

EDWARD GEIST

Qualities Precede Quantities

Deciding How Much Is Enough for U.S. Nuclear Forces

The discovery in 2021 that the People's Republic of China (PRC) appears to be engaged in an ambitious expansion of its nuclear arsenal has led to concerns about whether U.S. nuclear forces will be “enough” to deter potential adversaries and reassure allies. Historically, the United States sought to maintain quantitative parity in strategic nuclear forces with the Soviet Union and then Russia, while assuming that other possible opponents with much smaller nuclear arsenals, such as the PRC, could be treated as lesser included cases.¹ Beijing's ongoing effort to grow its nuclear arsenal calls this time-tested approach for sizing U.S. nuclear forces into question, but a replacement formula is not obvious—not least because China's nuclear build-out is just one of several emerging challenges to U.S. nuclear strategy. North Korea's unexpectedly rapid development of sophisticated nuclear capabilities and Russia's nuclear saber-rattling in the context of its invasion of Ukraine raise the question of how the United States should prepare for the possibility that an adversary would gamble on some kind of limited nuclear attack.

Abbreviations

DPRK	Democratic People's Republic of Korea
ICBM	intercontinental ballistic missile
NATO	North Atlantic Treaty Organization
NC3	nuclear command, control, and communications
NPR	Nuclear Posture Review
PRC	People's Republic of China
SLCM	submarine-launched cruise missile
SLCM-N	nuclear-capable submarine-launched cruise missile
STRATCOM	U.S. Strategic Command

Analysts and academics disagree as to what should be done in response to the ongoing nuclear build-out by the PRC. A study group assembled by Lawrence Livermore National Laboratory consisting of influential architects of past U.S. nuclear policy who served in both Republican and Democratic administrations concluded that, although “[i]t is not obvious that the growth of China’s targetable nuclear force translates automatically into a commensurate growth in U.S. nuclear forces,” “[s]ome quantitative increase will be required in response to China’s build-up.”² Academics Keir Lieber and Daryl Press noted in an April 2023 paper that, “[i]f the United States retains its current approach to nuclear force planning, the growth of China’s arsenal . . . will likely compel the United States to significantly increase its own arsenal.”³ But because such increases could be expected to fuel a spiraling arms race with Moscow and Beijing, Lieber and Press proposed that the United States should modify its nuclear strategy to reduce the number of nuclear weapons needed for deterrence and increase

assurance by relaxing the prohibition that bans threatening nuclear retaliation against civilian populations.⁴

Moreover, developments in Russia and North Korea might be even more concerning than the growth of China’s strategic nuclear arsenal. Russia’s decision to suspend its participation in the 2010 New START Treaty (Treaty Between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms); its pursuit of exotic nuclear delivery systems, such as nuclear-powered long-range torpedoes and cruise missiles; and the increasingly alarming rhetoric about nuclear use by Russian commentators in the context of the ongoing Ukraine conflict all suggest that Moscow’s nuclear arsenal could pose much greater challenges to U.S. interests in the future than it has in the recent past.⁵ Although the size of North Korea’s nuclear arsenal remains very modest by the standards of the United States, Russia, or the PRC, the sophistication of North Korean nuclear warheads and missiles has matured far faster than most analysts expected a decade ago. Pyongyang has fielded sophisticated capabilities, such as thermonuclear weapons and mobile intercontinental ballistic missiles (ICBMs), that pose an increasingly credible threat to the U.S. homeland.⁶

To plan effectively for an uncertain future, the United States needs a methodology for determining whether it needs to expand its nuclear arsenal and, if so, what additional capabilities and capacities are called for. No matter how the United States responds to the emerging strategic environment, two conditions must be fulfilled. Firstly, potential adversaries need to perceive that the United States has “enough” nuclear weapons to deter them. Secondly, adversary decisionmakers need to perceive that U.S. offi-

cials believe that the *United States* has “enough” that Washington’s resolve will not falter in the face of provocation or coercion. These are the qualities that the U.S. nuclear arsenal must meet, irrespective of how many nuclear weapons the United States has. Upon analysis, it might prove possible to meet both conditions without the need for significant growth in U.S. nuclear forces. It could also turn out that additional weapons or capabilities will be essential to shape adversary perceptions. But simply increasing the size of the U.S. nuclear arsenal cannot guarantee that both conditions will be met: Deterrence is difficult because it about perceptions and resolve rather than just pure numbers.

This Perspective explores some of the dimensions associated with fulfilling the two conditions in the quantitative and qualitative characteristics of U.S. nuclear forces in the emerging strategic environment. Because of the confluence of emerging challenges from China, Russia, and North Korea, a major reconsideration of policy and planning assumptions for U.S. nuclear forces could be unavoidable. This reevaluation might determine that, to meet its future security needs, the United States needs more or different nuclear weapons compared with those envisioned in the current nuclear force modernization program, but it also might find that the currently planned force will be more than sufficient. Drawing on both historical examples and abstract strategic analysis, I envision counterfactual scenarios to help illustrate how greater numbers might contribute to addressing the strategic challenges that the United States faces. Rather than envisioning plausible futures, these scenarios wish away many of the strategic challenges faced by the United States to illuminate how those challenges impose difficult trade-offs on decision-makers and what more-numerous or more-capable nuclear

weapons could contribute to solving these challenges. This Perspective concludes with some preliminary proposals for how U.S. officials could design a methodology for sizing U.S. nuclear forces in the face of multiple nuclear-armed potential adversaries.

Exploring How Much and What Is Enough

Since the early 1990s, every presidential administration has issued a Nuclear Posture Review (NPR) that articulates its nuclear weapons policy. Along with other key documents, such as the Missile Defense Review and the National Defense Strategy, the NPR outlines how the U.S. government seeks to use its nuclear arsenal to achieve its goals of deterring adversary aggression while assuring allies and partners that the United States will uphold its security guarantees and mitigating the consequences if deterrence should fail. The Biden administration folded its NPR and Missile Defense Review into its National Defense Strategy, releasing all three of them as a unified document in October 2022.⁷

Despite the ideological and policy differences between the Obama, Trump, and Biden administrations, the 2010, 2018, and 2022 NPRs largely agree about the assumptions of U.S. nuclear weapon policy, particularly on the matter of the size and composition of U.S. strategic nuclear forces.⁸ The 2010 Obama administration NPR envisioned a nuclear modernization program that would encompass all three legs of the nuclear “Triad” (bombers, land-based ICBMs, and missile-carrying submarines).⁹ This new force would be sized in accordance with the New START arms control treaty signed with Russia in 2010, which limited Russia and

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the United States to 1,550 treaty-accountable strategic warheads and a total of 700 deployed missiles and bombers for each country. A reserve of additional warheads that could be uploaded onto ballistic missiles and bombers would provide a hedge against unexpected security challenges or technical challenges afflicting some part of the nuclear Triad.¹⁰ Each administration pursued a plan to develop and field new long-range, nuclear-capable bombers; ICBMs; and missile-carrying submarines to replace the legacy platforms inherited from the Cold War. Despite speculation that the Biden administration might seek to scale down the extent of the nuclear modernization program by delaying or canceling the replacement of one or more legs of the Triad, the 2022 NPR ultimately continued what has become a well-established bipartisan, consensus policy.

The most striking difference between the 2010, 2018, and 2022 NPRs is in their attitudes toward low-yield or

substrategic nuclear weapons.¹¹ The New START Treaty does not limit such weapons, and, with the demise of the Intermediate-Range Nuclear Forces Treaty, signed between the Soviet Union and the United States in 1987, there are no longer any international agreements controlling them. Although the United States retired most of its substrategic nuclear weapons after the Cold War, according to the 2022 NPR, “Russia has an active stockpile of up to 2,000 non-strategic nuclear warheads.”¹² The Obama administration’s NPR deemphasized substrategic weapons, but the Trump administration’s NPR announced programs to introduce two new weapons to offset perceived Russian advantages in nonstrategic nuclear weapons: a low-yield version of the W76 warhead designed for the U.S. Navy’s D5 submarine-launched ballistic missile and a new nuclear-capable submarine-launched cruise missile (SLCM-N).¹³ The Biden administration elected to retain the low-yield D5, which had already been deployed in small numbers during the Trump presidency, but the 2022 NPR omitted plans to develop the SLCM-N.¹⁴

The Biden administration’s decision to cancel SLCM-N proved highly controversial, with critics charging that this system or something like it was essential for deterrence and assurance, given Moscow’s aggression in Ukraine and China’s nuclear build-out. Not least among these critics was Admiral Charles Richard, at that time head of U.S. Strategic Command (STRATCOM). Admiral Richard stated in an April 2022 letter to Congress that “[t]he current situation in Ukraine and China’s nuclear trajectory convinces me a deterrence and assurance gap exists.”¹⁵ The STRATCOM chief urged that, “[t]o address this gap, a low-yield, non-ballistic capability to deter and respond without visible generation is necessary to provide a persistent,

survivable, regional capability to deter adversaries, assure allies, provide flexible options, as well as complement existing capabilities.”¹⁶ The Lawrence Livermore National Laboratory study group concurred, warning that

[t]oday’s U.S. nuclear force is, in our judgment, only marginally sufficient to meet today’s requirements. Its primary deficiency is a lack of sufficient limited nuclear response options to deter and respond to adversary limited nuclear escalation in regional wars.¹⁷

The group’s report proposed fielding SLCM-N as one of a spectrum of technical options to make extended deterrence more credible.¹⁸

When do capability gaps, such as the U.S. lack of SLCM-Ns relative to Russia’s considerable stockpile of such weapons, lead to deterrence or assurance gaps that could imperil U.S. national security? Not every capability gap seems to lead to a deterrence or assurance gap. The United States does not have anything like the nuclear-powered transoceanic torpedo or the nuclear-powered ground-launched cruise missile that Russian President Vladimir Putin announced in his March 4, 2018, speech, but neither the American public nor U.S. allies seem to perceive that the United States needs to offset Moscow’s advantage in these systems by developing its own equivalents.¹⁹

Not every deterrence or assurance gap can be remedied by acquiring more or better nuclear weapons. If adversary leaders scoff at the resolve of U.S. decisionmakers, even huge U.S. advantages in the number and quality of the United States’ nuclear weapons might not deter these leaders. Exaggerated rhetoric about ostensible adversary nuclear advantages could greatly enhance the danger of this outcome. As Robert Jervis observed in the early 1980s,

when some argued that the Soviet Union’s advantage in heavy ICBMs had placed the United States on the disadvantageous side of a “throw weight gap,”

Those who argue that the USSR has strategic superiority which can be used for political gains . . . may be helping to produce the timidity that they decry. Their aim is to spur increases in U.S. arms sufficient to produce favorable results in the war-fighting calculations and therefore, they believe, to favorably influence U.S. and Soviet behavior. But if they succeed only partly and convince people that the calculations have real referents but do not convince them to build more missiles, they will have magnified, if not created, the danger that so worries them.²⁰

Decades later, declassified Soviet and U.S. archival documents revealed not only that the supposed Soviet strategic advantage in ICBMs had been illusory but that, in reality, the United States possessed advantages that greatly intimidated Soviet leaders.²¹ Not least of these advantages was a huge U.S. lead in antisubmarine warfare that greatly imperiled the survivability of the sea-based leg of the Soviet Union’s nuclear Triad.²²

It is critical that the United States does not handicap itself in a contest of resolve with its potential adversaries. Maintaining and projecting self-confidence is key to making deterrence credible. When officials proclaim the existence of deterrence and assurance gaps, there is a danger that both foreign audiences and senior U.S. decisionmakers will take them at their word and conclude that the United States does not have “enough.”

One way to explore the extent to which additional nuclear weapons could help resolve the strategic dilemmas that the United States faces is to imagine what the world

would be like if the United States had all the capabilities it wanted. What problems would remain if the United States had warheads, capabilities, and platforms to match any of its potential adversaries? In such a world, so-called capacity gaps that favor other powers, such as Russia's current lead in nonstrategic nuclear weapons, could not exist. Even substantial U.S. advantages in numbers and capacities cannot guarantee that potential adversaries will necessarily be deterred from threatening or engaging in a limited nuclear attack.

The possibility of limited nuclear strikes is one of the most nettlesome problems of nuclear strategy. The United States needs to convince a potential adversary, such as North Korea, China, or Russia, that a limited nuclear attack or the threat of one will fail to attain its goals or will result in consequences that will leave the attacker worse off than before. Possible responses to threatened or actual limited nuclear use can be grouped into four basic categories, which are detailed in the sections that follow. These four approaches are not mutually exclusive; indeed, they are best employed in combination as part of a balanced

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strategy. But they cannot be combined in arbitrary ways: In an improperly designed strategy for countering threatened or actual limited nuclear attack, the different approaches can undermine each other's credibility. Additional nuclear capabilities can be necessary enablers for the desired synergy, but inappropriate investments can also aggravate the potentially catastrophic contradictions.

Approach 1: Threaten Escalation to All-Out Nuclear War

One way to deter adversaries from limited nuclear use is to convince them that escalation cannot be controlled, so limited nuclear war could quickly devolve into an all-out nuclear exchange. This approach has the advantage of being simple and terrifying, but it also suffers from credibility problems. The adversary might reason that it would be irrational to fight a civilization-ending nuclear war in response to an attack that involved only one or a few nuclear weapons.

The classic solution to the problem of making all-out retaliation credible is Thomas Schelling's famous concept of "the threat that leaves something to chance." As Schelling explained in his 1960 book *The Strategy of Conflict*, "The key to these threats is that, though one may or may not carry them out if the threatened party fails to comply, *the final decision is not altogether under the threatener's control.*"²³ As Schelling pointed out, nuclear powers could take steps to undermine their ability to control escalation, such as predelegating authority to use tactical nuclear weapons to battlefield commanders, and make their opponents aware that national leaders could not prevent excessive retaliation even if they wanted to.

The risk of this kind of “threat that leaves something to chance” is that it leaves *everything* to chance by creating a real possibility that accident or miscalculation could result in an apocalypse that no one wanted. To make the threat more credible, nuclear states have to surrender more control and make the strategy more dangerous. Even in the late 1950s, strategic theorists recognized that making a threat bigger—for example, by stockpiling more-destructive weapons in larger numbers—could not be relied on to make acting on that bigger threat by using those weapons an effective deterrent.²⁴ This kind of threatened overkill, if anything, has only become less credible with time.

Approach 2: Retaliate in Kind

A common intuition is that the appropriate response to limited nuclear use is for the United States to respond with equivalent nuclear employment of its own. Proportional retaliation might signal that cheating will be punished but that one is reasonable or fair enough not to attack unless one is provoked.²⁵ The intuitive appeal of such a response is borne out by game theory and computer simulations.²⁶

Despite its commonsensical allure, implementation of a “retaliate in kind” strategy is not at all straightforward when one tries to apply it in the real world. What constitutes a proportionate retaliation to a particular nuclear attack? For example, is it more important that a weapon with similar characteristics be used in the attack—such as in terms of explosive yield or choice of delivery platform—or that the targets be equivalent? It might be necessary not only to match both weapon and target but also to calibrate the amount of damage inflicted in the retaliatory attack to closely parallel the damage caused by the initial strike,

which could prove difficult or impossible. And even if U.S. decisionmakers did their best to choose a weapon-target combination that they believed that the adversary would perceive as proportional, the adversary might characterize the retaliatory strike as an escalatory act regardless. Indeed, adversaries have incentives to act as though they interpret U.S. retaliation as disproportionate even if they do not perceive it as such.

Approach 3: Up the Ante

Another strategy for responding to threatened or actual provocations encountered both in theory and in practice is that of always escalating in the belief that doing so will impress on the opponent that one has greater resolve. The presumed existence of players with this strategy was an important assumption in Robert Powell’s game-theoretic analyses of limited nuclear use, in which rational players tried to convince their rivals to capitulate by convincing those rivals that they were willing to climb the escalation ladder while discounting the risks of doing so.²⁷

Herman Kahn’s concept of “escalation dominance” can be characterized as a more sophisticated and nuanced variant of this same idea. In this concept, the aim is to make threats to engage in escalation in response to adversary provocation credible by creating the impression in the mind of adversary decisionmakers that U.S. leaders believe that they can prevail at higher levels of conflict. Kahn emphasized that perceptions and resolve were just as important for escalation dominance as technical capabilities. “One variable affecting escalation dominance,” he explained, “is each side’s relative fear of eruption [meaning the outbreak of all-out thermonuclear war]. That side that

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has least to lose by eruption, or fears eruption the least, will automatically have an element of escalation dominance.”²⁸ Kahn proposed that nuclear powers could try to convince their adversaries that they believed they had a “credible first strike capability” and might be able to prevail in all-out nuclear war.²⁹

The advantage of these “up the ante” strategies is that they credibly signal resolve to sensible opponents. Powell’s game-theoretic analyses found that players with a greater willingness to escalate would be expected to prevail over more-cautious, rational opponents.³⁰ These strategies might also offer advantages for enhancing the credibility of extended deterrence. But they also come with great risks and credibility problems. The strategy only works if the resolve of one’s opponent wavers. If both sides try to out-escalate each other, the ultimate result is total catastrophe. The kind of escalation dominance championed by Kahn seems likely to require not only parity with adversary weapons but also substantial overmatch that will probably

be economically unaffordable or beyond the capabilities of available technology. Even if one has all the requisite forces, the problem remains of convincing adversaries and allies of one’s resolve before conflict begins. How can one prove to rivals and partners that one’s resolve will not falter before that resolve has been tested? Additional capabilities can provide more ways of signaling resolve but cannot make up for resolve one does not actually have.

Approach 4: Stay the Course

Responding to adversary limited nuclear use by matching it with a similar attack or escalating to some higher level of conflict are not the only options. There is always the possibility of retaliating with a smaller or even no counterattack. Done properly, this sort of response can demonstrate will rather than signaling weakness. As Schelling mused in his 1966 book *Arms and Influence*, “[t]he appropriate strategy for showing resolve, firmness, endurance, contempt, and righteousness, is not an easy one to determine. The cold-blooded *acceptance* of pain might be just as impressive as the cold-blooded infliction of it.”³¹

One way that the United States might implement this strategy in practice would be to retaliate to a limited nuclear attack using conventional means. This possibility was reportedly investigated in a 2016 National Security Council wargame that explored possible responses to a Russian low-yield nuclear attack in the context of a conflict in Eastern Europe between North Atlantic Treaty Organization (NATO) countries and Russia. The game participants concluded that, so long as NATO retained its conventional military advantages and U.S. nuclear retaliation would not improve the speed or likelihood of NATO

victory, then it would be preferable to continue conventional operations against Russia and retain the moral high ground rather than responding with nuclear retaliation.³²

Like upping the ante, the goal of a “stay the course” strategy is to convince the adversary of one’s resolve, although the means of doing so are reversed. The strategy has some very appealing features. It seems compatible with the desire to reduce reliance on nuclear weapons and could even devalue adversary nuclear-use options by creating a more robust conventional force that could continue to fight in the aftermath of a limited nuclear strike. This approach is also a readily available default that might not require investment in costly new military capabilities. But, similar to the other three approaches, the “stay the course” strategy suffers from credibility problems. How are adversaries and allies supposed to distinguish inaction from irresolution or weakness? One way to make the difference clear is to try and ensure that conventional military operations proceed effectively even after a limited nuclear attack by the adversary. But this is easier said than done. If the limited nuclear strike destroys essential enablers of ongoing conventional operations, then continuing those operations might prove impossible. Substantial investment in making conventional capabilities more resilient to limited nuclear attack might be essential to bolster the credibility of this approach with adversaries and allies.

None of the four approaches provides a comprehensive solution to the problem of deterring or responding to threatened or actual adversary limited nuclear use. Each of them has credibility and implementation issues, but these challenges vary in both degree and kind across the four approaches. In practice, it is impossible to avoid crossover between the four concepts—for example, any

form of nuclear retaliation (approaches 2 and 3) inevitably brings with it some possibility of uncontrolled escalation (approach 1).

Therefore, it is best to plan on a combination of the four strategies, signaling to different stakeholders that different approaches will be used in different ways under different circumstances. Combining strategies was the essence of the “flexible response” policy adopted by NATO to deter the Warsaw Pact in Europe during the Cold War. NATO allies disagreed about which of the four strategies they preferred for responding to a Soviet attack, so they split the difference to make different threats credible to different audiences at different times.³³ However, just because the four approaches can and should be deployed in combination does not mean that they can be combined arbitrarily. It is also possible to combine the four approaches in a way in which each strategy undermines the others rather than reinforcing their strengths.

Nor is it possible to employ the four approaches today in the same combination as the United States and its NATO allies did against the Warsaw Pact. In particular, it is far more difficult to make the threat of uncontrolled all-out escalation credible today than it was in Central Europe during the Cold War because Soviet nuclear strategy and doctrine played a key role in making that threat credible. The United States and NATO deployed battlefield and theater nuclear weapons to West Germany to ensure that a Warsaw Pact invasion would swiftly encounter nuclear-armed resistance. NATO doctrine called for first use of those substrategic nuclear weapons, if necessary, to impede the Soviet advance.³⁴ Official Soviet military doctrine in the 1960s and 1970s, however, dismissed the possibility of a controlled, limited nuclear war, asserting instead that

“any armed conflict will inevitably escalate into a general nuclear war if the nuclear powers are drawn into this conflict.” Soviet strategists promised that nuclear war in Europe would “immediately be transferred to the territory of the United States of America. All weapons—ICBMs, missiles from submarines, and other strategic weapons—will be used in this military conflict.”³⁵ If the Soviets kept their word, limited nuclear use in Europe would act as the fuse that sparked off global thermonuclear war. By contrast, post-Soviet Russian and contemporary Chinese nuclear strategy do not make this kind of commitment to automatic escalation, rendering threats that leave something to chance far harder to make credible today than they were half a century ago.

The way in which additional capabilities, such as SLCM-N, would affect the U.S. ability to respond to possible or actual limited nuclear attack would depend on how these capabilities shaped these positive and negative interactions between the four approaches. A common argument in favor of SLCM-N is that Russia has a sizable stockpile of similar weapons, such as the nuclear-capable Kalibr submarine-launched cruise missile (SLCM). Many commentators envision a scenario in which Russia uses one or a few of these weapons to mount a nuclear demonstration shot or limited attack, reasoning that Russian leaders would feel that Russia would be relatively safe from U.S. and NATO retaliation because the United States lacks similar weapons with which to retaliate. They argue, plausibly, that the threat of all-out war (approach 1) would lack sufficient credibility to deter Russian decisionmakers, and these commentators anticipate that U.S. leaders would refrain from retaliation with a disproportionately larger nuclear weapons or larger numbers of nuclear weapons

(approach 3) out of fear of escalation risk. Therefore, they conclude that some kind of “proportionate” nuclear attack using a similar weapon to that used in the initial strike (approach 2) is the sole viable approach. Such a capability as SLCM-N might make it easier to enact this “retaliate in kind” strategy.

Although this line of argument is internally consistent, it discounts the extent to which simply introducing additional capabilities cannot overcome all the obstacles to the “retaliate in kind” strategy. A major problem is that an appropriate target for the retaliatory strike might not exist, or U.S. leaders might not want to retaliate against a similar target for ethical or other reasons. For instance, if the initial attack caused many civilian deaths, U.S. officials might not want to sully themselves by committing an equivalent act.³⁶ Alternatively, it might be the case that an attack on an equivalent target would place allies and partners at unacceptable risk.

The tyranny of geography remains an acute problem in the contemporary strategic environment, just as in past centuries. Unlike the Soviet Union, which had many satellite socialist states that hosted parts of its military infrastructure, the PRC, Russia, and North Korea are largely friendless countries whose significant military assets are mostly based within their homelands.³⁷ The United States and NATO, by contrast, have many facilities that contribute to their conventional military might that are located outside the territories of nuclear weapon states. These military facilities might be targets for a limited nuclear strike; the attacker could reason that the United States will not retaliate against a similar target located in the attacker’s homeland because a homeland strike would risk being too escalatory. This dilemma arose in another

iteration of the 2016 National Security Council game held a few months after the previously mentioned game. In this game, the players concluded that limited nuclear use by Russia demanded a U.S. nuclear response because of perceived risks to Washington's credibility with its foreign partners. But, fearing that retaliation against the Russian enclave of Kaliningrad would elicit a Russian attack against the U.S. homeland and that attacking Russian forces on NATO territory would kill allied civilians, players "settled on firing a few nuclear weapons at the former Soviet republic of Belarus, even though, in the game, it had played no role in Russia's incursion into the Baltics or in the nuclear strike."³⁸ Additional nuclear capabilities, such as SLCM-N, cannot make the "retaliate in kind" strategy viable in the absence of appropriate targets to strike.

Capabilities, such as SLCM-N, might undermine the strategy of upping the ante by making the prospect of unintended escalation to all-out war less plausible. If the United States has few or no appropriate weapons for proportional retaliation to limited nuclear use, adversary leaders have to grapple with the possibility that their U.S. counterparts will feel so compelled to mount a nuclear response to limited nuclear attack that they employ a disproportionately large (i.e., strategic) nuclear weapon in retaliation. Adversary leaders might plausibly conclude that such disproportionate retaliation was unlikely, but they would need to account for the greater damage it might cause and greater associated escalation risks. Their thinking might be as follows: "If I use a low-yield nuclear weapon and the only two options that the U.S. leaders perceive they have are to look weak and not respond or to retaliate using a strategic nuclear weapon because that is all they have, there is a pos-

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sibility that they will choose the latter. Even if it is unlikely, it could be so dangerous to me that I should not risk it."

With additional lower-yield nuclear weapons, adversary leaders might conclude that, although U.S. nuclear retaliation was more probable, the foreseeable consequences of that retaliation were likely to be more manageable for them. Depending on the adversary's risk calculus, it might be *more* likely, rather than less, to gamble on limited nuclear use if the United States had more capabilities, such as SLCM-N, at its disposal.³⁹ Now adversary leadership thinking might change to: "If I use a low-yield nuclear weapon, the United States will almost certainly use a similar low-yield weapon to retaliate. I am ready to accept the consequences of low-yield nuclear strikes, so I am tempted to attempt a limited nuclear attack to neutralize U.S. conventional military advantages."

Finally, depending on their characteristics, additional nuclear capabilities might undermine the strategy of showing resolve by accepting pain or might deprive the U.S. President of free rein to exploit U.S. conventional capabilities. During a confrontation with another nuclear power, U.S. decisionmakers might feel it necessary to maximize

the probability that the adversary can distinguish non-nuclear attacks from nuclear ones to tamp down escalation risk. If the United States introduces nuclear-capable weapons to its arsenal that appear similar to its conventional weapons, then the President might feel compelled not to use those conventional weapons for fear that they will be misinterpreted as a nuclear attack. The President might reason, “I would like to use nonnuclear Tomahawk SLCMs to attack adversary targets, but those missiles and the SLCM-N look the same to adversary radars. Since the enemy has threatened to retaliate immediately if they detect an ongoing U.S. nuclear attack, I cannot risk using the Tomahawks.” This problem becomes particularly acute in the context of the strategy of convincing the adversary of one’s resolve by continuing conventional operations after a limited nuclear attack. If the indicators available to the enemy of a continuing conventional strike campaign and a limited nuclear retaliation are the same, how is the enemy supposed to be able to tell the difference?⁴⁰

As these examples illustrate, additional nuclear capabilities can help deter adversaries from threatened or actual limited nuclear use and might be necessary, but they are not a panacea and can sometimes backfire. It is a mistake to assume that additional nuclear capabilities can substitute for resolve or that they will necessarily alter adversary perceptions to make limited nuclear use appear less attractive to an adversary. Ill-adapted combinations of capabilities and capacities can work at cross-purposes and undermine the balance of a strategy for countering adversary limited nuclear use. Establishing such a balance is all the more important—and more complicated—in an increasingly multipolar strategic environment.

How Does Multipolarity Change How Much Is Enough?

In August 2022, STRATCOM Commander Admiral Charles Richard announced that “[t]he global security environment is now today a three-party nuclear peer reality” and admitted that he was “not sure what strategic stability looks like in a three-party world.”⁴¹ Richard compared the emerging nuclear competition with the infamously unpredictable three-body problem in physics.⁴² The following month, Richard warned that “Russia and China can escalate to any level of violence that they choose in any domain with any instrument of power worldwide.”⁴³ The following year, a study drew a more sanguine distinction between an “emerging two near-peer problem” posed by China’s new fields of ICBM silos and an “emerged two-peer problem” that could materialize if Beijing continues to expand its nuclear forces after the silos are completed.⁴⁴

These formulations both overstate and understate the current and emerging challenges facing the United States in the nuclear arena. First, despite impressive ongoing growth in the PRC’s nuclear arsenal, it is generous at this time to grant the PRC peer or even near-peer status with the United States and Russia in that domain. The most recent U.S. Department of Defense China Military Power Report estimated that “China’s operational nuclear warheads stockpile has surpassed 400.”⁴⁵ This figure is similar to open-source estimates of the size of the Chinese nuclear stockpile from 20 years ago, yet those analyses did not cause anyone to attribute nuclear near-peer status to Beijing.⁴⁶ Even if the PRC’s leaders aspire to comprehensive parity in nuclear capabilities with Washington and Moscow, they might encounter unforeseen obstacles that

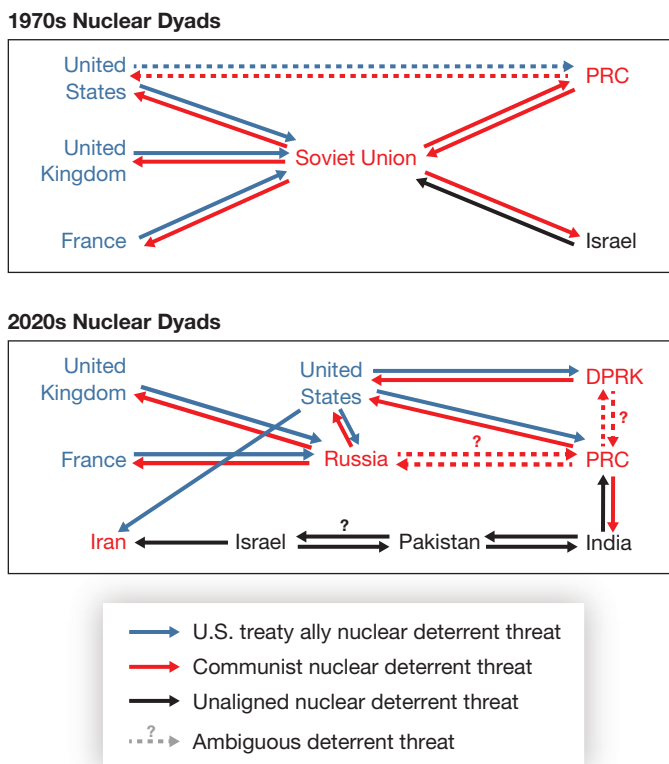
slow the pace of their ongoing build-out. The United States should not grant nuclear peer status to the PRC that it has yet to earn.

But the problems facing the United States and its allies are also worse than the “tripolar” or “three-body” formulation suggests, because the United States and the PRC are also entangled in other nuclear dyads. In contrast to the comparatively straightforward Cold War world, in which

every nuclear weapon state other than the Soviet Union perceived the Soviet regime as its primary adversary, today there are more nuclear weapon states and additional dyads that interact indirectly with one another (see Figure 1).

To give an example, the PRC has an active territorial dispute with India, and New Delhi is gradually improving its nuclear arsenal. This PRC-Indian nuclear dyad indirectly affects the U.S.-PRC nuclear relationship: Resources that

FIGURE 1
Nuclear Dyads in the 1970s and 2020s



the PRC devotes to its standoff with India might not be available for competition with the United States, or India might feel the need to increase its own nuclear arsenal to avoid an unacceptable PRC advantage in nuclear weapons, spurring the PRC to accelerate the expansion of its nuclear forces even further. In some cases, it is unclear whether a hostile nuclear relationship even exists between two states. For instance, do Russia and the PRC still perceive of each other as possible adversaries in a nuclear exchange, given their increasing security and economic cooperation in recent years?

In particular, the emergence of North Korea as a kind of nuclear “super-rogue” poses serious challenges that might be qualitatively distinct from those caused by the PRC’s build-out of its nuclear arsenal. Although the Democratic People’s Republic of Korea’s (DPRK’s) nuclear arsenal is still small, the technological sophistication of Pyongyang’s warheads and missiles has improved much more rapidly than most analysts anticipated, given North Korea’s poverty and isolation.⁴⁷ North Korea’s test of a solid-fueled road-mobile ICBM promises to make that country’s nuclear weapons much more of a credible threat to the U.S. homeland.⁴⁸

A key difference between the essentially bilateral Cold War nuclear order and the emerging multipolar nuclear environment is that potential adversaries need to take into account how these multiple dyads affect their rivals’ decision calculi. To give a concrete example, how do Russian, PRC, and North Korean leaders perceive the prospect that the United States might not have enough nuclear weapons to target both Russian and future expanded PRC nuclear strategic forces simultaneously? It is entirely conceivable that none of these officials perceives that they can get

away with provocative behavior that they could not before because the U.S. nuclear arsenal is cross-pressured in this way. But particularly if U.S. officials proclaim that they do not have “enough” for assurance and deterrence, adversary leaders might perceive that they have an exploitable advantage in resolve.

This problem is not just hypothetical. After the launch of Sputnik in 1957, many American analysts, politicians, and pundits perceived that the Soviet Union had a decisive lead in ballistic missile technology. In reality, that missile gap was an illusion, but its detrimental effect on Western self-confidence was real.⁴⁹ Soviet Premier Nikita Khrushchev sought to exploit his country’s illusory lead in missiles to secure gains for the Socialist Bloc by attempting to force a resolution of the status of West Berlin in the Communists’ favor. Although Khrushchev’s Berlin gambit ended in humiliating failure, the 1961 Berlin Crisis brought the superpowers to the brink of thermonuclear war.⁵⁰

One way to understand how increasing nuclear multipolarity complicates the strategic dilemmas that the United States faces is to imagine what the world would be like if this multipolarity did not exist. What would be different if the United States could focus all of its attention and strategic resources on each one of the potential adversaries, rather than having to divide them between Russia, the PRC, and North Korea? For example, let us suppose that, in each case, the other two countries experienced sudden changes in governmental philosophy, joined the 2017 Treaty on the Prohibition of Nuclear Weapons, and destroyed their nuclear arsenals, leaving the United States with just one nuclear-armed potential opponent. Such a scenario is not at all realistic, but it is illustrative as a thought experiment.

Russia-Only Scenario

The Russia-only scenario is familiar, because it is basically a return to the familiar Cold War world. Moreover, as the nuclear force modernization program that the United States has pursued since the Obama administration was designed around the assumption that Russia would remain the sole peer nuclear adversary, the United States would need few adaptations to optimize its nuclear resources to counter those of Moscow. It is also notable that the resources liberated by not needing to worry about potential nuclear conflict with the PRC and North Korea do not seem to be adequate to fundamentally alter the strategic relationship between the United States and Russia. Moscow's nuclear arsenal is sufficiently large and sophisticated that the United States has little hope of securing comprehensive escalation dominance or primacy over it.

People's Republic of China-Only Scenario

In a world in which Russia was no longer a potential nuclear adversary and China built its nuclear arsenal up to full parity with the United States, Washington might want a very different nuclear force composition from what it has at present. The extant U.S. nuclear force was designed to target the Soviet Union, and large parts can only target China inefficiently or not at all. For instance, U.S. missile submarines based in the Atlantic Ocean might be superfluous in this scenario. The U.S. silo-based ICBM force was designed to attack targets in the Soviet Union. Silos optimized to threaten PRC targets might be located in different locations to make the most of the missiles' available range. Depending on the evolution of the PRC target system, American analysts might find that relative proportions of

the U.S. nuclear Triad would benefit from adjustment (for instance, by buying more submarines and fewer ICBMs or vice versa).

Whether the strategic relationship between the United States and the PRC would be meaningfully different in this PRC-only scenario from how it is in reality would depend on the evolution of Beijing's strategic nuclear forces. If the PRC's nuclear build-out falters, leaving it with the kind of arsenal it possesses in 2023, then the United States might maintain some hope of attaining escalation dominance or primacy over the PRC, particularly given that Washington could focus its budget and institutional attention on this goal. But as the PRC grows its nuclear arsenal, fields more-survivable strategic nuclear platforms, and possibly alters its alert posture, the prospect that the United States could evade mutual vulnerability grows ever more distant.⁵¹ Once Beijing reaches a sufficient fraction of nuclear parity with the United States, the PRC-only case becomes similar to the Russia-only case.

North Korea-Only Scenario

The North Korea-only scenario, by contrast, is much more illuminating in that it highlights how preparing for potential conflict with North Korea is not a lesser included case of deterring a nuclear peer. The 2022 NPR states unequivocally that “[a]ny nuclear attack by North Korea against the United States or its Allies and partners is unacceptable and will result in the end of that regime. There is no scenario in which the Kim regime could employ nuclear weapons and survive.”⁵² South Korea also plans to eliminate the North Korean leadership by conventional means in the aftermath of nuclear employment by the DPRK.⁵³ These poli-

The assumption is not that the Kims are somehow irrational or crazy but that they face rational incentives that could make them undeterrable in a scenario in which their regime is imploding.

cies of explicitly threatening the North Korean leadership seek to deter Pyongyang from engaging in nuclear first use, but they might create serious obstacles to escalation control once a conflict is already underway. These policies also remove incentives for restraint should the rulers of North Korea perceive that their regime is likely to collapse anyway, which is all too plausible given the country's modest economy and conventional-military weakness.⁵⁴ Because losing power is almost certain to end in death in any case, North Korea's leaders might perceive that they have nothing to lose by using every weapon available to them to try to intimidate their adversaries into acceptance of their continued rule over North Korea.⁵⁵ The assumption is not that the Kims are somehow irrational or crazy

but that they face rational incentives that could make them undeterrable in a scenario in which their regime is imploding.

The threat of strikes against North Korean leaders only exacerbates the risk of accidental or unauthorized nuclear use because it leaves them few reasons to show restraint in a conflict. To make the counterleadership strategy credible, the United States needs to be able to deprive the North Korean regime of its weapons while simultaneously targeting its rulers. Even though the North Korean nuclear arsenal is relatively small in terms of the total number of weapons, locating and destroying those weapons before they could be used stands to be extremely challenging and could demand that the United States expend large amounts of military resources. Moreover, whatever the United States does needs to be compatible with South Korean planning for a possible conflict with North Korea and with the concerns of other regional allies, such as Japan. Plans for counterforce and counterleadership attacks on North Korea might be the best available means of deterring Pyongyang from nuclear first use, but they also come with associated inadvertent escalation risks. For example, these plans incentivize the DPRK to implement "more delegative C2 [command and control] procedures to overcome vulnerabilities and thereby increase the risk of accidental or unauthorized nuclear use. The threat of strikes against North Korean leaders only exacerbates these risks, because it leaves them few reasons to show restraint in a conflict."⁵⁶

To optimize the U.S. arsenal for counterforce disarming strikes against the DPRK and counterleadership strikes against its rulers, the United States would likely want a very different nuclear arsenal from the one it has procured for deterring Russia and China. The United States might

also develop very different enabling capabilities, such as loitering munitions designed to target missile launchers or boost-phase interceptors that would lack effectiveness against Russian or Chinese forces because of their more-advanced technology and more-favorable geography.⁵⁷ To hold North Korean leaders under threat of personal annihilation, the United States might seek to develop dedicated nuclear bunker-buster weapons tailored to DPRK geology.⁵⁸ In reality, competing priorities and concerns about strategic stability with Russia and China have discouraged the United States from emphasizing these capabilities in its defense procurement.

The United States faces significant cross-pressures because of the multipolar strategic environment. As a result of these pressures, the United States cannot design and operate its strategic nuclear forces to be optimal against all potential adversaries. Because of resource constraints, striking effective balances between these competing demands is all the more critical.

The Double Mirror

The ultimate determinant of whether the United States has “enough” for deterrence is not numbers and types of nuclear weapons but the perceptions of its potential adversaries. Their leaders have to perceive that the United States has “enough” to deter them, however they define “enough,” and they must also perceive that U.S. officials believe that they have “enough” not to lose their resolve and succumb to blackmail or coercion in the context of a crisis.

Assessments of whether U.S. nuclear capability is sufficient must account for how adversaries perceive that nuclear third parties affect U.S. resolve. For example, might

Russian leaders perceive that the United States would refrain from responding to provocation because they anticipate that U.S. leaders will be afraid to expend too many resources in a U.S.-Russia conflict for fear that doing so could weaken the United States too much relative to China?

To determine how to develop a sufficient, economical U.S. nuclear force, it is necessary to design a methodology to translate the available information about adversary perceptions of U.S. nuclear capabilities into qualitative and quantitative criteria that can be used to guide procurement decisions. One possible way to do so is to estimate how the sufficiency criteria employed by an adversary in its planning to deter the United States would map back onto that adversary, as well as how that adversary perceives U.S. requirements and Washington’s ability to meet those requirements. This dynamic could be termed the *double mirror*, because it seeks to reflect adversary conceptions of sufficiency back onto that adversary and to understand how U.S. requirements are understood through the lens of adversary perceptions. In a multipolar environment, the United States could seek to meet both of these criteria against all nuclear-armed potential opponents. Fortunately, the United States can wield significant influence in shaping how adversary leaders perceive whether their counterparts in Washington believe that the United States has “enough” to deter, stand up to blackmail, or retaliate to provocation.

Meeting this double mirror criterion might not require that many nuclear weapons, even when facing down a nuclear peer. For example, enough information is available about Russian strategists’ thinking about nuclear sufficiency to reach a rough estimate of the forces needed for both double mirror criteria. Since the late Soviet period, Russia has planned its nuclear forces to be able to

inflict “unacceptable damage” on its adversaries in the most-extreme scenarios.⁵⁹ Historically, this “unacceptable damage” requirement was defined in terms of cumulative megatonnage delivered to the U.S. homeland, and using open-source Russian discussions, this requirement appears to have remained about the same or has been reduced somewhat since the 1980s.⁶⁰ Meanwhile, Russian strategists have scrutinized and characterized the evolution of U.S. sufficiency requirements over the decades. Table 1 summarizes some of this information, which appears sufficient to estimate what U.S. nuclear forces need to be able to do to meet both of the double mirror criteria. First, if Russian strategists believe that their country needs to be able to deliver nuclear warheads that total 50–150 mega-

tons of yield to the U.S. homeland under the most-extreme circumstances, then the United States needs to be able to threaten a retaliatory strike of similar total yield on Russian territory.⁶¹ (Note that the Russian criteria do not make any distinctions about what this strike would be targeted against, only the total delivered megatonnage.) Second, Russian analysts apparently perceive that U.S. leaders believe that a retaliation of a few score weapons would be enough to impose “unacceptable damage” on Russia.⁶² If these insights are correct, the total U.S. force needed to meet both of the double mirror criteria against Russia, which has a larger nuclear arsenal than the United States, is relatively manageable—the equivalent of the missiles carried aboard a few submarines.

TABLE 1
Proposed U.S. and Soviet Nuclear Sufficiency Requirements

Source of Proposal	Classification Type	Parameter	Consequence
Robert McNamara, Alain Enthoven	Destruction of society and economy	<ul style="list-style-type: none"> • Delivery of at least 400 1-megaton warheads to the Soviet Union 	20% to 30% loss of population and 50% to 70% loss of industry (“assured destruction”)
McGeorge Bundy	Number of destroyed targets	<ul style="list-style-type: none"> • Destruction of one to ten cities 	“Unacceptable damage”
Harold Brown	Number of warheads	<ul style="list-style-type: none"> • 200 delivered warheads (with respect to the Soviet Union) 	Nation ceases to be viable by 20th-century standards (“assured destruction”)
1980s Soviet studies	Destruction of society, economy, military potential, and administrative-political system	<ul style="list-style-type: none"> • 45% to 55% of industrial production capacity • 25% to 30% loss of population • Loss of 100 to 130 administrative-political and military targets 	Functioning of target state as organized political and socioeconomic system interrupted for at least 15 years
Soviet “unacceptable damage” requirement (circa 1990)	Gross megatonnage	<ul style="list-style-type: none"> • Delivery of 150 megatons to adversary homeland 	“Unacceptable damage”

SOURCES: Adapted from Burenok and Pechatnov, *Strategic Deterrence [Strategicheskoe sderzhivanie]*, with additional material from Andriushin, Chernyshev, and Iudin, *Taming the Nucleus [Ukroshchenie iadra]*.

It seems plausible that meeting the double mirror criteria against China and North Korea would not require vastly more weapons than for Russia. At present, Chinese and North Korean thinking on these matters is insufficiently understood, not least because both countries seem to be in the process of rethinking their nuclear strategies.⁶³ Once the same kind of scrutiny that the United States used to glean its understanding of the USSR and Russia is applied against the PRC and DPRK, however, the United States might gain similar understanding of how those countries determine how much is enough for nuclear deterrence.

The double mirror could be characterized as a logical evolution of the concept of “tailored deterrence,” which is now a long-standing feature of U.S. nuclear strategy. According to the 2022 NPR, “Central to U.S. deterrence strategy is the credibility of our nuclear forces to hold at risk what adversary leaders value most. Effectively deterring—and restoring deterrence if necessary—requires tailored strategies for potential adversaries that reflect our best understanding of their decision-making and perceptions.”⁶⁴ The idea of tailoring deterrence to adversary perceptions is more important than ever in the multipolar emerging strategic environment, but because of finite U.S. resources and more adversary threats, it is essential to find ways to make tailored deterrence more efficient. Historically, the United States has sought to tailor deterrence by estimating what adversary leaders value on the basis of available intelligence information, developing a target set on the basis of those assessed values, and then designing a force that is credible to threaten those targets on the basis of U.S. analytical criteria. Adversary leaders might conceivably fail to understand that the force designed by the United States posed a threat to what they

valued (for instance, if they assessed the vulnerability of those targets using a different methodology than their U.S. counterparts); however, there is also a danger that the way in which the United States implemented tailored deterrence in the past could result in calls for excessive nuclear forces from stakeholders. In the current multipolar and resource-constrained environment, the United States cannot try to make up for prevailing uncertainties with nuclear overkill.

The argument here is not that the United States ought to modify its nuclear employment policy to emulate those of its potential adversaries. As the most recent *Report on the Nuclear Employment Strategy of the United States* explains, “U.S. nuclear planning and targeting adhere to the laws of armed conflict. The United States has for decades rejected a deterrence strategy based on purposely threatening civilian populations, and the United States will not intentionally target civilian populations.”⁶⁵ The United States should only plan to use its nuclear weapons in ways that accord to its own laws, regulations, and ethics.⁶⁶ The idea is that the United States should have “enough” that it could meet its potential adversaries’ sufficiency requirements if U.S. leaders decided to respond in kind to a large-scale nuclear attack from that opponent. Because Russia, China, and North Korea all appear to use counterpopulation targeting as part of their sufficiency criteria for sizing their nuclear forces, and counterpopulation targeting generally requires fewer weapons than current U.S. nuclear employment objectives, at present the United States likely does not need additional weapons to meet this aspect of the double mirror. However, this could change in the future if, for instance, one of the potential adversaries reformed its nuclear sufficiency criteria in a way that increased the

The emerging strategic environment poses challenges that are in some ways worse than those of the Cold War nuclear arms race.

number of nuclear warheads that the United States would need to emulate its employment policy.

What is the worst-case scenario that the United States ought to account for when designing its nuclear forces, given that it now faces multiple potential adversaries that it might need to fight simultaneously or in succession? The case in which the United States faces adversaries in succession could be far more challenging than that in which all adversaries team up against the United States; those states that did not participate in earlier rounds of conflict would have the opportunity to do damage assessment of degraded U.S. nuclear command, control, and communications (NC3) and retaliatory assets, which they could then use to exploit revealed U.S. vulnerabilities using their own intact forces.

Not every possible sequence of adversaries seems equally relevant. In particular, the DPRK lacks the resources to detect and exploit emergent vulnerabilities in

U.S. retaliatory capabilities. Therefore, it seems that it will probably only be necessary to plan for cases with all three adversaries in which North Korea is the first opponent that the United States faces.

Possible Implications

No matter how many nuclear weapons the United States decides it needs, there are qualitative criteria that the U.S. nuclear deterrent must have in the multipolar strategic environment. In light of possible iterated war scenarios, resilient and enduring NC3 is at a high premium, as is an adaptive planning capability. NC3 and adaptive planning offer key examples of qualitative enablers that the United States ought to invest in irrespective of the size of its nuclear forces, as well as areas of the U.S. nuclear weapon enterprise that might have suffered from neglect. John R. Harvey and John K. Warden prognosticate that

[m]odern conflict will also drive changes to support more flexible adaptive planning and force execution. Responding to limited nuclear first use against U.S. forces or allies could require development of a new strike option tailored to the specific scenario at hand, upload of targeting coordinates to weapons systems computers, execution by one or more U.S. nuclear delivery systems, and reporting back on damage assessment. The process of situation assessment, course of action development and evaluation, and execution will all have to occur within a constrained time window, in coordination with key allies and partners, and in a way that is fully aligned with ongoing conventional military operations. *This exceeds capabilities and processes in place today and*

will drive a much closer integration of mission planning with NC2 [nuclear command and control].⁶⁷

Former STRATCOM Commander Robert Kehler echoes these concerns, warning that “[w]ithout the necessary investments and improvements, the NCCS [Nuclear Command and Control System] will become the Achilles’ heel of the nuclear deterrent.”⁶⁸

The emerging strategic environment poses challenges that are in some ways worse than those of the Cold War nuclear arms race. Not the least of these challenges is the emergence of North Korea as a kind of nuclear “super-rogue” that combines a small but remarkably sophisticated nuclear arsenal with a leadership that might not be deterrable in the same sense as the leadership of Russia and the PRC. If the United States decides to continue its policy of threatening to disarm and decapitate the North Korean regime if it uses its nuclear weapons, the requisite operational capabilities might place similar or even greater qualitative demands on the U.S. nuclear arsenal than the mission of deterring Russia and China.

Even if China builds up to nuclear parity with the United States and Russia, if PRC leaders do not perceive that the United States needs a larger retaliatory capability to deter them than to deter Russian leaders, the United

States will not need to expand its nuclear arsenal back to its Cold War size to maintain a credible deterrent against both Moscow and Beijing. Russian and PRC leaders are likely to perceive that a few submarines’ worth of missiles will be more than sufficient to inflict “unacceptable damage” on either state. But ensuring this “minimal” retaliation might require that the United States acquire many more than that number of warheads and delivery systems to hedge against such possibilities as unanticipated technical faults, accidents, programmatic failure, and enemy action.

There is also a possibility that intelligence analysis could determine that adversary leaders perceive a gap between what nuclear weapons the United States has and what they feel would be sufficient to deter them. In that case, the United States might opt to expand its nuclear stockpile. But the United States and its allies might instead undertake a campaign to influence adversary perceptions to convince those leaders that in fact Washington does have “enough.” Such a campaign could include placing emphasis on superior U.S. technologies as amplifiers of U.S. nuclear deterrence capabilities, calling attention to U.S. conventional options, or performing influence operations to reshape the anxieties of adversary leaders about their own military capabilities.

Notes

¹ John F. Kennedy regularly commented in speeches during his 1960 presidential campaign that the country needed a nuclear capacity “second to none” (Kennedy, transcription of speech at the Sheraton Park Hotel). A *lesser included case* is a problem that is sufficiently trivial relative to the larger problem at hand that it does not require significant additional dedicated resources or planning efforts.

² Center for Global Security Research, Lawrence Livermore National Laboratory, *China’s Emergence as a Second Nuclear Peer*, pp. 34, 41.

³ Lieber and Press, *U.S. Strategy and Force Posture for an Era of Nuclear Tripolarity*, p. 1.

⁴ Lieber and Press, *U.S. Strategy and Force Posture for an Era of Nuclear Tripolarity*.

⁵ Geist and Massicot, “Understanding Putin’s Nuclear ‘Superweapons’”; Karaganov, “By Using Its Nuclear Weapons, Russia Could Save Humanity from a Global Catastrophe”; U.S. Department of State, “Russian Noncompliance with and Invalid Suspension of the New START Treaty.”

⁶ Kristensen and Korda, “North Korean Nuclear Weapons, 2022.”

⁷ U.S. Department of Defense, *2022 National Defense Strategy of the United States of America*.

⁸ U.S. Department of Defense, *Nuclear Posture Review Report*; U.S. Department of Defense, *Nuclear Posture Review*; U.S. Department of Defense, *2022 National Defense Strategy of the United States of America*.

⁹ Office of the Secretary of Defense for Nuclear Matters, *Nuclear Matters Handbook*, pp. 31–40.

¹⁰ U.S. Congressional Budget Office, *The Potential Costs of Expanding U.S. Strategic Nuclear Forces If the New START Treaty Expires*.

¹¹ *Low-yield or substrategic nuclear weapons* are nuclear weapons that have lower explosive yield than typical strategic warheads, delivery systems that are not counted as “strategic” under such arms control agreements as New START because they lack the requisite range, or both.

¹² U.S. Department of Defense, *2022 National Defense Strategy of the United States of America*, p. 4.

¹³ U.S. Department of Defense, *2022 National Defense Strategy of the United States of America*.

¹⁴ U.S. Department of Defense, *Nuclear Posture Review Report*; U.S. Department of Defense, *Nuclear Posture Review*.

¹⁵ Gould, “US Strategic Command Chief: Sea Missile Cancellation Opens ‘Deterrence and Assurance Gap.’”

¹⁶ Gould, “US Strategic Command Chief: Sea Missile Cancellation Opens ‘Deterrence and Assurance Gap.’”

¹⁷ Center for Global Security Research, Lawrence Livermore National Laboratory, *China’s Emergence as a Second Nuclear Peer*, p. 66.

¹⁸ Center for Global Security Research, Lawrence Livermore National Laboratory, *China’s Emergence as a Second Nuclear Peer*, p. 49.

¹⁹ Geist and Massicot, “Understanding Putin’s Nuclear ‘Superweapons.’”

²⁰ Jervis, “Deterrence and Perception,” p. 19.

²¹ Green and Long, “The MAD Who Wasn’t There”; Podvig, “The Window of Vulnerability That Wasn’t.”

²² Green, and Long, “Conceal or Reveal?”

²³ Schelling, *The Strategy of Conflict*, p. 188.

²⁴ For instance, see the discussion in Kahn, *On Thermonuclear War*, p. 146.

²⁵ Miller, “Nice Strategies Finish First.”

²⁶ Agent-based models of the iterated prisoner’s dilemma and the related peace wargame find that such a “tough but fair” strategy outperforms alternatives, such as refraining from retaliation to demonstrate one’s peaceful intentions or opening with an aggressive gambit oneself (Axelrod, *The Evolution of Cooperation*).

²⁷ Powell, *Nuclear Deterrence Theory*.

²⁸ Kahn, *On Escalation*, p. 290.

²⁹ Kahn, *On Escalation*, p. 137.

³⁰ Powell, *Nuclear Deterrence Theory*.

- ³¹ Schelling, *Arms and Influence*, p. 202.
- ³² Kaplan, *The Bomb*, p. 256.
- ³³ Daalder, *The Nature and Practice of Flexible Response*, p. 70.
- ³⁴ Daalder, *The Nature and Practice of Flexible Response*, pp. 72–87.
- ³⁵ Sokolovskiy, *Soviet Military Strategy*, p. 195.
- ³⁶ Sagan and Weiner, “The Rule of Law and the Role of Strategy in U.S. Nuclear Doctrine.”
- ³⁷ For a discussion of the targeting of Warsaw Pact targets by U.S. theater nuclear forces during the Cold War, see U.S. Congressional Budget Office, *Planning U.S. General Purpose Forces*.
- ³⁸ Kaplan, *The Bomb*, p. 257.
- ³⁹ The likelihood of this possibility depends on whether adversary decisionmakers assume that the United States will use these weapons in a “tit-for-tat” manner. For example, adversaries might conclude that U.S. low-yield nuclear weapons were intended to enable escalatory options at lower levels of conflict (the “up the ante” approach).
- ⁴⁰ This is already a potential problem because of U.S. reliance on dual-use platforms, such as B-52 and B-2 bombers, for both nuclear and conventional missions. Adversaries face incentives to signal that they will interpret attacks with these aircraft as ongoing nuclear strikes to dissuade the United States from using them in a conventional role. But this issue is not unique to the United States; Russia boasts a far larger stable of dual-capable systems that the United States might interpret as nuclear during a conflict (Kristensen, Korda, and Jones, “Nuclear Notebook”).
- ⁴¹ Richard, transcription of speech delivered at the 2022 Space and Missile Defense Program. In physics, the three-body problem examines the predicted motion of three point masses (such as celestial bodies) using Newton’s laws. It notoriously lacks a closed-form solution, with outcomes that depend chaotically on exact initial conditions.
- ⁴² Richard, transcription of speech delivered at the 2022 Space and Missile Defense Program.
- ⁴³ Vergun, “Conflict with a Nuclear-Capable Peer Possible, Says Stratcom Commander.”
- ⁴⁴ Center for Global Security Research, Lawrence Livermore National Laboratory, *China’s Emergence as a Second Nuclear Peer*, p. 21.
- ⁴⁵ Office of the Secretary of Defense, *Military and Security Developments Involving the People’s Republic of China*, p. 94.
- ⁴⁶ Norris and Kristensen, “Global Nuclear Stockpiles, 1945–2006.”
- ⁴⁷ Kristensen and Korda, “North Korean Nuclear Weapons, 2022.”
- ⁴⁸ Kim and Kim, “N. Korea Says It Tested New Solid-Fuel Long-Range Missile.”
- ⁴⁹ Renshon, “Assessing Capabilities in International Politics.”
- ⁵⁰ Luňák, “Khrushchev and the Berlin Crisis.”
- ⁵¹ Glaser and Fetter, “Should the United States Reject MAD?”
- ⁵² U.S. Department of Defense, *2022 National Defense Strategy of the United States of America*, p. 12.
- ⁵³ Work, “Navigating South Korea’s Plan for Preemption.”
- ⁵⁴ Davis and Bennett, “Nuclear-Use Cases for Contemplating Crisis and Conflict on the Korean Peninsula.”
- ⁵⁵ As a 2017 article explained, “[t]his desperate, use-it-or-lose-it attack occurs when the adversary believes that it will suffer similar costs regardless of whether it strikes first” (Lanoszka and Scherer, “Nuclear Ambiguity, No-First-Use, and Crisis Stability in Asymmetric Crises”).
- ⁵⁶ Bowers and Hiim, “Conventional Counterforce Dilemmas,” p. 9.
- ⁵⁷ For instance, it has been proposed that boost-phase missile defenses could be viable against North Korean ballistic missiles (Goodby and Postol, “A New Boost-Phase Missile Defense System—and Its Diplomatic Uses in the North Korea Dispute”).
- ⁵⁸ For a discussion of weapons of this kind, see National Research Council, *Effects of Nuclear Earth-Penetrator and Other Weapons*.
- ⁵⁹ Burutin et al., “The Concept of Unacceptable Damage” [“Kontseptsiia nepriemlemogo ushcherba”].
- ⁶⁰ Andriushin, Chernyshev, and Iudin, *Taming the Nucleus* [Ukroshchenie iadra; Burenok and Pechatnov, *Strategic Deterrence* [Strategicheskoe sderzhivanie].

⁶¹ Andriushin, Chernyshev, and Iudin, *Taming the Nucleus* [*Ukroshchennie iadra*].

⁶² Burenok and Pechatnov, *Strategic Deterrence* [*Strategicheskoe sderzhivanie*].

⁶³ Hiim, Fravel, and Trøan, “The Dynamics of an Entangled Security Dilemma.”

⁶⁴ U.S. Department of Defense, *2022 National Defense Strategy of the United States of America*, p. 11.

⁶⁵ U.S. Department of Defense, *Report on the Nuclear Employment Strategy of the United States—2020*, p. 6.

⁶⁶ For a discussion of the implications of the Law of Armed Conflict for U.S. nuclear employment planning, see Sagan and Weiner, “The Rule of Law and the Role of Strategy in U.S. Nuclear Doctrine.”

⁶⁷ Harvey and Warden, “Command and Control of Nuclear Forces,” p. 196, emphasis added.

⁶⁸ Kehler, “Commanding Nuclear Forces,” p. 157.

References

- Andriushin, I. A., A. K. Chernyshev, and Iu. A. Iudin, *Taming the Nucleus: Pages from the History of the Nuclear Weapons and Nuclear Infrastructure of the USSR* [Ukroshchenie iadra: Stranitsy istorii iadernogo oruzhiia I iadernoi infrastruktury SSSR], Tipografiia Krasnyi Oktiabr', 2003.
- Axelrod, Robert, *The Evolution of Cooperation*, Basic Books, 1984.
- Bowers, Ian, and Henrik Stålhane Hiim, "Conventional Counterforce Dilemmas: South Korea's Deterrence Strategy and Stability on the Korean Peninsula," *International Security*, Vol. 45, No. 3, Winter 2020–2021.
- Burenok, V. M., and Iu. A. Pechatnov, *Strategic Deterrence* [Strategicheskoe sderzhivanie], prepublication copy, 2011.
- Burutin, A. G., G. N. Vinokurov, V. M. Loborev, S. F. Pertsev, and Iu. A. Podkorytov, "The Concept of Unacceptable Damage: Genesis, Fundamental Reasons for Transformation, and Contemporary Status" ["Kontseptsii nepriemlemogo usherba: Genezis, osnovnye prichiny transformatsii, sovremennoe sostoianie"], *Vooruzhenie, Politika, Konversii*, No. 4, 2010.
- Center for Global Security Research, Lawrence Livermore National Laboratory, *China's Emergence as a Second Nuclear Peer: Implications for U.S. Nuclear Deterrence Strategy*, 2023.
- Daalder, Ivo H., *The Nature and Practice of Flexible Response: NATO Strategy and Theater Nuclear Forces Since 1967*, Columbia University Press, 1991.
- Davis, Paul K., and Bruce W. Bennett, "Nuclear-Use Cases for Contemplating Crisis and Conflict on the Korean Peninsula," *Journal for Peace and Nuclear Disarmament*, Vol. 5, No. S1, 2022.
- Geist, Edward, and Dara Massicot, "Understanding Putin's Nuclear 'Superweapons,'" *SAIS Review of International Affairs*, Vol. 39, No. 2, Summer–Fall 2019.
- Glaser, Charles L., and Steve Fetter, "Should the United States Reject MAD? Damage Limitation and U.S. Nuclear Strategy Toward China," *International Security*, Vol. 41, No. 1, Summer 2016.
- Goodby, James E., and Theodore A. Postol, "A New Boost-Phase Missile Defense System—and Its Diplomatic Uses in the North Korea Dispute," *Bulletin of the Atomic Scientists*, Vol. 74, No. 4, 2018.
- Gould, Joe, "US Strategic Command Chief: Sea Missile Cancellation Opens 'Deterrence and Assurance Gap,'" *Defense News*, April 5, 2022.
- Green, Brendan R., and Austin Long, "The MAD Who Wasn't There: Soviet Reactions to the Late Cold War Nuclear Balance," *Security Studies*, Vol. 26, No. 4, October–December 2017.
- Green, Brendan R., and Austin Long, "Conceal or Reveal? Managing Clandestine Military Capabilities in Peacetime Competition," *International Security*, Vol. 44, No. 3, Winter 2019–2020.
- John R. Harvey and John K. Warden, "Command and Control of Nuclear Forces," in Charles Glaser, Austin Long, and Brain Radzinsky, eds., *Managing U.S. Nuclear Operations in the 21st Century*, Brookings Institution Press, 2022.
- Hiim, Henrik Stålhane, M. Taylor Fravel, and Magnus Langset Trøan, "The Dynamics of an Entangled Security Dilemma: China's Changing Nuclear Posture," *International Security*, Vol. 47, No. 4, Spring 2023.
- Jervis, Robert, "Deterrence and Perception," *International Security*, Vol. 7, No. 3, Winter 1982–1983.
- Kahn, Herman, *On Thermonuclear War*, Princeton University Press, 1960.
- Kahn, Herman, *On Escalation: Metaphors and Scenarios*, Routledge, 2017.
- Kaplan, Fred, *The Bomb: Presidents, Generals, and the Secret History of Nuclear War*, Simon and Schuster, 2020.
- Karaganov, Sergey, "By Using Its Nuclear Weapons, Russia Could Save Humanity from a Global Catastrophe," RT, June 14, 2023.
- Kehler, C. Robert, "Commanding Nuclear Forces," in Charles Glaser, Austin Long, and Brain Radzinsky, eds., *Managing U.S. Nuclear Operations in the 21st Century*, Brookings Institution Press, 2022.
- Kennedy, John F., speech at the Sheraton Park Hotel, Washington, D.C., September 20, 1960.
- Kim Tong-hyung and Hyung-Jin Kim, "N. Korea Says It Tested New Solid-Fuel Long-Range Missile," Associated Press, April 14, 2023.
- Kristensen, Hans M., and Matt Korda, "North Korean Nuclear Weapons, 2022," *Bulletin of the Atomic Scientists*, Vol. 78, No. 5, 2022.
- Kristensen, Hans M., Matt Korda, and Eliana Johns, "Nuclear Notebook: Russian Nuclear Weapons, 2023," *Bulletin of the Atomic Scientists*, Vol. 79, No. 3, 2023.
- Lanoszka, Alexander, and Thomas Leo Scherer, "Nuclear Ambiguity, No-First-Use, and Crisis Stability in Asymmetric Crises," *Nonproliferation Review*, Vol. 24, Nos. 3–4, 2018.

Lieber, Keir A., and Daryl G. Press, *U.S. Strategy and Force Posture for an Era of Nuclear Tripolarity*, Scowcroft Center for Strategy and Security, Atlantic Council, April 2023.

Luňák, Petr, “Khrushchev and the Berlin Crisis: Soviet Brinkmanship Seen from Inside,” *Cold War History*, Vol. 3, No. 2, 2003.

Miller, Nicholas R., “Nice Strategies Finish First: A Review of *The Evolution of Cooperation*,” *Politics and the Life Sciences*, Vol. 4, No. 1, August 1985.

National Research Council, *Effects of Nuclear Earth-Penetrator and Other Weapons*, National Academies Press, 2005.

Norris, Robert S., and Hans M. Kristensen, “Global Nuclear Stockpiles, 1945–2006,” *Bulletin of the Atomic Scientists*, Vol. 62, No. 4, July 2006.

Office of the Secretary of Defense, *Military and Security Developments Involving the People’s Republic of China*, U.S. Department of Defense, 2022.

Office of the Secretary of Defense for Nuclear Matters, *Nuclear Matters Handbook*, U.S. Department of Defense, 2020.

Podvig, Pavel, “The Window of Vulnerability That Wasn’t: Soviet Military Buildup in the 1970s: A Research Note,” *International Security*, Vol. 33, No. 1, Summer 2008.

Powell, Robert, *Nuclear Deterrence Theory: The Search for Credibility*, Cambridge University Press, 1990.

Renshon, Jonathan, “Assessing Capabilities in International Politics: Biased Overestimation and the Case of the Imaginary ‘Missile Gap,’” *Journal of Strategic Studies*, Vol. 32, No. 1, February 2009.

Richard, Charles, transcription of speech delivered at the 2022 Space and Missile Defense Program, Huntsville, Alabama, August 11, 2022.

Sagan, Scott D., and Allen S. Weiner, “The Rule of Law and the Role of Strategy in U.S. Nuclear Doctrine,” *International Security*, Vol. 45, No. 4, Spring 2021.

Schelling, Thomas, *The Strategy of Conflict*, Harvard University Press, 1960.

Schelling, Thomas, *Arms and Influence*, Yale University Press, 1966.

Sokolovskiy, V. D., *Soviet Military Strategy*, 3rd ed., Crane, Russak & Co., 1975.

U.S. Congressional Budget Office, *Planning U.S. General Purpose Forces: The Theater Nuclear Forces*, 1977.

U.S. Congressional Budget Office, *The Potential Costs of Expanding U.S. Strategic Nuclear Forces If the New START Treaty Expires*, August 2020.

U.S. Department of Defense, *Nuclear Posture Review Report*, April 2010.

U.S. Department of Defense, *Nuclear Posture Review*, February 2018.

U.S. Department of Defense, *Report on the Nuclear Employment Strategy of the United States—2020*, 2020.

U.S. Department of Defense, *2022 National Defense Strategy of the United States of America*, October 27, 2022.

U.S. Department of State, “Russian Noncompliance with and Invalid Suspension of the New START Treaty,” fact sheet, June 1, 2023.

Vergun, David, “Conflict with a Nuclear-Capable Peer Possible, Says STRATCOM Commander,” *DOD News*, September 21, 2022.

Work, Clint, “Navigating South Korea’s Plan for Preemption,” *War on the Rocks*, June 23, 2023.

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About This Perspective

The discovery that the People's Republic of China is expanding its nuclear arsenal, Russia's "suspension" of the New START arms control treaty and aggression in Ukraine, and North Korea's evolving nuclear capabilities have led some to argue that the United States needs to expand its own nuclear forces to deter these potential adversaries. This Perspective articulates a framework for determining how much is enough for U.S. nuclear forces in the emerging strategic environment. I argue that adversary perceptions, rather than quantitative comparisons, should be the primary criteria for sizing U.S. nuclear forces.

This Perspective is a companion piece to David A. Ochmanek, Anna Dowd, Stephen J. Flanagan, Andrew R. Hoehn, Jeffrey W. Hornung, Michael J. Lostumbo, and Michael J. Mazarr, *Inflection Point: How to Reverse the Erosion of U.S. and Allied Military Power and Influence*, RAND Corporation, RR-A2555-1, 2023, and Michael J. Mazarr, *Defending Without Dominance: Accelerating the Transition to a New U.S. Defense Strategy*, RAND Corporation, forthcoming.

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