THE ARSENAL OF DEMOCRACY

TECHNOLOGY, INDUSTRY, AND DETERRENCE IN AN AGE OF HARD CHOICES

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NUCLEAR WEAPONS

Any direct US-China conflict runs some risk of escalation to the nuclear level. Thus, any strategy to deter conventional conflict with China must consider the two sides' comparative capabilities and strategies. As the nonpartisan Congressional Commission on the Strategic Posture of the United States has emphasized, the United States now faces dual nuclear peer adversaries—China and Russia—which are pursuing a deepening partnership that threatens potential simultaneous aggression in multiple theaters.[1] Mindful that many of the key data points are highly classified, this chapter frames the key questions that the US government must ask as it considers how to enhance its strategic deterrent.

The key reason for concern is that China has recently broken from its long-standing policy of "minimal" nuclear deterrence and is now engaged in a stunning nuclear buildup without a clear doctrinal explanation. China's arsenal is still smaller than that of the United States, but it is rapidly expanding and modernizing. The Department of Defense (DOD) publicly estimates that it will reach over 1,000 warheads by 2030 and 1,500 by 2035.[2] China is also rapidly building out infrastructure for intercontinental ballistic missiles (ICBMs) capable of delivering nuclear weapons against the US homeland and ballistic

missile submarines to augment its second-strike capability. Beijing's communications about its strategic transformation are deliberately vague, and it may span Thomas Schelling's full spectrum of "coercion": with an offensive "compellent" purpose in addition to a defensive "deterrent" one.[3] This possibility is imposing stress on US allies and partners—particularly Japan and South Korea—which depend on the US nuclear umbrella and fear that they might be targeted in a US-China crisis.

There is no silver bullet for responding to China's nuclear modernization, but a few steps appear prudent, based on the strategic picture presented in the open-source literature. Congress, the White House, and the Departments of State and Defense can coordinate to sustain the recapitalization of US nuclear forces and delivery systems. If China's nuclear buildup continues on its current trajectory, it might become necessary to grow the US-deployed nuclear arsenal. This means—at minimum—that it is important to show China that the US nuclear industrial base is capable of producing new weapons. The minimum viable arsenal size depends on the state of China's arsenal, delivery systems, and nuclear industrial base, as well as on targeting assumptions and other data points about the US arsenal that are highly classified. Finally, US doctrine should respond to the clear evidence in the open-source literature that China believes "strategic deterrence" goes beyond nuclear threats.[4] The US strategic force must therefore explore other forms of strategic deterrence in the space, cyber, and economic domains. Beijing must understand that the United States has flexible options across domains to respond proportionately to strategic attacks, combining credible resolve with credible restraint.

Beyond the bilateral nuclear balance, the United States must proactively address the political and strategic implications of China's nuclear buildup for allies in the Indo-Pacific. All nuclear proliferation is strongly counter to US interests. However, nuclear sharing—a practice that involves allies in decision-making processes and operations involving nuclear weapons—has helped to strengthen NATO for

decades. Nuclear sharing may become appropriate for Japan and South Korea in the future if these governments request it and China and North Korea continue their nuclear buildups along current trends. US policymakers should carefully evaluate the military-technical requirements of potential nuclear sharing in Asia and engage with the strategic arguments for and against taking this step.

Historical Inspiration

The historical record suggests that nuclear weapons have contributed to strategic stability between great powers.[5] Since the Soviet Union acquired nuclear capability in 1949, followed by the British and the French in the 1950s, no two nuclear-armed states have engaged in a full-scale conventional war. During this period, explicit and implicit nuclear threats have shaped many conflicts. Most recently, they have prevented direct conventional strikes between Russia and NATO. Even if China believes it could defeat US forces in a conventional war, it may be deterred by the risk of nuclear escalation.

However, the absence of a conventional war between nuclear-armed states in the historical record does not guarantee that such a war is impossible. There is no inherent reason why two nuclear powers could not fight a conventional war if both were determined to avoid being the first to escalate to nuclear use. It is therefore essential to review at a high level how the theory and the practice of nuclear deterrence have evolved over time.

At the heart of nuclear deterrence is the concept of mutually assured destruction (MAD).[6] In the mid-1950s, the Eisenhower administration's policy of "massive retaliation" threatened a nuclear response to a conventional Soviet attack on Western Europe, aiming to destroy Soviet industrial and military infrastructure.[7] Once both sides achieved credible second-strike capabilities, however, any nuclear exchange became tantamount to mutual suicide.[8] This balance of terror discouraged direct conflict even as nuclear competition continued.

Massive retaliation was soon replaced by more nuanced nuclear doctrines. Soviet "salami-slicing" tactics, the progressive intensification of pressure without actually moving to general war, could erode US interests without provoking a nuclear response.[9] Recognizing these shortcomings, the Kennedy administration adopted a new doctrine called "flexible response."[10] The idea was to provide a range of limited nuclear options, rather than a binary choice between inaction and strategic nuclear escalation.

Maintaining a flexible nuclear posture is crucial for signaling both credible threats and credible restraint in a crisis. As Thomas Schelling famously argued in *Arms and Influence* (1966), brinkmanship is all about "manipulating the shared risk of war."[11] The primary risk is not an accidental slide into conflict but rather a deliberate escalation resulting from profound miscalculation of the potential responses, resolve, or capabilities of the opponent. If one side believes it can strike with nuclear weapons while preventing retaliation, it may therefore feel more emboldened to take risks. This dynamic was evident during the Cuban Missile Crisis in 1962, when both the United States and the Soviet Union found themselves on the brink of nuclear war. Even after this crisis de-escalated, nuclear competition continued throughout the Cold War. Both superpowers invested in new warheads and delivery systems, as well as conventional systems to hold the other's nuclear infrastructure at risk. All these steps were attempts to gain political leverage by "manipulating the shared risk of war." It was only with the Strategic Arms Reduction Treaty in 1991 that the United States stepped back from nuclear competition.

The fact that nuclear weapons have not been used in combat since 1945 is often attributed to the deterrent effects of MAD and international norms. Yet, no nuclear power has faced a situation where it could gain a decisive advantage by being the first to use nuclear weapons in a conventional conflict. Furthermore, no two nuclear-armed states have ever fought a major conventional war. If China were to initiate a conflict with the United States, the situation would be unprecedented, and normative constraints might not be sufficient to pre-

vent escalation. Indeed, Beijing's decision to engage in such a conflict in the first place would signal that it is willing to accept some risk of nuclear escalation to achieve its political objectives.

An Indo-Pacific contingency in the 2020s or 2030s could differ markedly from past instances of US-China nuclear brinkmanship. During the Korean War, General Douglas MacArthur requested authority to use nuclear weapons against Chinese forces advancing toward the Yalu River.[12] President Truman denied the request partly because of pressure from the British, who strongly opposed any US escalation against China and feared Soviet retaliation in Europe.[13] In a future Sino-American conflict, the price of defeat would be high enough that both sides might seriously entertain nuclear use if they began to lose a conventional fight. During the 1958 Taiwan Straits Crisis, the Eisenhower administration again considered nuclear retaliation, this time against People's Liberation Army (PLA) forces attacking Taiwan's outlying islands.[14] However, the PLA was incapable of breaking Taiwan's control of the air and sea in the Taiwan Strait, largely because of the air-to-air missiles that Washington provided to Taipei. Moreover, the Second Taiwan Straits Crisis never escalated into full-scale war, and Beijing was able to de-escalate without loss of face. In response to these experiences, China redoubled its efforts to acquire its own nuclear deterrent, first with help from the Soviets and, after 1960, through an indigenous weapons program. Chen Yi, who became PRC foreign minister in 1958, put it this way: China would acquire nuclear weapons "even if we had to pawn our pants."[15]

In the Cold War, Washington and Moscow used nuclear alert levels to signal their risk tolerance during brinkmanship episodes. During the Yom Kippur War in 1973, Washington increased its nuclear alert to Defense Readiness Condition (DEFCON) 3—just two steps below active nuclear war—to deter Soviet conventional intervention in support of Egypt. Moscow backed down.[16] In an Indo-Pacific war, both sides would have to place their nuclear arsenals on wartime alert, so these signaling mechanisms would not be available to support de-escalation.

More recently, Russia has repeatedly threatened to use nuclear weapons against both Ukraine and NATO.[17] However, neither side has used nuclear weapons because the conflict has clear and mutually beneficial boundary conditions: Russia does not use nuclear weapons and refrains from conventional strikes against NATO, and in return NATO does not intervene directly. Moreover, Russia had and still has no real nuclear use case in Ukraine. Attacking a major population center like Kyiv would neither break Ukraine's will to fight nor seriously erode Ukrainian combat capacity, but it runs a high risk of NATO intervention. Battlefield nuclear strikes would likely require many devices given the length of the front line, almost guaranteeing NATO intervention. NATO forces could potentially push Russia back to its borders or beyond. These risks outweigh the immediate benefits that Russia might gain from using nuclear weapons. The situation would obviously be different in a Sino-American war. Here, both nuclear powers would already be in direct conflict, and the risk of drawing in a nuclear-armed adversary would not be a major concern.

In short, a Sino-American conventional war would represent such an unprecedented situation that nuclear escalation cannot be ruled out.[18] To be sure, in response to initial use, the other side would have the full range of strategic and nonstrategic delivery systems available for a response, including numbers, yields, and delivery trajectories. The risks would be great for both sides, which would have vital interests in avoiding strategic nuclear escalation. Still, China might calculate that it had a compelling use case for limited nuclear strikes. If US forces were heavily concentrated at a small number of regional bases, China might calculate that it could seize a decisive conventional advantage by neutralizing them, while deterring Washington from escalating to a strategic nuclear exchange.[19] US allies are very concerned about this possibility, as we will see below. To deter China from thinking this way, and enhance the credibility of US nuclear assurances, the United States must consider nuclear weapons as part of the broader conventional balance in the region, as well as a strategic deterrent in their own right. In practice, this means keeping sufficient

numbers of low-yield warheads and appropriate delivery systems for them in the Indo-Pacific at all times.

Interpreting China's Nuclear Buildup

For the half-century after China tested its first nuclear weapon in 1964, it embraced a doctrine of minimal strategic deterrence. By maintaining a smaller arsenal of 60 to 150 warheads, China assumed it could impose sufficient costs on an adversary to deter any first strike against itself.[20] This approach to strategic deterrence reflected Maoist ideology, which downplayed China's vulnerability to large-scale nuclear attacks.[21] It also recognized budget realities.[22] China was still a developing country, and building and maintaining a secure second-strike system is expensive: It involves missiles, explosives, nuclear engineering, investments in submarine technology, hardened silos, and a complex, failure-proof command-and-control system that can withstand an adversary's first strike. After the PLA's embarrassing performance in its 1979 war with Vietnam, it was also clear that modernizing the conventional force was a priority. China's calculus has been that to deter adversaries from launching a first strike, a massive retaliation capability is unnecessary because a second strike of even a few dozen high-yield warheads is deterrent enough.

Notably, China retained this minimal deterrence doctrine even as its economic growth began to take off in the 1990s and 2000s. Rather than increasing its number of deployable warheads, it developed the world's largest conventional ballistic missile force after the Second Artillery Corps, now the PLA Rocket Force, received a conventional mission in 1993,[23] deploying conventional over nuclear missiles by perhaps a 7:1 ratio.[24] Of the roughly six hundred operational nuclear warheads in China, about four hundred are on long-range missiles that can strike the continental United States.[25] However, China did not have a fully mature nuclear triad with nuclear-powered ballistic missile submarines (SSBNs) until the 1980s. Even today, China's

SSBNs and submarine-launched ballistic missiles (SLBMs) are noisy, although Russia could share quieting technology to reduce their detectability, and the longest-range SLBMs deployed on them can reach only a portion of the United States from waters off China's coast.[26] China could likely have developed these capabilities much faster if Xi's predecessors had seen nuclear deterrence as an urgent priority.

This minimal deterrence approach, however, stands in stark contrast to China's current posture. China's nuclear arsenal has undergone a dramatic expansion from its modest beginnings. It has now developed a sophisticated nuclear triad with diverse delivery systems and capabilities. This expansion represents a significant shift from China's traditional doctrine of maintaining a limited nuclear arsenal.

Even before Xi rose to power, the PLA had begun to express interest in modernizing its nuclear forces. By the mid-2000s, it was clear that China's nuclear arsenal (like Russia's) was becoming more vulnerable as US precision strike technology improved.[27] Leading US scholars predicted that China would take "logical" steps to strengthen deterrence in response.[28] China's use of nuclear threats to deter Taiwan independence also precedes Xi. The 2013 version of the *Science of Military Strategy*, a key PLA textbook written before Xi took power, states that China maintains nuclear forces to ensure that its "status as a powerful country does not waver, ensure that its core national interests are not violated," and "create a secure environment for [China's] peaceful development."[29] Taiwan is often called the "core of China's core interests."[30]

Xi has greatly accelerated China's nuclear modernization, however, raising questions about whether he has a different idea about nuclear doctrine. China's current buildup emphasizes strategic nuclear weapons—especially ground-based ICBMs—and second-strike tools like SSBNs. Since Xi took power in 2012, the PLA has roughly quadrupled its arsenal of nuclear warheads to more than six hundred.[31] As of 2024, the PLA fields a true nuclear triad. China has continued to expand its large land-based nuclear arsenal with more than four hundred ICBMs capable of striking the continental United States. At sea, China has six operational Type 094 Jin-class SSBNs capable of carry-

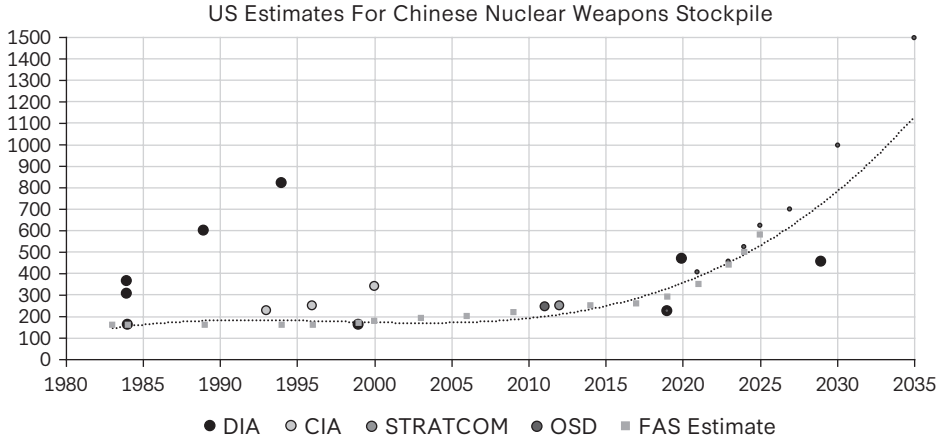

Figure 10.1 US estimates of the PRC nuclear weapons stockpile from multiple intelligence, Defense Department, and open sources over time. US estimates have been revised up sharply during the Xi era. Notably, China has far exceeded the FAS estimate trendline.

Abbreviations used: CIA, Central Intelligence Agency; DIA, Defense Intelligence Agency; DOD, US Department of Defense; FAS, Federation of American Scientists; OSD, Office of the Secretary of Defense; STRATCOM, US Strategic Command.

Source: Hans M. Kristensen, Matt Korda, Eliana Johns, and Mackenzie Knight, "Chinese Nuclear Weapons, 2024," *Bulletin of the Atomic Scientists* (January 15, 2024).

ing up to twelve submarine-launched ballistic missiles (SLBMs), including the JL-3 missile with a range of over 10,000 kilometers. These submarines conduct regular deterrence patrols, allowing the PLAN to threaten continental US targets while still in Chinese littoral waters.[32] In the air, China achieved a significant milestone in 2020 with the operational deployment of the H-6N bomber, completing its nuclear triad.[33] This modified bomber features air-to-air refueling capability and can carry an air-launched ballistic missile (ALBM) with a maneuvering reentry vehicle for precision strike.[34] China is also developing a strategic stealth bomber with a range exceeding ten thousand kilometers, further expanding its air-based nuclear capabilities.[35]

Forecasting nuclear trends in China is not easy, and US and allied analysts must therefore approach this exercise with great humility.

Figure 10.1, from the *Bulletin of the Atomic Scientists*, shows how US forecasts of China's future arsenal have varied widely over time. Between the 1980s and the 2000s, US intelligence agencies repeatedly predicted rapid expansions of China's arsenal that did not ultimately materialize. The Federation of American Scientists (FAS) published more conservative estimates, which have proved more accurate. However, the FAS failed to foresee the nuclear breakout under Xi. As we have seen, the Pentagon currently assesses that China's arsenal has entered a period of exponential growth that significantly exceeds the FAS's trendline estimate.

To understand the Pentagon's latest forecast—that China will have one thousand warheads and a fully operational second-strike capability by the early 2030s—it is essential to keep this context in mind.[36] History suggests that China's buildup could accelerate even faster than current estimates indicate, although it could also slow down. The other notable point is that Xi has made nuclear buildup a political priority to an extent that his recent predecessors did not. In his Work Report to the 20th Party Congress in October 2022, Xi ordered the PLA to establish a strong "strategic deterrence system" [*zhanlüe weishe tixi,* 战略威慑体系], with the PLA Rocket Force as the center.[37] Mindful of Xi's determination and his ability to direct vast resources to his priority programs, the US deterrent posture should be prepared for dramatic revisions to the forecast in either direction.

China's opacity regarding its nuclear doctrine is a deliberate choice to put psychological pressure on the nation's adversaries.[38] According to two scholars at the Chinese Academy of Social Sciences, "on tactics and specific issues, China must remain [*sic*] a certain degree of 'fuzziness' . . . it cannot be transparent about specific tactics, technical indicators, development, production, deployment and other important information about nuclear weapons." The authors characterize this approach as "strategic transparency and tactical secrecy."[39] US and PRC scholars and policymakers regularly hold dialogues to consult on nuclear issues. The scholar Andrew Erickson cites an anonymous US government official who, after twenty years of attending these dia-

logues, has come to a simple conclusion: "China doesn't want us to understand their deterrence strategy."[40]

China is also working to make its second-strike capability more secure. It is developing a new bastion for its SSBNs in the South China Sea—a marginal sea that can be protected with land-based aviation and surface combatants.[41] However, it is questionable how well China can protect its SSBNs in the shallow waters of the South China Sea, given their noise level and consequent potential vulnerability to US antisubmarine warfare (ASW). The ongoing expansion of ground-based ICBMs under Xi therefore plays an important role in China's strengthening of its second-strike capability.

China's nuclear buildup has coincided with a general worsening of the US strategic nuclear position. Russia has 1,500 deployed warheads, and this number could grow since Moscow has either withdrawn from or stopped complying with the key arms control agreements of the last few decades. North Korea fields just a few dozen deployed warheads but has made significant strides in nuclear engineering and ballistic missile design, and its arsenal is also growing. Russia also may be providing North Korea with multiple independent reentry vehicle (MIRV) technology that would make its nuclear strikes far harder to intercept.[42] Pyongyang is currently assessed to have roughly fifty warheads, with enough fissile material for ninety capable of hitting the US homeland reliably.[43] US and Israeli strikes in June 2025 have greatly set back Iran's nuclear and ballistic missile programs, but the country still aspires to build a nuclear weapon.[44] Depending on regional dynamics, Iran could plausibly field several dozen warheads by the end of the decade, if not sooner. Iran's weapons are unlikely to have the range to hit the US homeland, but they will certainly be capable of targeting US allies in the Middle East and Europe.[45]

To be sure, the US nuclear arsenal remains formidable. The United States has around 1,700 deployed warheads and a fully developed nuclear triad.[46] Britain fields roughly 225 more, and France 300.[47] China also has to keep in mind India. Even though New Delhi deploys mostly short-range tactical weapons and is presumably more

focused on deterring Pakistan, India places increasing emphasis on China and has gone to a lot of effort to bring Beijing within range of nuclear armed missiles.[48] China must also be cognizant of Russia, Pakistan, and North Korea's nuclear arsenals, even though these countries have a growing strategic alignment with Beijing. A coordinated nuclear strike by all four authoritarian states at once would be hard to orchestrate.[49] Still, to maintain effective deterrence in accordance with its existing doctrine, US and allied nuclear forces should ideally be able to respond appropriately to an attack coordinated by all their major adversaries. Also relevant is that the US nuclear stockpile is aging. Currently, the average US warhead is twenty-five to thirty years old.[50] Delivery systems and command-and-control infrastructure are being modernized first, but no new warhead designs have been introduced since the 1990s, and the nuclear enterprise has lost the ability to build new warheads quickly.[51]

Escalation Dynamics

China's new nuclear strategy supports its goal of controlling escalation in a conventional war in the Indo-Pacific. For example, China has fielded a large arsenal of DF-26 missiles, a nuclear-capable intermediate-range ballistic missile (IRBM), that can strike crucial US facilities in the region, including Guam and Diego Garcia.[52] China's growing arsenal of nuclear weapons includes a wide spectrum of capabilities, from low-yield precision strike missiles to ICBMs carrying multi-megaton warheads.[53] This provides China with greater options, and more rungs on the nuclear escalation ladder. For decades, China has maintained a No First Use (NFU) policy on nuclear weapons, a commitment to refrain from executing even a theater-level nuclear first strike. However, that policy appears in tension with China's rapid nuclear buildup and frequent doctrinal vagueness.[54] At a minimum, Beijing is rethinking its nuclear strategy for strategic competition with the United States, and there are hints in the Chinese open-

source nuclear literature about the existence of an internal debate about whether to reconsider NFU.[55] Washington must therefore prepare for the possibility that China may use or threaten to use tactical nuclear weapons against crucial US regional supply and logistical hubs.[56] If China fires dual capable DF-26 IRBMs at US forces in the region, US commanders may not know whether they are carrying nuclear payloads until after they detonate.

The combination of a growing nuclear arsenal, a growing missile stockpile, and an attenuated NFU pledge provides several strategic benefits to Beijing:

1. As the conventional balance approaches parity in the late 2020s, the PLA is likely to become increasingly comfortable with brinkmanship crises in the Taiwan Strait, the South China Sea, and elsewhere. Cognizant of China's modernized nuclear forces, Washington may become less inclined to take risks during such crises. It might also struggle to provide credible assurances to regional allies and partners using its nuclear umbrella.
2. There are limits to the US ability to leverage its alliances to stabilize the nuclear balance. History suggests that public nuclear deployments in partner countries can cause serious political challenges if the voting public there is opposed.[57] Currently, South Korea is actively seeking nuclear sharing, and Japan may be open to it in some form—but these countries' domestic political contexts could change.
3. If a Sino-American war does break out, China's expanded nuclear arsenal will help deter the United States from any nuclear first-use, which the United States has always insisted remains an option in any major conflict.
4. If the United States does not expand its tactical nuclear forces and intermediate-range delivery systems in the region, there are scenarios in which the PLA might be tempted to use tactical nuclear weapons against crucial Indo-Pacific targets. Such a strike would be based on the calculation that China could

> deter the United States from escalating first to the strategic nuclear level. Even if US planners believe that such a move is unlikely, they must respond to the fact that US allies fear this scenario.

China's growing antisatellite capabilities also deliberately create a risk of misperception and miscalculation in crisis scenarios. The US Space Force's Defense Support Program sustains around two dozen American nuclear early-warning satellites.[58] These satellites also provide generalized reconnaissance capabilities and are a key advantage for the US Armed Forces over the PLA. If China disables these satellites, US commanders may not be immediately able to tell whether China is preparing an operation in the war theater or an attack on the US homeland. During the Cold War, the threat not to attack early-warning systems was articulated as a red line to Moscow. There is an argument for articulating the same threat to Beijing today. An alternative to relying on legacy early-warning satellites is to modernize and disaggregate US nuclear command and control, including potentially by using commercial satellites. The risk is that if these commercial communications links take on strategic implications, then an enemy attack on them might seem to be an imminent precursor to a nuclear exchange. China is aware that its antisatellite programs risk misperception and nuclear escalation in the fog of war. Indeed, that is the point.[59] If China decides to start a war, it will implicitly signal that it is prepared for a high risk of nuclear escalation—so Washington should not think it can win the war by escalating.

Effects on Alliances

Cold War history also shows how alliance politics can complicate nuclear planning. The crux of the problem is that allies fear abandonment, but they also do not want to become targets. Navigating this gap between allied preferences and guarantor strategic requirements

is a thorny political question that, historically speaking, the United States has managed only with great pain.

In the 1970s, Moscow used nuclear policy to divide the United States from its European allies. The Soviet Armed Forces sought to build up the conventional capabilities to overrun Western Europe to the Rhine in just over a week.[60] The outcomes of great-power war are never certain ex ante, but by the late 1970s, the Soviet military seemed to enjoy key advantages. The Soviets also deployed limited forces and cultivated proxies around the world—in West Africa, Latin America, and Southeast Asia—to stretch American combat capacity thin, particularly the naval forces that would be crucial for sustaining NATO armies in Europe and striking the Soviet rear. In 1976, the Soviet Union deployed the SS-20, a road-mobile intermediate-range ballistic missile with advanced multiple independent reentry vehicles that threatened to destroy any target in Europe.[61]

This Soviet posture raised fears within NATO countries about the credibility of US nuclear assurances. NATO had two worries. First, as the Soviets eroded US nuclear superiority, Western Europeans worried that the United States might abandon them during a major war to avoid Soviet retaliation on American soil. German Chancellor Helmut Schmidt expressed these fears in a 1977 speech in London, voicing concerns that agreements like SALT I and II might weaken NATO's position by limiting US nuclear options. Schmidt argued that without a credible US response to the SS-20, the US nuclear umbrella would have a leak.[62] This sentiment was widely shared among NATO members.[63] Second, the European powers were simultaneously hesitant to expand conventional or tactical nuclear forces in Europe, fearing that doing so would raise the risk of suffering extensive damage in a conflict. Although a larger European conventional force paired with a reasonable tactical nuclear capability might have bolstered regional deterrence, it could have invited Soviet nuclear strikes on Europe.[64] Paradoxically, NATO's Western European members sought American military guarantees, but not expanded conventional or tactical US nuclear presence on European soil. Rather, European governments

wanted the US to commit to immediate strategic nuclear war in the event of a European conflict, effectively preferring that Washington hold the threat of global nuclear escalation over Europe's head.[65]

Starting in the late 1970s, the "Euromissiles" issue severely strained ties between the NATO allies.[66] Eventually, in 1979, NATO struck a compromise, known as the dual-track decision. The first track involved the deployment of 108 Pershing IIs and 464 Gryphon ground-launched cruise missiles across Germany, Italy, Belgium, the United Kingdom, and the Netherlands.[67] The second track involved a commitment to engage in arms control negotiations with the Soviets to limit medium-range nuclear weapons and reassure NATO allies wary of escalation. The Soviets sought to exploit antinuclear sentiment among the European left, promoting a narrative that portrayed Washington as a warmonger turning Europe into a nuclear target.[68] This resonated particularly strongly with the West German public, fueling the growth of the peace movements across Germany and Western Europe. Indeed, when Ronald Reagan delivered his famous "tear down this wall" speech at the Brandenburg Gate in 1983, much of Berlin was blocked off to preempt large-scale antinuclear protests. The crisis finally found resolution with the rise of Mikhail Gorbachev, whose more flexible approach culminated in the 1987 Intermediate-Range Nuclear Forces (INF) Treaty. This landmark agreement eliminated an entire category of nuclear and conventional ballistic missiles, effectively resolving the Euromissiles dispute.[69]

The United States faces a somewhat analogous problem today. China's theater nuclear delivery systems threaten America's Asian treaty allies—especially Japan, South Korea, and the Philippines—just as the SS-20 threatened Western Europe. These countries also face a growing nuclear threat from North Korea and Russia. Like the Europeans in the late 1970s and early 1980s, these countries' populations are calling for stronger nuclear assurances from Washington.[70] The US nuclear posture in Asia has significant limitations. Since withdrawing its nuclear weapons from South Korea in 1991, the US nuclear weapons closest to Taiwan are based in Guam—and, presumably,

on submarines conducting deterrence patrols.[71] Moreover, the United States lacks a diverse arsenal of ground-launched or sea-launched intermediate-range nuclear-capable missiles, the current equivalent of Euromissiles. This gap emerged partly because of the INF Treaty, which prevented the development of ground-launched theater nuclear weapons. The United States honored this treaty, but China never joined it and Russia stopped complying. Citing these facts, the Trump administration withdrew in 2019.[72]

To stabilize the missile balance in the region, the United States has initiated several programs. Congress has mandated the development of the Nuclear-Armed Sea-Launched Cruise Missile (SLCM-N),[73] and new air-launched nuclear-armed Long-Range Stand-Off (LRSO) weapons are also in development.[74] Still, China's theater-level nuclear delivery systems now outmatch those of the United States, and both China and Russia are reportedly developing low-yield nuclear weapons that they might consider more usable in theater.

This growing disparity in nuclear capabilities has heightened concerns among US allies. In South Korea, the fear is explicitly one of abandonment. South Koreans fear that North Korea might exploit America's distraction during a Taiwan crisis to move against Seoul. A survey conducted in February 2022 by the Chicago Council on Global Affairs and the Carnegie Endowment for International Peace revealed that 71 percent of South Korean respondents were in favor of their country developing nuclear weapons, while 56 percent supported the return of US tactical nuclear weapons to the peninsula.[75] In January 2023, President Yoon Suk-yeol demanded that Washington make more specific commitments to defend South Korea against nuclear attack and to strengthen US assurances by redeploying nukes on the Korean Peninsula. He hinted that if Washington failed to do so, South Korea would have to consider developing its own nukes.[76]

US responses to date have been insufficient to fully reassure allies. The Biden administration did not want to permanently station nuclear weapons in South Korea or to deploy low-yield warheads elsewhere in the region, fearing retaliation from North Korea, China, and

Russia. Instead, after Yoon made his threats, Biden invited him to a summit and proposed sending an *Ohio*-class ballistic missile submarine to visit the South Korean port of Busan in 2023, reasoning that semi-regular visits could strengthen deterrence in a way similar to ground-based nukes.[77] However, revealing the location of US SSBNs may not be wise, and a low- to medium-yield nuclear warhead aboard an *Ohio*-class SSBN arguably does not provide the same assurance as larger strategic nukes on board an SSN or stationed on the peninsula.[78] Looking ahead, when allies voice concerns about the credibility of US nuclear assurances, Washington should heed the warning and take corrective measures.

In Japan and the Philippines, the stance on nuclear weapons is complex. Japan's "nuclear principles"—not possessing, producing, or permitting the introduction of nuclear weapons—have been central to its postwar identity since their establishment in 1967.[79] Although secret agreements in the 1960s allowed the transit of US nuclear weapons through Japanese territory, public opposition to nuclear arms remains strong, rooted in the legacy of Hiroshima and Nagasaki. In the Philippines, the 1987 constitution explicitly bans nuclear weapons, reflecting Cold War–era concerns over US military bases at Clark and Subic Bay.[80]

Despite these long-standing antinuclear positions, growing regional security concerns have prompted consideration of alternative defense arrangements. Some analysts and policymakers have proposed "nuclear sharing" with South Korea and Japan as a potential solution.[81] The United States has nuclear-sharing agreements with several NATO allies. Five host dual-capability aircraft on their soil, and seven are organized to support US nuclear operations with their own, conventional air tactics.[82] Importantly, the US nuclear-sharing scheme with NATO does not give foreign commanders power to use nuclear weapons without explicit US executive approval and the approval of NATO's Nuclear Planning Group. (US nuclear sharing was more permissive for a brief period in the early Cold War, but the Kennedy administration rolled back this regime in the early 1960s.[83]) Nuclear-

sharing proposals are gaining traction in both Japan and South Korea, particularly in response to the Russian invasion of Ukraine. In 2022, former Japanese Prime Minister Shinzo Abe suggested that Japan consider breaking with its nonnuclear stance to enter a nuclear-sharing agreement with the United States, a position supported by some of the more hawkish military and civilian officials.[84] Polls conducted in Japan show that support for this position among the general population is rising too.[85] In South Korea, as well, politicians and military leaders have called for nuclear sharing—a position enjoying growing support from the South Korean population.[86]

Expanding nuclear sharing in the Pacific presents challenges and risks. Training Japanese and South Korean forces to support US nuclear-related operations would serve a largely symbolic purpose, as operational control would remain exclusively with the United States. The only relevant military targets in the region that the United States would be unable to destroy with conventional weapons during a regional security contingency are inside mainland China. A nuclear-sharing agreement with South Korea would violate the 1992 Joint Declaration of the Denuclearization of the Korean Peninsula—an agreement that, while not enforced and extensively violated by North Korea, still represents a symbolic US commitment.[87] Likewise, a nuclear-sharing agreement with Japan would conflict with Japan's nonnuclear principles and its historical and cultural opposition to nuclear weapons.[88] Any nuclear-sharing agreement would likely face considerable resistance from political factions in both nations.

Furthermore, the response from China, Russia, and North Korea would likely be severe, with possible retaliations ranging from economic and cyber measures to the potential spread of nuclear technology to adversarial states such as Iran. These political and security concerns make nuclear sharing with South Korea and Japan a complex or potentially unfeasible proposition. Nevertheless, given that Seoul and Tokyo have shown interest, it is worth exploring how nuclear sharing could be offered quickly if circumstances demanded. Insofar as China wants to prevent the United States from extending

this offer to its regional allies, the mere threat of offering nuclear sharing may also have some deterrent effect.

Modernizing the US Arsenal

Meanwhile, Washington is gradually recapitalizing its dated nuclear force. The entire ICBM arsenal is run by a computer system roughly as powerful as a modern smartphone.[89] Until 2019, many of the highest-payload weapons in the arsenal were operated by eight-inch floppy disks, roughly as advanced as North Korea's legacy Windows-sustained nuclear command-and-control system.[90] These legacy systems have proved reliable over decades, and hardware remains more critical than software sophistication in maintaining deterrence. Still, modernization has become necessary to ensure continued safety and reliability. Although US adversaries label the effort a strategic threat, this is rhetoric rather than reality: The modernization drive is about maintaining the current force, not expanding it.

The US nuclear modernization effort is a multidecade project that will ultimately cost around $1 trillion overall.[91] Most of the funds are going to replace delivery systems, not warheads themselves. The Minuteman III—the backbone of the ground-launched nuclear force—is being replaced by the Sentinel.[92] Northrop Grumman won a $13.3 billion development contract in 2020. The total project will be much larger, indirectly involving the entirety of the US defense industrial base and running through 2075. The US Air Force is procuring the B-21 Raider to replace its B-1 and B-2, while keeping B-52 bombers armed with long-range cruise missiles.[93] The Navy is ordering twelve *Columbia*-class SSBNs to replace its eighteen *Ohio*-class boats.

Though the current systems are aging, they remain effective in fulfilling their deterrence role. Some delays and cost overruns are likely in a project of this scale, particularly in the *Columbia* program.[94] In the meantime, the *Ohio* boats may need to modify their operating patterns as fuel levels decrease. However, if Congress provides the requested

funding and recapitalizes the submarine industrial base, these challenges will not compromise the core capability of the US nuclear force, which is designed to operate reliably through the modernization transition.

All currently proposed nuclear spending—the new platforms identified above, plus new command-and-control and early-warning systems—totals $750 billion through 2032. Now, Congress must approve the money. In general, the House and Senate Armed Services Committees are inclined to fund nuclear-related budget requests in full. The key question is whether or not the president wants to spend political capital to ask for a very large nuclear spending increase. If not, the modernization timeline is likely to be delayed, with potential implications for readiness.

The nonpartisan Congressional Commission on US Strategic Posture has emphasized the need to modernize the US nuclear arsenal to address the challenge posed by the emergence of two nuclear peer adversaries—China and Russia—whose deepening partnership threatens potential two-theater aggression.[95] The report further asserts that the United States is currently unequipped to address this dual threat and must therefore either expand or alter current nuclear capabilities to maintain credible deterrence.[96] A resilient nuclear force must be able to absorb a first strike and respond with sufficient power not only to inflict unacceptable damage to the aggressor but also to maintain deterrent power over the other.[97] To this end, the commission finds that the modernization of nuclear command, control, and communications (NC3) and the nuclear weapons defense industrial base will be crucial to demonstrating to adversaries that the United States has both the ability and the will to prevent other powers from seizing military advantages through a nuclear arms race.[98]

There is also a growing debate over the role of tactical nuclear weapons in US strategy. The first Trump administration authorized development of the SLCM-N, the US Navy's first nuclear cruise missile since the Cold War and the first nonstrategic nuclear weapon to enter the US arsenal since the Cold War. The Biden administration

proposed canceling SLCM-N, while maintaining the Long-Range Stand-Off (LRSO) nuclear cruise missile, which is primarily a project of the Air Force.[99] The United States also maintains an arsenal of "dial-a-yield" gravity bombs where the same bomb's effective yield can be altered prelaunch.[100] It is unclear under what circumstances the United States would want to use these weapons. Delivering them to relevant PLA targets would also run a high risk of escalation in a high-intensity combat scenario.[101] It is hard to take a position on this debate from unclassified sources alone. It is worth noting, however, that these weapons may remain essential assurances in allied eyes. They provide the United States with an intermediate option that regional partners find valuable diplomatically and politically.

Another key issue is nuclear warhead production. The United States has not produced a new nuclear warhead since 1991, instead opting to extend the service life of the weapons it produced throughout the Cold War.[102] This poses an obvious problem if the US is to expand its nonstrategic nuclear arsenal. Depending on the delivery system in question and the number of weapons being procured, the US may need to restart nuclear warhead production essentially from scratch at significant cost. By contrast, both China and Russia have produced new warheads since the end of the Cold War. The Soviet nuclear stockpile replaced warheads after around a decade or two of operational deployment. In 1991, Russia therefore inherited a large and sophisticated nuclear warhead industrial complex that remains operational today.[103]

Ballistic Missile Defense

Missile defense has long loomed large in the popular imagination and has played a role in nuclear competition in the past. In the Cold War, the Reagan administration's Strategic Defense Initiative ("Star Wars") sought to develop lasers and "Brilliant Pebbles"—a constellation of satellites capable of launching small tungsten projectiles to destroy

ballistic missiles before they could reenter the atmosphere. These notional technologies were (mostly) science fiction in the 1980s, but the program accelerated R&D into space-based sensors in the 1990s and 2000s. In the late Cold War, Reagan's missile defense investments strengthened deterrence even though they failed to work as advertised. Evidence from Soviet archives and oral histories indicates that the Kremlin thought the technology was real. Alongside the United States' conventional buildup in Europe and at sea, Moscow became convinced that the United States was on the cusp of attaining long-term conventional and nuclear superiority. This perception explained some of Gorbachev's retrenchments in the late 1980s, which ultimately undermined the USSR's military posture.[104]

However, missile defense is not an alternative to strategic deterrence, nor is emerging missile defense technology likely to significantly strengthen deterrence against a PRC strategic nuclear strike. Current US ballistic missile defenses, primarily designed to counter threats from smaller powers like North Korea and Iran, rely on a network of the Aegis Ballistic Missile Defense (BMD), the Patriot missile system, Terminal High Altitude Area Defense (THAAD), and the Ground-Based Interceptor (GBI) program.[105] BMD remains effective for defenses of specific locations, but despite hundreds of billions of dollars of investment over decades, many experts doubt the system could stop a salvo of ICBMs targeting the US homeland, let alone nuclear-armed hypersonics.[106] Although Ukraine has effectively combined point defenses and electronic warfare to counter complex Russian missile raids, BMD works best against conventional missile attacks, where intercepting most warheads or causing them to miss is an effective solution. In the case of a nuclear attack, any warheads that penetrate air defenses would still cause catastrophic destruction, including damage to the missile defense systems themselves. Furthermore, modernizing and fully recapitalizing the US missile defense system would likely require trillions of dollars over decades, and it remains uncertain whether any foreseeable technologies will be able to effectively intercept the latest generation of hypersonic missiles. Based on

open sources, it seems that offensive countermeasures would almost certainly be less costly and potentially more effective deterrents than missile defenses.

Conclusion

Nuclear deterrence is based on the perception of adversaries that the costs of nuclear use outweigh any possible benefits. The United States maintains these perceptions through the visible choices it makes in developing and deploying nuclear and conventional forces and capabilities, as well as other signals it sends about its willingness to use them. China aims to strengthen its own nuclear deterrence, for similar reasons.

In any US-China war in the Indo-Pacific, both sides would presumably have strong incentives to limit a conflict to the conventional level, but nuclear escalation as a result of miscalculation would be possible. China has changed its nuclear policy from one of sufficiency to parity. Its nuclear arsenal remains far smaller than that of the United States, but it is rapidly developing and expanding. The United States, in contrast, is pursuing a long-overdue modernization program but lacks the intent—and currently, the ability—to grow its inventory of nuclear weapons. As Vladimir Putin has shown in Ukraine, it is not straightforward to use nuclear threats to compel changes to the status quo, even in an ongoing conflict. Still, given Xi's statements and China's ongoing buildup, the United States must adapt to retain strategic stability to ensure that Beijing does not miscalculate about its ability to use nuclear threats as leverage in a crisis.

Based on information available in open sources and findings from the nonpartisan Congressional Commission on the US Strategic Posture, it seems prudent to continue the ongoing recapitalization of US nuclear forces and delivery systems. More investments in C4ISR are also appropriate, including measures to protect US space assets and relevant ground infrastructure from kinetic attack or cyberattack.

The US nuclear enterprise may also need to maintain the capacity to expand the deployed nuclear arsenal and produce new weapons if Russian and Chinese actions make such steps necessary.

Even though China has not shown interest in nuclear arms control, the United States should be open to exploring mutually beneficial arms control agreements. The open-source literature makes clear that at least some prominent strategists in China believe that "strategic deterrence" goes beyond nuclear threats.[107] The US strategic force must therefore actively develop other forms of strategic deterrence, including in the space, cyber, and economic domains. If Beijing continues to show no interest in arms control, then the United States should pursue unilateral strategic initiatives that encourage China to reconsider, as it did with the Soviet Union during the Cold War.

Beyond the bilateral nuclear balance, the United States must also proactively address the political and strategic implications of China's nuclear buildup for allies in the Indo-Pacific. Although the United States has a vital interest in preventing nuclear proliferation, nuclear-sharing protocols have helped to strengthen the NATO alliance for decades, and they may also be appropriate for Japan and South Korea in the future. There are various ways that nuclear sharing and nuclear consultation can be calibrated, depending on strategic considerations and domestic politics in the partner countries. Deepening interaction with allies will be essential to preserving the credibility of US nuclear assurances.