities. This creates challenges for the US in its rivalry with China. From a systemic

perspective, the existence of three relatively equal nuclear powers will lead to a less stable dynamic and undermine the credibility of American extended deterrence commitments. Moreover, Russian doctrine likely posits an explicit use for tactical nuclear weapons. Throughout the war with Ukraine, Russian leaders have made frequent threats to employ nuclear weapons. New technology is destabilizing as well. Hypersonic weapons, cyber capabilities, the prospect of space warfare, the potential of drones, and AI all create uncertainty for states, threatening nuclear second-strike capabilities as well as command and control of arsenals. Entanglement between nuclear and non-nuclear forces increases risks (Cimbala, 2023; Naylor, 2019). North Korea's nuclear expansion – in terms of the quantity, quality, and diversity of weapons – adds an unfamiliar level of complexity to managing strategic stability among multiple great powers.

This article argues that a variety of factors are undermining strategic stability in the contemporary world, making the prospects of nuclear war more dangerous. Moreover, there are implications of these changes that undermine long-held assumptions regarding American nuclear strategy, extended deterrence, and arms control. The first section of the article reviews the concept of strategic stability and provides an overview of the nuclear forces of the United States, Russia, and China to offer some understanding of the nuclear hardware that shapes strategic stability. The next section explores new challenges to strategic stability. These include uncertainty about the reasoning behind China's nuclear buildup and the strategic challenge that this buildup presents to the United States, the shift to a tripolar nuclear "balance" as China's nuclear forces continue to grow, Russian threats to use nuclear weapons in Ukraine, enhanced Russian-Chinese ties overall and specifically in the nuclear arena, and challenges posed by smaller nuclear powers. The third section draws out important implications of changes in the strategic environment and hence strategic stability. These include pressures on the United States to upgrade its nuclear posture, greater challenges for the US in convincingly providing extended deterrence to its allies, and the need to shift focus in arms control from limiting the number of weapons to more modest but achievable goals.

Strategic stability and nuclear weapons

Strategic stability refers to a situation where nuclear powers are unlikely to initiate nuclear war, but there are various definitions and controversy over the concept. Schuyler Foerster defines strategic stability as "preserving a degree of predictability" and "resistance to sudden change," discouraging a transition from peace to war (Foerster, 2024, p. 18). In other words, key actors have a stake in the status quo and refrain from challenging it. Ulrich Kühn asserts the core of strategic stability is that nuclear powers have a survivable second-strike capability, making it unlikely that any given country will launch a first strike. States further have little incentive to dramatically increase their nuclear forces (Kühn, 2023, p. 2). Stulberg and Rubin argue that there is debate over the usefulness of the concept of strategic stability because of disagreement over what it means. However, they cannot resist suggesting there are two central components: changing force structure does not produce first-strike benefits, and there can be a return to stability after escalation (Stulberg and Rubin, 2018, p. 3–5). Albert Wohlstetter, writing in 1958 in a bipolar system, argued that achieving strategic stability and deterrence was extremely difficult, despite assumptions held by many at the time that thermonuclear war was unlikely (Wohlstetter, 1958).

The number and types of nuclear weapons held by great powers are important determinants of strategic stability. Currently the United States and Russia are close to parity in strategic nuclear weapons. China is behind but is engaged in a sustained effort to increase its force. According to the definitions of strategic stability by Kühn and Stulberg and Rubin, this does not indicate a world of stability. China's expansion of its arsenal demonstrates that Beijing does not believe the system is stable, or more likely holds the stability that existed before its nuclear expansion was detrimental to its interests.

In 2024 the Stockholm International Peace Research Institute (SIPRI) estimated that the United States had a military stockpile of 3,708 nuclear weapons. SIPRI estimated that 1,770 of these warheads were deployed (100 being tactical), while the rest remained in reserve or were waiting to be dismantled. American nuclear weapons are distributed across the triad. The air component consists of B-2A and B-52H bombers. Land-based missiles consist of 400 deployed silo-based Minuteman III intercontinental ballistic missiles (ICBMs), each carrying a single warhead. Later this decade the Air Force is scheduled to begin replacing the Minuteman III with the Sentinel. The navy's submarine-launched ballistic missiles (SLBMs) are deployed on fourteen Ohio-class ballistic missile submarines (SSBNs). The first Columbia-class submarine is projected to deploy in 2031, and Columbia-class submarines will eventually replace the fleet of Ohio-class submarines. In addition, SIPRI estimates the US has 200 B61 gravity bombs, the only non-strategic nuclear weapon held by the US (Kristensen and Korda, 2024a).

SIPRI estimates that Russia has 4,380 warheads in its nuclear stockpile, although its analysts admit uncertainty on these numbers. SIPRI estimates that 1,710 strategic warheads are deployed, while Russia also has 1,558 tactical warheads. Additional warheads are being dismantled. Russia too has a triad to deliver nuclear warheads. Tu-160 Blackjack and Tu-95MS bombers make up the air component. An estimated 329 ICBMs are deployed with approximately 872 warheads, meaning that some or all missiles have multiple independently targetable reentry vehicles (MIRVs). Russia is modernizing its ICBM force, with some missiles outfitted with the Avangard hypersonic glide vehicle system. At sea, Russia has twelve nuclear-armed SSBNs with an estimated 640 deployed warheads. The sea leg is undergoing modernization as well. What sets the Russian arsenal apart from the American is its sizable number of non-nuclear or tactical warheads distributed across a variety of dual use platforms. They can be launched from ships, submarines, aircraft, or land-based missiles (Kristensen and Korda, 2024b).

China's nuclear forces have historically been much smaller than American and Soviet/Russian forces. SIPRI estimates that China has a stockpile of approximately 500 nuclear warheads, although it relies heavily on US Department of Defense data because China does not publish details about its arsenal. The air arm of China's nuclear forces is relatively weak. The H-6 N is reported to have a nuclear mission, with an estimated 20 warheads controlled by the PLAAF. SIPRI estimates that China's land-based missiles have 346 nuclear warheads. These missiles vary in terms of their range and include ICBMs, medium range ballistic missiles (MRBMs), and intermediate range ballistic missiles (IRBMs). They also vary in terms of fueling system (liquid and solid) and basing modes (silo-based or mobile). China

continues to attempt to improve its sea-based capabilities, possessing six Type 094 Jin class SSBNs, each with up to twelve SLBMs (Kristensen and Korda, 2024c). China's arsenal is designed for regional missions as well as strategic strike (Saunders and Logan, 2021).

What sets apart China's arsenal compared to that of Russia and the United States is its rapid expansion. The US Department of Defense estimates that the Chinese stockpile of nuclear warheads will increase from over 500 in May 2023 to over 1,000 by 2030, most of which will be capable of targeting the continental United States. In addition, China is feared to be developing a strategic hypersonic glide vehicle and a fractional orbital bombardment system that would enable China to launch missiles from space orbit, as well as lower-yield nuclear weapons and perhaps a launch on warning (LOW) posture (US Department of Defense, 2023, p. 111-113). Moreover, the Federation of American Scientists notes the increase in the number of Chinese missile silos, stating "The most significant recent development in China's nuclear arsenal is the construction of what appears to be approximately 320 new missile silos in three desert areas across northern China (excluding the training silos at Jilantai) and the construction of 30 new silos in three mountainous areas of central-eastern China." (Kristensen et al., 2024). It is unclear if all these silos will hold missiles or if China intends to use them in a type of shell game, leaving rivals guessing as to which silos contain missiles. China has not admitted the existence of the new silo fields nor commented on the expansion of its nuclear force. There is also no indication that China will stop its modernization and expansion of both long-range systems and theater systems after 2030. Thus a Lawrence Livermore study group has asserted "China has already emerged as a near nuclear peer of the United States. Over the next decade or so, it is likely to emerge as a full peer in both qualitative and quantitative terms" (CGSR Study Group, 2023, p. 4).

New challenges to strategic stability

While there is no official explanation for China's nuclear expansion, scholars suggest at least three theories. Each of these has different implications for strategic stability. The first is that China's buildup is a response to American military advances. For example, Bin Li and Riqiang Wu write that China is reacting to American damage limitation programs, including ballistic missile defenses, US antisubmarine warfare, and the military's effort to develop a ground moving target indicator (GMTI) that could track China's mobile ICBMs (Li and Wu, 2024). Henrik Stålhane Hiim, M. Taylor Fravel, and Magnus Langset Trøan add that Chinese analysts fear the US may use nuclear weapons first in a conflict with China as Beijing's conventional capabilities have grown. The 2018 Nuclear Posture Review that calls for new lower-yield nuclear weapons is marshaled as evidence. China is also apprehensive that US missile defenses, conventional precision-strike capabilities that can target China's nuclear forces, and "left of launch" cyber/electronic warfare capabilities can undermine its second-strike forces (Hiim et al., 2023, p. 156–168; Eveleth, 2023, p. 50–52). The implication of this argument is that China is attempting to restore a stability threatened by American military advances.

Tong Zhao puts forth a second theory for China's buildup. Zhao asserts that nuclear expansion is not driven by any change in strategy or even specific military objectives. Instead, Xi Jinping sees nuclear weapons as symbolic of national power. Thus, an increased number of nuclear weapons elevates an adversary's perception of where China stands in the international power balance. Zhao states "Chinese officials are not simply expanding their nuclear arsenal for military-technical purposes. Rather, Chinese leaders seem to have embraced the untested belief that nuclear weaponry grants them greater geopolitical leverage to counter perceived threats" (Zhao, 2024b). Zhao goes on to argue that China's current policy lacks coherence. Decisions are made in a personalistic manner, with bureaucrats eager to please Xi Jinping. The process leaves policy experts sidelined and confused, allowing little room for debate or checks and balances. Thus, despite Beijing's rapid increase in nuclear weapons, China may not be shifting from assured retaliation to an offensive nuclear posture as might be expected by observing China's buildup (Zhao, 2024a). It is likely that other policy areas in today's China face similar disfunction due to the concentration of power in Xi Jinping.

A third possibility is that China intends to use its nuclear force for coercion and possibly warfighting. An Atlantic Council report suggests that in the event of an unsuccessful invasion of Tawain that threatens Xi's regime, China may resort to the use of nuclear weapons (Shullman et al., 2024). While doctrinal changes may or may not have driven China's new buildup, it is likely that the possession of enhanced capabilities will stimulate new thinking on the use of nuclear weapons that produce doctrinal change. China's combination of MRBMs, IRBMs, and ICBMs give it enhanced flexibility if it decides to abandon its no first use (NFU) policy and consider employing nuclear weapons for warfighting.

This theory acknowledges that China is disrupting the stability that existed before its nuclear buildup. Beijing saw that stability as benefiting the United States because it reinforced Washington's desire to maintain the status quo over Taiwan. As an analogy, the PLA conducts maneuvers at sea around American naval vessels and performs air operations close to American military aircraft in ways the US considers to be dangerous. These actions are designed to increase risk to American (and Chinese) forces and cause the United States to change its policies, what Thomas Schelling might describe as a game of chicken (Schelling, 1960). Similarly, a nuclear buildup increases risks that can be beneficial from Beijing's viewpoint, even as the likelihood of nuclear war increases.

China's rapid improvement in nuclear capabilities, including a large theater force armed with both conventional and nuclear missiles, appears inconsistent with its stated NFU doctrine and assured retaliation, reflecting the incoherence that Zhao alludes to. The PLA's test of a fractional orbital bombardment capability in 2021 is especially destabilizing, and if deployed would deepen nuclear insecurity (CGSR Study Group, 2023, p. 14, 54). It too is inconsistent with an NFU policy. However, there is no firm evidence that China has officially changed its nuclear strategy. Outside the advances in China's arsenal, there is little evidence that China is moving toward a limited first use strategy or an escalate-to-deescalate strategy, although Chinese movement toward LOW, or launch-under-attack, would be a major shift (Hiim et al., 2023, p. 168–180; Twomey, 2021). Therefore we are left with an analytical puzzle. Is China's policy in fact incoherent, is there a belief that new weapons are necessary to support China's current doctrine because of threats posed by the United States, or is there a shift to an offensive strategy to accompany China's enhanced arsenal that has been kept secret or is still being developed? Regardless of the answer, this ambiguity itself undermines stability.

China's buildup presents two sets of challenges to the United States. The first relates to the US-Chinese strategic competition. The second

is relevant to the broader systemic instability that results from the existence of three nuclear powers. Regarding the first set of challenges, the security dilemma drives the rivalry between China and the United States, with each side seeing the other as having hostile intentions. Chinese leaders likely believe American defense modernization is dangerous because it threatens China's second-strike capabilities, while China's nuclear expansion, as well as efforts to protect its nuclear forces through conventional means, confirms the worst fears of American defense planners suspicious that China intends to use its nuclear weapons for coercion (Hiim et al., 2023).

China's potential moves toward LOW, which includes silos, large phased-array radars, and enhanced command, control, and communication (NC3), are also dangerous from an American perspective because LOW can lead to missile launches resulting from false alarms. Decker Eveleth notes "The most concerning change to China's nuclear forces is not actually the numerical expansion in launchers, but their apparent shift from a retaliation plan that imagined firing a salvo of nuclear missiles after an adversary had already completed an attack against the Chinese homeland to a posture of launch on warning (LOW)" (Eveleth, 2023, p. 53). Since China has co-located nuclear and conventional missiles, and some types of Chinese missiles are dual-use (capable of firing conventional or nuclear warheads), an American attack on Chinese conventional weapons might be misinterpreted as an attack on Chinese nuclear facilities. Similarly, the US might mistakenly attack Chinese nuclear missiles thinking that they were conventional weapons.

China's buildup is further problematic from an American perspective because if conventional war over Taiwan were to break out between China and the United States, China's expanding arsenal would make it more difficult to avoid nuclear escalation. A recent RAND report asserts "there is a narrow range of scenarios that can enable great powers to wage a protracted war without it becoming a nuclear war," and American tabletop exercises demonstrate a risk of escalation in a war over Taiwan (Heim et al., 2024, p. 30; Pettyjohn and Dennis, 2023). Finally, increased Chinese nuclear weapons complicate US targeting for damage limitation strategies because it presents a greater range of targets, and has caused the US to rethink whether its current nuclear posture is sufficient for deterrence.

The second issue related to China's buildup is the resulting development of a tripolar nuclear balance, or imbalance. Of course, there are more than three nuclear powers, but if one looks at the number of warheads, the US, Russia, and soon China stand above the rest. In nature, the dynamic interactions of three objects are nonlinear and much more complicated than pairs, the so-called three body problem. We see this in stars, subatomic particles, swirling bodies of water or air, and even human social groups. The behavior of threes is chaotic and difficult to predict (Broad, 2023).

Andrew Krepinevich points out the complexities inherent in a tripolar nuclear system. The fact that each power must deal with two adversaries complicates strategy. For example, it is likely impossible to achieve nuclear parity with the combined arsenal of two other powers. No two parties will allow a third to get that far ahead of them, enhancing the security dilemma. Furthermore, each state will feel the need to guarantee a second-strike capability against two states if it suffers a first strike. This requires larger arsenals and makes it difficult to maintain a strategy of mutually assured destruction (MAD). These factors mean that states will be more afraid of being a slow second or third responder during a war, increasing the temptations of a first strike. Moreover, the three-body problem makes extended deterrence less credible, creating pressures for nuclear proliferation (Krepinevich, 2022).

Another factor that shakes strategic stability is Russian nuclear doctrine and threats to use nuclear weapons after the 2022 invasion of Ukraine. Many analysts believe that Russia has an unofficial military doctrine termed escalate-to-deescalate that was developed in the 1990s, although it is ambiguous in official Russian doctrine. This thinking grew out of Russian conventional military deficiencies. The premise behind the concept is that a Russian first strike using a tactical nuclear warhead in wartime could shock an enemy and lead to the war's ending on terms favorable to Russia. The Zapad 1999 military exercise simulated a nuclear first strike against NATO, and subsequent Russian exercises have simulated nuclear attacks as well. In other words, Russia sees nuclear weapons as a warfighting tool and not only as an instrument of deterrence. Russia may be tempted to use a tactical nuclear weapon due to its conventional weaknesses vis-à-vis NATO and its diverse arsenal of non-strategic nuclear weapons matched only by American gravity bombs. While Russia has attempted to increase the quality of its conventional forces to lessen reliance on nuclear weapons, the war in Ukraine has demonstrated continued limitations (McDermott, 2020, p. 77–85; Mahnken et al., 2019, p. 37–38; Singh, 2023).

Three days after the Russian invasion, Putin called for "special combat readiness" for Russian nuclear forces. Throughout the war, Putin and other Russian leaders have made veiled threats to use nuclear weapons if Russia's red lines were crossed, what the Atlantic Council calls the "normalization of nuclear threats" (Dickinson, 2024). The invasion of Ukraine suggests that Russia's nuclear weapons embolden it to take risks with conventional forces. Ukraine and NATO fear nuclear escalation due to Russia's threats while Moscow does not fear escalation, giving Russia an advantage (Blank, 2022, p. 64). Sharyl Cross warns "The longer the war in Ukraine continues the greater the risk of miscalculation and accidents that could result in a nuclear confrontation" (Cross, 2024; Arceneaux, 2023).

In 2023, Sergei A. Karaganov, Professor Emeritus at Moscow's National Research University, asserted in a chilling article that the Russian threshold for use of nuclear weapons was too high. He stated Russia must move up the escalation ladder, hitting targets in several countries if the West does not back down in its support of Ukraine. Karaganov believes that Russian friends will ultimately support a nuclear first strike and such action would be effective in achieving Russian goals in Ukraine (Karaganov, 2023). Ivan N. Timofeev, associate professor at MGIMO University and program director of the Valdai Discussion Club, forcefully responded that this was not official Russian policy, and the preemptive use of nuclear weapons will not solve Russia's problems but instead worsen them (Timofeev, 2023). Nevertheless, Karaganov's article is a reminder that Russian elites are seriously considering nuclear strikes in a manner quite different from the Cold War, or at least wish to make it appear so.

In November 2024, Putin announced that Russia had revised its nuclear doctrine to expand the conditions under which Russia might use nuclear weapons. Nuclear weapon states supporting nonnuclear states at war with Russia could be targets and attacks against Russia that were a "critical threat" to the sovereignty of the country could provoke a nuclear response (Troianovski, 2024). While the new doctrine increases nuclear risks, perhaps more dangerous is Russia continuing to make nuclear threats that are ignored by the West

without major consequences. President Putin has laid out a variety of redlines that the West has crossed. At this point, it is not clear what might actually provoke a Russian nuclear response. This uncertainty itself undermines strategic stability.

Another security concern for the United States is the close relationship between China and Russia. Sino-Russian ties have deepened in the last decade, particularly after Russia's illegal annexation of Crimea. Beijing and Moscow cooperate in joint military patrols, the energy trade, preventing color revolutions, and working through international institutions to defend the legitimacy of authoritarianism (Bolt and Cross, 2018). Shortly before Russia's invasion of Ukraine in February 2022, Xi and Putin issued a statement that declared a "no limits" partnership between their countries. Since Russia's invasion, China has increased trade with Russia (largely in Chinese *yuan*), sold Russia components necessary for its military equipment, and provided Russia with diplomatic support, stymying Western efforts to isolate Moscow. Beijing has also amplified Russian war propaganda in the developing world. While the two states do not have a formal alliance, they have close cooperative relations in the security realm and a host of other areas. Xi and Putin continue to frequently meet. Both Russia and China also have deteriorating ties with Washington.

Most noteworthy from the perspective of strategic stability, China and Russia have enhanced ties in the nuclear realm. Starting in 2019, security cooperation has deepened with a series of joint strategic air patrols involving Russian and Chinese bombers. Notably, in May of 2022, Russian and Chinese bombers flew a patrol near Japanese and South Korean air defense zones while President Biden was meeting in Tokyo with leaders of the Quad. In July of 2024, two Chinese Xian H-6 bombers and two Russian Tu-95 bombers, escorted by Russian fighters, flew a joint patrol reaching about 200 miles off the coast of Alaska (Sonne, 2024). There are also reports that Russia is supplying China with highly enriched uranium (Vergun, 2023). Andrew Kydd states that nuclear weapons play a role in the triangular relationship between Russia, China, and the United States. Nuclear weapons reduce the security dilemma between China and Russia because each has a second-strike capability against the other. However, Kydd suggests the United States seeks primacy and has first strike capabilities that threaten both China and Russia, driving them closer together (Kydd, 2022). While it seems quite unlikely that the United States could disarm either China or Russia through a first strike, this possibility may weigh on the minds of policymakers.

National leaders tightly control nuclear weapons, and coordinating nuclear policies with another state would be an extraordinary level of cooperation. It does not seem that China and Russia have reached that level of cooperation. While Russia and China have conducted joint military exercises, the level of military coordination does not approach that of the United States and its allies. Nevertheless, the prospect of joint Russian-Chinese coordination of nuclear strikes in a war with the United States is a haunting scenario for American defense planners (Cimbala, 2023, p. 766–772; Congressional Commission on the Strategic Posture of the United States, 2023). From the perspective of Washington, the prospect of China and Russia planning an attack against the United States magnifies the three-body problem and builds pressure to increase the number of nuclear warheads.

The United States needs to deter nuclear attack in two theaters, by two or more countries if North Korea is included, and must be capable of effectively responding to attacks from Russia and/or China even if the US absorbs an initial nuclear strike. Moreover, even absent Chinese and Russian coordination, one might take advantage of a crisis begun by the other (CGSR Study Group, 2023, p. 10–12, 18–19). There is precedent for this. Chinese forces invaded India on October 20, 1962, during the Cuban Missile Crisis.

Compounding the problem of strategic instability are the issues posed by some of the smaller nuclear powers. Outside the US, Russia, and China, states deploying nuclear weapons include Great Britain, France, India, Pakistan, North Korea, and Israel, although Israel does not acknowledge it is a nuclear power. Great Britain and France have long-standing, secure arsenals that nevertheless pose concerns for Russia. North Korea may have 50 assembled warheads as of January 2024, along with fissile material for up to 90 warheads, and has a variety of missile delivery systems, including ICBMs (Arms Control Association, 2024). Thus it can threaten American cities as well as South Korea and Japan. Pyongyang is developing a second-strike capability and weapons systems that would enable it to fight a regional nuclear war, although the details of its command-and-control system, complicated by the structure and vulnerabilities of a political system where all things fall under Kim Jung Un, are opaque (Smith and Bernstein, 2022). North Korea's aggressive rhetoric and continued development of its nuclear program undermine strategic stability in Northeast Asia and exacerbate the three body problem for the United States.

Just as nuclear parity is difficult to define under the three-body problem for the US, China, and Russia, parity can also be difficult to assess for the smaller nuclear powers. For example, India has adopted a minimum deterrence posture while Pakistan, like Russia, plans for nuclear warfighting. However, India could face a two-front nuclear confrontation with both China and Pakistan, creating vexing questions about what parity means and what role the US and Russia might play in a confrontation between India and its rivals (Mahnken et al., 2019, p. 35–36). India too must respond to China's increasing arsenal. Thus, dangers to strategic stability are not limited to the major nuclear powers.

Implications

The challenges to strategic stability discussed above have important implications for long-standing approaches to nuclear security. While the Obama administration made efforts to reduce the saliency of nuclear weapons, today there are increasing calls to expand the American arsenal in response to changes in the external environment. The new challenges to stability also reduce the credibility of extended deterrence and lead arms control experts to rethink what is possible in the contemporary environment.

American nuclear strategy

The challenges to strategic stability have critical implications for US nuclear forces and strategy. With the end of the Cold War, fears of nuclear war decreased, as did attention to nuclear weapons in the United States. However, the George W. Bush administration became concerned about multiple nuclear threats developing over the coming years from both state and non-state actors. The 2001 Nuclear Posture

Review called for a new triad consisting of nuclear and non-nuclear strike capabilities, air and missile defenses, and a responsive nuclear infrastructure (Frankel et al., 2009). The Obama administration sought to prevent nuclear terrorism and proliferation in the short term, endeavored to reduce the importance of the American nuclear arsenal in guaranteeing security, and in the long term sought the elimination of all nuclear weapons. In a speech in Prague in 2009, President Obama said the United States will "seek the peace and security of a world without nuclear weapons." As part of this overall emphasis to reduce the salience of such weapons, the president considered, but did not adopt, a no first use policy (US Department of Defense, 2010; Woolf, 2022).

The Trump administration took a different tone by focusing on nuclear modernization to confront a more dangerous world. While the Trump Nuclear Posture Review was consistent with previous policy in that it maintained the triad, continued modernization efforts, held to open-ocean targeting, adhered to the testing moratorium, maintained negative security assurances for most states, and called for adherence to the Law of Armed Conflict (LOAC), there were also important differences. The Trump document saw a more conflictual international system and a broader picture of when nuclear weapons might be used. Most importantly, it called for low yield capabilities, such as a nuclear capable sea-launched cruise missile (SLCM) and low yield warhead for the Trident missile, to counter Russian nonstrategic options and for potential use in a China scenario (Péczeli, 2018; US Department of Defense, 2018).

The Biden Nuclear Posture Review, rolled out in 2022, addresses the problem of facing two nuclear competitors. It calls for the continuation of American nuclear modernization, but canceled the nuclear Sea-Launched Cruise Missile Program initiated in the Trump administration. However, the review maintains the W76-2 warhead, a lower-yield warhead for submarine-launched ballistic missiles, which Biden once opposed. It also focuses on "integrated deterrence" that coordinates nuclear and non-nuclear weapons, as well as other elements of US national power (Harries, 2022; US Department of Defense, 2022). The administration further announced a new variant of the B61 nuclear gravity bomb and issued a classified "Nuclear Employment Guidance" designed to respond to China's increased arsenal and enable the US to deter China, Russia, and North Korea at the same time (Sanger, 2024).

There are various proposals for how US nuclear policy should move forward. Keith Payne calls for the US to consider new nuclear capabilities, a re-capitalized nuclear infrastructure, and a NATO with more theater nuclear options (Payne, 2018). In June 2024 the Biden administration itself threatened to increase the number of weapons in the American nuclear arsenal if China and Russia stay on their current path (Barnes and Sanger, 2024). However, the current modernization program of replacing the Minuteman III with the Sentinel is expensive and costs are rising, limiting American options (Cameron, 2024). Andrew Krepinevich calls for enhanced stability by spreading out nuclear weapons across various platforms to require an attacker to use more missiles on a first strike (Krepinevich, 2022), while Madison Estes advocates for a new escalation management framework that consists of the objectives, tools, and phases of the escalation management process (Estes, 2020).

The CGSR Study Group has conducted a lengthy analysis of the necessary US response to the unfolding environment. It calls for the US to be able to deter both Chinese and Russian aggression simultaneously, prioritizing both equally. This will require quantitative increases in US weapons, with preparations for doing so beginning now. The study group recommends uploading nuclear warheads onto SLBMs that the navy had downloaded to comply with New START, increasing the number of American nuclear bombers, and securing a nuclear reserve force such that there are additional weapons available to the US even after a nuclear exchange. The United States also needs to enhance its defense industrial base, including its atrophied nuclear infrastructure, with excess capacity as a hedge against further buildups by rivals (CGSR Study Group, 2023, p. 40–46).

Extended deterrence

The emerging multipolarity and the greater uncertainties it brings makes cooperation among great powers in enforcing international rules tougher, thus adding new challenges to the Nuclear Non-Proliferation Treaty (NPT) (Gibbons and Herzog, 2022). In a similar vein, the emerging nuclear environment makes it increasingly difficult for the United States to provide credible extended deterrence for Europe, Asian allies such as Japan and South Korea, and Australia. The rise of China and its expanding nuclear arsenal, North Korean nuclear weapons that threaten the United States, President Trump's bringing into doubt American alliances, and Russian aggression all contribute to decreased confidence in the American nuclear umbrella. As a result, there have been discussions in Europe and Asia about developing nuclear capabilities (Koch, 2020). If American allies were to seek nuclear weapons, the entire nonproliferation regime would be shattered.

The global nuclear balance is shifting, especially in Asia, due to both China's and North Korea's nuclear expansion. This is occurring at the same time as the enhanced quality and quantity of China's conventional forces threaten the traditional conventional superiority of the United States in Asia. Some Asian observers worry about the stability-instability paradox. As China reaches nuclear parity with the United States, it may feel freer to use conventional force in the region against American partners or allies. China has a distinct advantage over the United States in conventional missiles in the Pacific theater, which threaten American air bases. Concerns have moved beyond experts to regional publics as well. For example, South Korean surveys demonstrate that up to 70 percent of South Koreans want the country to have an independent nuclear arsenal, and if having to make a choice, most South Koreans would prefer nuclear weapons over US troops in the country (Choe, 2024).

The United States cannot take the willingness of its Asian allies to refrain from developing nuclear weapons for granted. Even Britain and France developed their own nuclear weapons after World War II as they were unwilling to rely solely on the American nuclear umbrella. While Russia and China rhetorically push for a multipolar world, with increasing military pressure they may create new poles in a way they do not intend if American allies lose confidence in extended deterrence. This would create a serious rift in strategic stability, fundamentally changing the nuclear environment.

If the United States hopes to limit proliferation and maintain credible extended deterrence, it needs to take additional steps to assure its allies. One option is to reintroduce nuclear weapons onto the soil or around the waters of our regional allies. Currently Europe hosts

American nuclear gravity bombs, deliverable by dual-capable aircraft, but the number of bombs is not large and the ability of the aircraft to penetrate enemy air space is up for debate. In Asia, the United States will fly nuclear capable bomber exercises or send nuclear submarines for port calls to demonstrate its commitment to extended deterrence. However, the US removed tactical nuclear weapons from the Asian theater after the Cold War. Forward deployed nuclear forces would demonstrate American resolve to both our adversaries and allies. These forces might include nuclear-capable F-35 s and bombers, nuclear SLCMs, or even ground-launched cruise missiles (GLCMs), returning closer to the Cold War posture (CGSR Study Group, 2023, p. 47–51).

Arms control

Current developments are also discouraging for the prospects of traditional arms control but invite us to think more broadly about non-traditional agreements excluding numerical limits that might enhance strategic stability. New START is the only existing treaty limiting the nuclear weapons of the US and Russia. New START went into effect in 2011 and was renewed in 2021 for five years. The treaty limits the US and Russia to 700 deployed ICBMs, SLBMs, and nuclear equipped heavy bombers; 1,550 deployed nuclear warheads; and 800 deployed and non-deployed launchers and bombers (US Department of State, 2023). However, Russia suspended participation in 2023 due to American support for Ukraine, although both the US and Russia state they will observe the limits until the treaty expires in 2026. From the American perspective, a problem with New START is that it does not include China.

There are various impediments to future arms control agreements. Obviously, the war in Ukraine does not create a conducive environment for negotiations, although during the Cold War the US and Russia could negotiate on weapons limitations despite serious tensions (Cross, 2024). New technologies that have expanded the domains of conflict also discourage arms control. For example, both space and cyber are relevant to deterrence. Attacks in space can blind satellites necessary to monitor nuclear launches, while cyber-attacks, particularly "left of launch" activities, might threaten second-strike capabilities. Similarly, hypersonic weapons and improved anti-missile systems can threaten the second-strike capabilities of a nuclear state, making it less likely to agree to limits on its weapons (Cimbala and Lowther, 2023). Moreover, the three-body problem means that arms control agreements imposing low limits on nuclear warheads could make instability worse. Fears of losing one's limited weapons to an attack by one or both rivals increase the temptation to strike first (Krepinevich, 2022).

Another factor inhibiting new arms control agreements is that Russia, China, and the US have different goals for arms control. For example, the US wants to negotiate with Russia on all Russia's nuclear warheads, including nonstrategic weapons, and is concerned about whether Russia would use nuclear weapons first in a conventional war. Russia is not interested in negotiations on tactical weapons. The United States wants China brought into discussions on nuclear limitations, while Russia wants Britain and France brought in. Russia and China have serious concerns about American missile defenses and American conventional long-range strike capabilities, which the US does not want included in negotiations. Russia also fears the introduction of American intermediate-range missiles into Europe. Within the United States, there is both political and bureaucratic infighting that prevents a single "American" view on arms control. China has never agreed to nuclear weapons limitations and seems unwilling to begin negotiations now (Pifer, 2024; Woolf, 2024; Saunders, 2024).

Instead of limiting nuclear weapons, future arms agreements might seek more achievable goals that would still enhance stability. For example, greater transparency on the part of all parties regarding existing and planned forces might help ease the security dilemma. Chinese openness regarding the extent of its missile program buildup and doctrine, Russian explanations of the purpose and numbers of its non-strategic forces, and even greater American openness on its missile defenses could ease tensions. Bans on weapons systems that are particularly destabilizing, such as fractional orbital/multiple orbital bombardment systems, would enhance stability and confidence in second strike capabilities (CGSR Study Group, 2023, p. 56–61). Continued efforts to achieve arms control are needed more than ever, but in practical terms the goals must be less ambitious if anything is to be achieved.

Conclusion

In conclusion, strategic stability is being undermined in the contemporary world. Russian threats to use nuclear weapons to end the war in Ukraine, China's rapid buildup of nuclear weapons and three new silo fields without official explanation or comment, and fears in Moscow and Beijing that American conventional weapons might threaten their second-strike capabilities all undermine strategic stability. Technological advances in hypersonic weapons, AI, counter-space capabilities, and cyber add to the uncertainties as these weapons too threaten warning systems and second-strike forces. Because China's nuclear plans are opaque, and the United States and Russia will no longer be bound to declare the status of their forces after New START expires, transparency is not likely to improve. North Korea's continued development of warheads and missiles adds to the sense of threat.

Due to the complexities of the three-body problem, analysts need to rethink the assumptions and theories regarding nuclear conflict developed during the Cold War. A tripolar nuclear "balance" is much more complex than the Cold War's bipolar balance. While fundamental concepts like deterrence are sound, we need to rethink the way these concepts will be applied with three major nuclear powers instead of two. The United States also needs to make careful judgments on the extent to which China and Russia might cooperate more closely in the military sphere.

As a result of the undermining of strategic stability, the United States faces difficult choices. During the Obama administration the US sought to minimize the role of nuclear weapons in American defense strategy and seek the elimination of this category of weapons at some point in the future. Today Washington needs to seriously address whether the US needs additional nuclear weapons, even as it struggles to upgrade to the Sentinel. The United States must also wrestle with the question of whether US forces need additional types of tactical weapons to deter Russia and China. As we have seen, the Trump and Biden administrations have differed on this point. Washington must also seek to assure regional allies that the American nuclear umbrella is still credible is spite of worsening military balances. This may involve the difficult decision to again forward deploy nuclear weapons to add to the gravity bombs

already in Europe. Finally, the preceding factors all complicate the prospects for future arms control. Our best hope is to focus on achievable goals such as increasing transparency and foregoing the development of weapons systems that are particularly destabilizing. These types of agreements may provide a small beginning toward greater steps that might better enhance stability.

Author contributions

PB: Writing – original draft, Writing – review & editing.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author declares that no Gen AI was used in the creation of this manuscript.

Publisher's note

Author disclaimer

The views expressed in this article are those of the author and do not necessarily reflect the official policy or position of the United States Air Force Academy, the Air Force, the Department of Defense, or the U.S. Government. I wish to thank Grace Buettner for research assistance, as well as Shane Smith and the reviewers for helpful comments.

References

Arceneaux, G. D. (2023). Whether to worry: nuclear weapons in the Russia-Ukraine war. *Contemp. Security Policy* 44, 561–575. doi: 10.1080/13523260.2023.2260175

Arms Control Association. (2024). Arms control and proliferation profile: North Korea. Available online at: https://www.armscontrol.org/factsheets/arms-control-and-proliferation-profile-north-korea#Nuclear (Accessed September 15, 2024).

Barnes, J. E., and Sanger, D. E. (2024). US considers expanded nuclear arsenal, a reversal of decades of cuts. New York Times. Available online at: https://www.nytimes.com/2024/06/07/us/politics/us-nuclear-russia-china.html (Accessed June 7, 2024)

Blank, S. (2022). Nuclear weapons in Russia's war against Ukraine. *Naval War College Review* 75, 53–78.

Bolt, P. J., and Cross, S. N. (2018). China, Russia, and twenty-first century global geopolitics. Oxford: Oxford University Press.

Broad, W.J. (2023). The terror of threes in the heavens and on earth. New York Times. Available online at: https://www.nytimes.com/2023/06/26/science/3-body-problem-nuclear-china.html (Accessed June 26, 2023).

Cameron, D. (2024). "US nuclear missile silos need modernizing, but fixes aren't coming soon. Wall Street J. Available online at: https://www.wsj.com/politics/national-security/u-s-nuclear-missile-silos-need-modernizing-but-fixes-arent-coming-soon-7985e1ba (Accessed August 26, 2024).

CGSR Study Group. (2023). China's emergence as a second nuclear power. Lawrence Livermore National Laboratory. Available online at: https://cgsr.llnl.gov/sites/cgsr/files/2024-08/CGSR_Two_Peer_230314.pdf (Accessed August 12, 2024).

Choe, S.-H. (2024). Doubting America's 'nuclear umbrella,' some South Koreans want their own. New York Times. Available online at: https://www.nytimes.com/2024/08/17/world/asia/south-korea-nuclear-arsenal.html (Accessed August 17, 2024).

Cimbala, S. J. (2023). The indelicate balance of terror: nuclear deterrence stability in a world of three nuclear superpowers. *Comp. Strateg.* 42, 763–775. doi: 10.1080/01495933.2023.2263335

Cimbala, S. J., and Lowther, A. B. (2023). Russo-American strategic arms control: new START or a new START? *Aether* 2, 36–50.

Congressional Commission on the Strategic Posture of the United States. (2023). America's Strategic Posture. Available online at: https://www.ida.org/-/media/feature/publications/a/am/americas-strategic-posture/strategic-posture-commission-report.ashx (Accessed October 15, 2024).

Cross, S. (2024). Major power geopolitical clashes jeopardizing the global arms control regime: reassessing priorities, searching for approaches in a new era of nuclear tripolarity. Perry World House. Available online at: https://global.upenn.edu/perryworldhouse/news/major-power-geopolitical-clashes-jeopardizing-global-arms-control-regime (Accessed July 15, 2024).

Dickinson, P. (2024). Ukraine erases Russia's red lines. Atlantic Council. Available online at: https://www.atlanticcouncil.org/blogs/ukrainealert/moscow-escalates-nuclear-threats-as-ukraine-erases-russias-red-lines/ (Accessed September 10, 2024).

Estes, M. A. (2020). Prevailing under the nuclear shadow: a new framework for escalation management. CNA. Available at: https://www.cna.org/archive/CNA_Files/pdf/crm-2020-u-027973-final%20(002).pdf (Accessed July 12, 2024).

Eveleth, D. (2023). "People's liberation Army rocket force order of battle 2023," CNS Occasional Paper #58, Middlebury Institute of International Studies at Monterey. Available online at: https://nonproliferation.org/wp-content/uploads/2023/07/web_peoples_liberation_army_rocket_force_order_of_battle_07102023.pdf (Accessed June 28, 2024).

Foerster, S. (2024). "Deterrence and strategic stability" in Arms control at a crossroads: Renewal or demise? eds. J. A. Larsen and S. Smith (Boulder: Lynne Rienner), 17–32.

Frankel, M., Scouras, J., and Ullrich, G. (2009). The new triad: diffusion, illusion, and confusion in the nuclear mission. Johns Hopkins University Applied Physics Laboratory. Available online at: https://www.jhuapl.edu/sites/default/files/2022-12/TheNewtriad.pdf (Accessed July 15, 2024).

Gibbons, R. D., and Herzog, S. (2022). Durable institutions under fire? The NPT confronts emerging mulipolarity. *Contemporary Security Policy* 43, 50–79. doi: 10.1080/13523260.2021.1998294

Harries, M. (2022). Biden's nuclear strategy is about living with a dangerous world. *Foreign Policy*.

Heim, J. L., Burdette, Z., and Beauchamp-Mustafaga, N. (2024). US military theories of victory for a war with the People's Republic of China. RAND. Available online at: https://www.rand.org/pubs/perspectives/PEA1743-1.html (Accessed June 26, 2024).

Hiim, H. S., Fravel, M. T., and Trøan, M. L. (2023). The dynamics of an entangled security dilemma. *Int. Secur.* 47, 147–187. doi: 10.1162/isec_a_00457

Jones, N. (2016). Able Archer 83. New York: The New Press.

Karaganov, S. A. (2023). A difficult but necessary decision. Russia in Global Affairs. Available online at: https://eng.globalaffairs.ru/articles/a-difficult-but-necessary-decision/ (Accessed May 30, 2024).

Koch, S. J. (2020). Extended deterrence and the future of the nuclear nonproliferation treaty. *Comp. Strateg.* 39, 239–249. doi: 10.1080/01495933.2020.1740569

Krepinevich, A. F. Jr. (2022). The new nuclear age: how China's growing nuclear arsenal threatens deterrence. Foreign Aff. Available at: https://www.foreignaffairs.com/articles/china/2022-04-19/new-nuclear-age (Accessed July 22, 2024).

Kristensen, H. M., and Korda, M. (2024a). "United States nuclear forces" in SIPRI yearbook 2024 (Oxford: Oxford University Press), 273–286.

Kristensen, H. M., and Korda, M. (2024b). "Russian nuclear forces" in SIPRI yearbook 2024 (Oxford: Oxford University Press), 287–301.

Kristensen, H. M., and Korda, M. (2024c). "Chinese nuclear forces" in SIPRI yearbook 2024 (Oxford: Oxford University Press), 315–324.

Kristensen, H. M., Korda, M., Johns, E., and Knight, M. (2024). Chinese nuclear weapons, 2024. *Bull. At. Sci.* Available online at: https://thebulletin.org/premium/2024-01/chinese-nuclear-weapons-2024/#:~:text=The%20most%20significant%20recent%20development,areas%20of%20central%2Deastern%20China (Accessed November 1, 2024).

Kühn, U. (2023). Strategic stability in the 21st century: an introduction. *J. Peace Nuclear Disarmament* 6, 1–8. doi: 10.1080/25751654.2023.2223804

Kydd, A. (2022). "Bargaining, nuclear weapons, and alliance choices in US-China-Russia relations" in The United States and contemporary China-Russia relations. ed. B. K. Yoder (Cham, Switzerland: Palgrave Macmillan), 207–229.

Li, B., and Wu, R. (2024). US strategy of damage limitation Vis-à-Vis China: long-term programs and effects. *China Int. Strategy Rev.* 6, 9–21. doi: 10.1007/s42533-024-00153-w

Mahnken, T. G., Montgomery, E. B., and Cohn, J. (2019). Assessing the changing nuclear balance. *SAIS Rev. Int. Aff.* 39, 27–42. doi: 10.1353/sais.2019.0014

McDermott, R. N. (2020). Russia's impact on nuclear policy in China: cooperative trends and depth of influence. *J. Slav. Mil. Stud.* 33, 44–88. doi: 10.1080/13518046.2020.1723218

Moran, B. (2009). The day we lost the H-bomb. Novato, CA: Presidio Press.

Munton, D., and Welch, D. (2011). The Cuban missile crisis: A concise history. *2nd* Edn. Oxford: Oxford University Press.

Naylor, J. L. (2019). The third nuclear age. *Comp. Strateg.* 38, 276–288. doi: 10.1080/01495933.2019.1633185

Payne, K. B. (2018). Nuclear deterrence in a new age. *Comp. Strateg.* 37, 1–8. doi: 10.1080/01495933.2018.1419708

Péczeli, A. (2018). The Trump administration's nuclear posture review: back to great power competition. *J. Peace Nuclear Disarmament* 1, 238–255. doi: 10.1080/25751654.2018.1530741

Pettyjohn, S., and Dennis, H. (2023). Avoiding the brink: escalation management in a war to defend Taiwan. CNAS. Available at: https://www.cnas.org/publications/reports/avoiding-the-brink (Accessed June 26, 2024).

Pifer, S. (2024). "Russia" in Arms control at a crossroads: Renewal or demise? eds. J. A. Larsen and S. Smith (Boulder: Lynne Rienner), 71–90.

Sanger, D. E. (2024). Biden approved secret nuclear strategy refocusing on Chinese threat. New York Times. Available online at: https://www.nytimes.com/2024/08/20/us/politics/biden-nuclear-china-russia.html (Accessed August 20, 2024).

Saunders, P. C. (2024). "China" in Arms control at a crossroads: Renewal or demise? eds. J. A. Larsen and S. Smith (Boulder: Lynne Rienner), 91–109.

Saunders, P. C., and Logan, D. C. (2021). "China's regional nuclear capability, nonnuclear strategic systems, and integration of concepts and operations" in China's strategic arsenal. eds. J. M. Smith and P. J. Bolt (Washington: Georgetown University Press), 125–157.

Schelling, T. C. (1960). Strategy of conflict. Cambridge: Harvard University Press.

Shullman, D. O., Culver, J. K., Liao, K., and Wong, S. (2024). Adapting US strategy to account for China's transformation into a peer nuclear power. Atlantic Council. Available online at: https://www.atlanticcouncil.org/in-depth-research-reports/report/adapting-us-strategy-to-account-for-chinas-transformation-into-a-peer-nuclear-power/#:~:text=China%20now%20has%20a%20higher,and%20safeguard%20its%20core%20interests (Accessed October 15, 2024).

Singh, A. (2023). Russia's nuclear strategy: changes or continuities. *J. Adv. Military Stud.* 14, 34–48. doi: 10.21140/mcuj.20231402002

Smith, S., and Bernstein, P. (2022). North Korean nuclear command and control: alternatives and implication. Defense Threat Reduction Agency. Available online at: https://wmdcenter.ndu.edu/Portals/97/Documents/Publications/NK-Nuclear-Command-and-Control_Report.pdf (Accessed February 15, 2023).

Sonne, P. (2024). Russia and China carry out first joint bomber patrol near Alaska. New York Times. Available at: https://www.nytimes.com/2024/07/25/world/asia/russia-and-china-carry-out-first-joint-bomber-patrol-near-alaska.html (Accessed July 25, 2024).

Stulberg, A. N., and Rubin, L. (2018). "Introduction" in The end of strategic stability? eds. L. Rubin and A. N. Stulberg (Washington: Georgetown University Press), 1–20.

Timofeev, I.N. (2023). A preemptive nuclear strike? No! Russia in global affairs. Available online at: https://eng.globalaffairs.ru/articles/a-preemptive-nuclear-strike-no/ (Accessed May 30, 2024).

Troianovski, A. (2024). Putin lowers Russia's threshold for using nuclear arms. New York Times. Available online at: https://www.nytimes.com/2024/11/19/world/europe/putin-russia-nuclear-weapons-missiles.html (Accessed November 19, 2024).

Twomey, C. (2021). "China's nuclear doctrine and deterrence concept" in China's strategic arsenal. eds. J. M. Smith and P. J. Bolt (Washington: Georgetown University Press), 45–62.

US Department of Defense. (2010). Nuclear posture review report.

US Department of Defense. (2018). Nuclear posture review. Available online at: https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-nuclear-posture-review-final-report.pdf (Accessed July 6, 2024).

US Department of Defense. (2022). 2022 national defense strategy of the United States of America. Available online at: https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.PDF (Accessed October 15, 2024).

US Department of Defense. (2023). Military and security developments involving the People's Republic of China, 2023. Available at: https://media.defense.gov/2023/Oct/19/2003323409/-1/-1/1/2023-MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA.PDF (Accessed July 6, 2024).

US Department of State. (2023). New START treaty. Available online at: https://www.state.gov/new-start/#:~:text=Aggregate%20Limits&text=1%2C550%20nuclear%20warheads%20on%20deployed,bombers%20equipped%20for%20nuclear%20armaments (Accessed October 1, 2024).

Vergun, D. (2023). Russia reportedly supplying enriched uranium to China. US Department of Defense. Available online at: https://www.defense.gov/News/News-Stories/Article/Article/3323381/russia-reportedly-supplying-enriched-uranium-to-china/ (Accessed March 8, 2023).

Wohlstetter, A. (1958). The delicate balance of terror. RAND. Available at: https://www.rand.org/pubs/papers/P1472.html (Accessed August 28, 2024).

Woolf, A. F. (2022). U.S. nuclear weapons policy: Considering 'no first use'. Washington, DC: Congressional Research Service.

Woolf, A. F. (2024). "United States" in Arms control at a crossroads: Renewal or demise? eds. J. A. Larsen and S. Smith (Boulder: Lynne Rienner), 51–70.

Zhao, T. (2024a). Underlying challenges and near-term opportunities for engaging China. Arms Control Today. Available online at: https://www.armscontrol.org/act/2024-01/features/underlying-challenges-and-near-term-opportunities-engaging-china (Accessed June 26, 2024).

Zhao, T. (2024b). The real motives for China's nuclear expansion. Foreign Aff. Available online at: https://www.foreignaffairs.com/china/real-motives-chinas-nuclear-expansion (Accessed August 22, 2024).