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# The U.S. Must Strengthen Its Nuclear Forces to Deter Growing Nuclear Threats

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## KEY TAKEAWAYS

As China and other adversaries expand their nuclear forces, the U.S. faces a significantly more dangerous nuclear environment than previously anticipated.

The current nuclear force structure will likely not suffice to protect Americans from these growing threats and may increase the chance of deterrence failure.

The U.S. should enhance the size and capability of its nuclear forces to pace these growing threats and ensure strong nuclear deterrence into the future.

In the summer of 2021, satellite imagery revealed that China is pursuing a strategic breakout of its nuclear forces that could enable it to surpass Russia as the top nuclear threat to the United States.[1] The current U.S. nuclear force structure was designed based on assumptions of a more benign threat environment than the one the United States faces today, and there is growing recognition that it will not suffice to deter both Russia and China at the same time.

Failure to adjust U.S. nuclear forces to account for China's strategic breakout, in addition to the advancing Russian, North Korean, and Iranian nuclear threats, will result in an ever-growing risk of deterrence failure. To maintain strong deterrence, Congress and the Administration must bolster the size and capability of U.S. nuclear forces and reconstitute the U.S. ability to hedge against an uncertain future.

## Background

The United States currently maintains a nuclear force structure that complies with the New Strategic Arms Control Treaty (START), signed by the United States and Russia in 2010.[2] This structure consists of 12 operational *Ohio*-class nuclear submarines (SSBNs), each of which can be armed with 20 multiple-warhead Trident II D5 submarine-launched ballistic missiles (SLBMs); 400 single-warhead Minuteman III intercontinental ballistic missiles (ICBMs) deployed among 450 silos; and about 60 nuclear-capable B-52 and B-2 bombers that can be armed, respectively, with air-launched cruise missiles or gravity bombs.[3] It also reportedly includes a small inventory of non-strategic nuclear weapons consisting of about a few hundred B61 nuclear gravity bombs, some of which are forward deployed to Europe in support of NATO.[4] As all these systems—warheads, delivery vehicles, and the infrastructure on which they rely—were developed during the Cold War, the United States is currently undergoing a comprehensive nuclear modernization program.

The basic design of the current U.S. nuclear force structure on which the ongoing nuclear modernization program is based dates to around 2010 when the overall nuclear threat environment was expected to become less dangerous over time.[5] The Obama Administration's Nuclear Posture Review (NPR), for example, proclaimed that "Russia and the United States are no longer adversaries, and the prospects of military confrontation between us have declined dramatically."[6]

At the time, Russia was America's only peer nuclear competitor. China still maintained its historic minimum deterrence strategy supported by an arsenal of fewer than 50 ICBMs,[7] and it was expected that it would continue to maintain only the forces necessary for a credible second-strike capability in line with its claimed "No First Use" policy.[8] According to General C. Robert Kehler, then-Commander of U.S. Strategic Command (STRATCOM), "At this time, China doesn't appear to seek to expand their nuclear arsenal beyond what they perceive as a credible deterrent and is unlikely to attempt to match numbers of nuclear weapons or warheads with either the U.S. or Russia."[9]

Threat assessments predicted growth in China's nuclear forces, but not to the extent we are seeing today. For instance, a 2012 annual threat assessment noted that China will likely more than double its force of fewer than 50 ICBMs by 2025.[10] However, current predictions estimate that China's ICBM force alone could eventually surpass the 400 currently in the U.S. arsenal.[11] Additionally, the National Intelligence Council's 2012 *Global Trends 2030*

report focused on future nuclear threats posed by Iran or the India–Pakistan conflict with no discussion of the potential three-party nuclear peer dynamic that is emerging today.[12]

The extraordinary technical and geopolitical developments that we see today—China's strategic breakout and Russia's nuclear expansion rather than reduction—were generally not taken into account as the Obama Administration went about finalizing the nuclear force structure for the coming decades.[13] Decisions about the future U.S. force structure were made in the context of presumably more benevolent trends. The *Columbia*-class nuclear submarine, for example, will have eight fewer missile tubes than its predecessor, the *Ohio*-class, and therefore less firing capacity.[14] According to a 2021 RAND Corporation study led by former Obama Administration official Frank Klotz, the decision to reduce the number of missiles in the *Columbia*-class design "was based in part on the assumption that the multi-decade reduction in U.S. nuclear delivery systems is unlikely to be suddenly and dramatically reversed."[15] Moreover, a major premise behind agreeing to New START's reductions was that the United States was "resetting" its relations with Russia and that the projected threat environment would allow it to reduce its nuclear forces to historically low levels.

## Deterioration of the Strategic Environment

The assumptions of a more benign security environment that guided nuclear force planning over a decade ago have been invalidated. Several developments have contributed to the deterioration of the threat environment, and U.S. nuclear force planning should be revised to account for those developments.

**China.** Most significant is China's strategic breakout. In the summer of 2021, satellite imagery revealed that China is building more than 300 new missile silos in its western desert, probably for the Dong Feng (DF)-41, China's most modern ICBM, which is believed to carry multiple warheads.[16] As China already deploys about 100 ICBMs, filling these new silos with missiles would place its ICBM force on track to exceed the U.S. arsenal of 400 deployed ICBMs. The Pentagon's 2021 report on Chinese military power stated that China intends to have "at least 1,000 nuclear warheads by 2030," which is roughly five times the size of its current estimated stockpile.[17] In February 2022, the Director of National Intelligence predicted that "Beijing will continue the largest ever nuclear force expansion and arsenal diversification in its history."[18]

- Beijing is also advancing its nuclear forces qualitatively. In addition to rounding out its nuclear triad with the deployment of the H-6N nuclear-capable bomber, Beijing has hundreds of regional, dual-capable missiles like the DF-26 and DF-21 that are capable of striking out to the second island chain with precision.[19] The United States, by contrast, has no nuclear weapons based in the Indo-Pacific, leaving a potential perceived gap in U.S. deterrence capability. China is also testing and deploying nuclear-capable hypersonic weapons, including a fractional orbital bombardment system (FOBS) that orbited the globe before releasing its hypersonic glide vehicle, which maneuvered to its target, demonstrating a technological capability not known to exist in U.S. and Russian arsenals.[20]

Finally, activity at China's Lop Nur nuclear test site raises concern that Beijing is not adhering to the zero-yield nuclear test standard by which the United States abides.[21] Conducting even low-yield nuclear tests would enable China to improve the quality of its nuclear warheads and pursue other novel nuclear capabilities.

These upgrades have led senior U.S. leaders to conclude that China has become a nuclear peer of the United States and Russia. According to STRATCOM Commander Admiral Charles Richard, China "possesses the capability to employ any coercive nuclear strategy today."[22] The United States for the first time now faces a three-party nuclear dynamic that requires it to deter two nuclear peers at once and deter them differently.

**Russia.** The new Chinese nuclear threat adds to the Russian nuclear threat, which is also growing. The United States and Russia have rough parity in their strategic nuclear forces under the limits set by New START. However, Russia is expanding its nuclear capabilities in three key areas that may enable it to gain advantages—or strengthen preexisting ones—over the United States.

- Russia is modernizing and expanding its stockpile of approximately 2,000 non-strategic nuclear weapons, which is unconstrained by New START,[23] at a time when the United States deploys only a small inventory of weapons in this category in Europe.[24] The Obama Administration's 2010 Nuclear Posture Review and 2013 Nuclear Employment Guidance stated that large disparities in nuclear forces, such as this one, will impact long-term strategic stability.[25] Russian President Vladimir Putin's threats that nuclear weapons might be used as Russia wages war on Ukraine only increase the significance of this

disparity in non-strategic nuclear weapons.

- Russia is developing several new nuclear capabilities, including nuclear-armed hypersonic weapons that could strike key U.S. and allied forces during a regional conflict. It is also developing a nuclear-powered torpedo armed with a megaton-class nuclear warhead and a nuclear-powered and nuclear-armed cruise missile.[26] These exotic capabilities were probably not anticipated in 2010.

- Like China, Russia has active nuclear weapons facilities and is believed to be conducting low-yield nuclear tests that could enable it to improve the military characteristics of its warheads.[27] Unlike the United States, which has no active nuclear weapon production capability, it also has an active nuclear production complex that would enable it to develop more weapons that it can add to ample upload capacity on its strategic forces.[28]

**Russian and Chinese cooperation.** A concern that the United States did not face in 2010 is the potential for greater Russian and Chinese military cooperation. In February 2022, Russia and China declared a "no limits" partnership with "no 'forbidden' areas of cooperation."[29] This partnership has included arms sales and technical cooperation, joint participation in major exercises such as Vostok 2022, and each country's implicit or explicit diplomatic support for the other's revanchist ambitions.[30] More concrete military cooperation is uncertain, and Russian–Chinese cooperation will probably ebb and flow; nevertheless, because its nuclear forces cannot be adjusted rapidly in response to these fluctuations, the United States will need to account for this risk in its force planning.

**Adversary Missile Defense.** Russia and China are improving their missile defense systems, which could challenge the ability of U.S. missiles to hold targets at risk. Russia has more midcourse defense interceptors than the United States has and is modernizing that system and others like the S-500 that can defend against a range of missile threats. China is also developing a midcourse interceptor that could engage ICBMs.[31] Future U.S. capabilities will need to be able to contend with these defenses.

**Rogue States.** The United States must also contend with the increasing nuclear threat from North Korea, which is improving its ability to strike the U.S. homeland and U.S. regional allies while lowering its threshold for nuclear use.[32] This threat will likely implicate U.S. extended deterrence commitments. The United States may also need to contend with a future

nuclear-armed Iran, which will have implications for stability in the Middle East.[33]

## Worsened Strategic Environment Requires Stronger Nuclear Deterrent

During a 2010 hearing on the ratification of New START, then-STRATCOM Commander General Kevin Chilton was asked whether the treaty might leave the U.S. with forces beyond what was needed for the threat environment. Chilton rejected that idea: "I think the arsenal that we have is exactly what is needed today to provide the deterrent."[34] If the size of the current U.S. nuclear arsenal was exactly right for the lower-threat environment of 2010, it is not logical to assume it is adequate for today's worsened threat environment.

Ever since the United States first acquired nuclear weapons, Administrations of both parties have pursued a strategy designed to deter strategic attack; assure allies; and, in the event of nuclear employment, restore deterrence at the lowest possible cost to the United States. While applied differently over time as threats have evolved, the fundamental tenets of this approach have proved to be effective.

To accomplish this strategy, STRATCOM must be able to execute a credible plan in the event of war. To be deterred from using a nuclear weapon, an adversary must be convinced that it cannot achieve its objectives through any level of nuclear escalation. Central to this strategy is the ability to absorb a first strike and then retaliate. This strategy of "assured retaliation" has long defined U.S. conceptions of stability. It also has supported the U.S. strategy of counterforce targeting, by which the United States targets an opponent's forces, including command and control nodes and supporting infrastructure, rather than population centers.

If U.S. nuclear forces are currently structured to execute this strategy against only one nuclear peer, they cannot likely do so for two. Part of the reason is based on numbers. There is a direct relationship between the size of adversary nuclear forces and U.S. deterrence requirements. Fundamental to the concept of deterrence is the ability to hold at risk the assets our adversaries value most, including their nuclear forces and accompanying infrastructure. The United States also targets adversary nuclear forces to limit damage should nuclear weapons be employed. For deterrence to be credible, the United States must maintain the numbers and types of nuclear weapons that it needs to convince adversaries that it can strike these targets if necessary. Given the hundreds of new Chinese missile silos, among other

forces, STRATCOM will simply have more targets that it needs to cover as part of this counterforce strategy.

The U.S. nuclear force structure will also need to consist of the right *types* of capabilities to deter the advancing threat compared to the threat in 2010. The mix of forces available now was configured to deter Russia and may not be what is needed to deter China. Our adversaries value different things, and the situations in which they might resort to nuclear weapons differ. This idea of "tailored deterrence" has been outlined in the 2018 Nuclear Posture Review,[35] in the 2020 Nuclear Employment Guidance,[36] and most recently in the 2022 NPR. According to the 2022 NPR:

> Central to U.S. deterrence strategy is the credibility of our nuclear forces to hold at risk what adversary leadership values 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.[37]

To tailor deterrence to the new Chinese nuclear threat, the United States may need additional types of nuclear capabilities.

In addition to China's growing offensive nuclear forces, adversary defenses may also affect the types of capabilities the United States needs in the future to ensure its ability to hold certain targets at risk. For instance, the United States may eventually need to consider advanced offensive capabilities of its own that can overcome evolving Russian and Chinese missile defenses.

A critic might argue that from the Russian or Chinese perspective, the United States has sufficient nuclear forces to threaten or deter either country individually. The U.S. force of roughly 1,550 deployed nuclear warheads, for instance, purportedly should suffice to deter the 1,000 warheads China is projected to have by 2030. However, as Admiral Richard has stated, "I don't have the luxury of deterring potential adversaries one at a time.... We have to deter all, all of the time."[38] This means, for example, that the United States cannot afford to have a force that is only able to absorb a first strike from Russia and retaliate. Rather, it will need a force that can retaliate against a Russian first strike and at the same time deter China without moving away from a counterforce strategy.

The U.S. will also need to address any potential future cooperation between Russia and China. Such scenarios are not implausible. According to national security expert Matthew Kroenig:

> If the United States were in a crisis or conflict with Russia, China might be more tempted to conduct a simultaneous strategic attack on the United States and its allies. Beijing might assess (perhaps correctly) that the United States lacks the capability or the resolve to deal with two simultaneous great-power military challenges at once. Beijing might believe, therefore, that a US crisis or conflict with Russia gives China [an] opportunity to engage in military aggression in the Indo-Pacific.[39]

To prevent such scenarios, the United States will need a nuclear force that is capable of executing its strategy to deter strategic attack, assure allies, and (should it fail) restore deterrence against two nuclear peers simultaneously.

## Consequences of Failing to Adjust U.S. Nuclear Forces

Failing to adjust the size and composition of the U.S. nuclear arsenal to account for dramatic changes in the threat environment involves significant risks to U.S. deterrence, assurance, stability, and the overall security of the American people. Relying on the current force to deter two nuclear peers would require assuming unacceptable risk in U.S. nuclear strategy. The United States would have to sacrifice redundancy and flexibility in its targeting strategy at great risk to the continued functioning of deterrence. The result would be a less credible nuclear strategy, which would produce consequences that include—but are not limited to—the following.

- A less credible nuclear force allows adversaries to take greater risks in their aggression. If an adversary perceives that the United States is disadvantaged or unable to respond at higher levels of escalation during a conflict, it gains an incentive to escalate during a conflict to achieve its objectives.[40] It might even gain an incentive to initiate a conflict if it has confidence in its level of escalation dominance. By the same logic, a less credible nuclear force may require the United States to take less risk in its own national security strategy, potentially impeding its ability to pursue vital national interests.

  The impact of China's expanded nuclear forces would become evident in the case of a military effort to unify with Taiwan. Backed by nuclear missiles that can strike targets ranging from Taiwan out to the second island chain (in addition to a strategic force capable of threatening

the U.S. homeland), China can become more confident in its ability to wage conventional war if it believes its nuclear "backstop" provides an advantage over the United States that enables it to force the United States to back down.

In general, a perceived nuclear advantage gives adversaries a greater ability to employ nuclear coercion to achieve their goals. Russian President Vladimir Putin has clearly been attempting to use nuclear weapons to coerce the West to stay out of the conflict in Ukraine. With the backing of a strong nuclear force, China could attempt the same tactic in a conflict over Taiwan and threaten "consequences you have never seen," as Putin threatened when his forces invaded Ukraine, to discourage the United States from coming to Taiwan's defense.[41]

- A less credible nuclear deterrent increases the risk of deterrence failure and adversaries' use of nuclear weapons. If Russia or China doubt the capability or willingness of the United States to respond to a nuclear strike, they are more likely to see nuclear weapons as a viable way to accomplish their objectives. Given Russia's and China's advantages in non-strategic or regional nuclear weapons compared to the United States' limited non-strategic nuclear capabilities, this risk becomes acute when considered within the context of limited nuclear escalation in a regional conflict. Without the ability to threaten an in-kind response, the United States would be forced to choose between backing down and responding in an escalatory manner, which adversaries might not find credible. This is why the 2018 NPR proposed a low-yield submarine-launched ballistic missile and a sea-launched cruise missile-nuclear (SLCM-N) as supplementary capabilities to improve deterrence of these threats.[42] It is also why Admiral Richard has testified that without SLCM-N, a deterrence gap exists.[43]

  Nor could the consequences of a conclusion by Russia's or China's leaders that they enjoy an escalation advantage relative to the United States be assumed to involve only the limited use of nuclear weapons.[44] As the two countries' nuclear capabilities continue to expand, their perception of nuclear advantage could make a strike on the U.S. homeland—including a decapitating first strike—potentially more tempting. Currently, for example, an overwhelming amount of force would be required for a first strike on the U.S. homeland to neutralize the U.S. ICBM force of 450 silos spread across the Midwest. China is

not believed to possess the forces required to disarm the entire U.S. ICBM fleet, but if China continues its nuclear buildup and arms its more than 300 new missile silos with ICBMs equipped with multiple warheads, this option becomes more feasible and therefore more likely to be considered by Beijing.[45] It is projected that China will have 1,000 warheads by the end of the decade, but it would be unwise to assume that it would stop expanding at that point.[46] Today, America's assured second strike capability makes such an attack highly unlikely, but as Admiral Richard recently stated, "As I assess our level of deterrence against China, the ship is slowly sinking."[47]

Beyond the numerical growth of adversaries' arsenals, Russia's and China's development of novel nuclear capabilities could contribute to both countries' perception of an escalation advantage. For instance, the FOBS that released a hypersonic weapon that China tested in August 2021 offers unique advantages as a first-strike weapon because it can avoid U.S. early warning systems until late in its flight.[48] (The nuclear-powered cruise missile being developed by Russia may have a similar ability to avoid early warning systems.) Systems that can reduce early warning time and strike U.S. command and control targets would prevent the United States from organizing a retaliatory strike before realizing that the incoming warheads are aimed at those targets—a concept that is fundamental to deterrence. This FOBS capability raises the prospect of a decapitating surprise attack on the United States that cripples the nation's ability to respond. Though one test does not necessarily mean that China is necessarily embracing a doctrine of nuclear preemption, the development of capabilities that might allow the mere contemplation of such an approach is a matter of extreme concern.

- Failing to adjust to growing Chinese, Russian, and North Korean nuclear forces would hinder the credibility of U.S. extended deterrence commitments. As the U.S. homeland becomes increasingly vulnerable to a Chinese nuclear strike, for example, China could perceive that the United States is less willing to come to the defense of an ally in the region—to trade Los Angeles for Taipei, Seoul, or Tokyo. In other words, China might believe it can decouple the United States from its allies by using its growing nuclear force to hold the U.S. homeland at increased risk. Conversely, China could attempt to decouple the United States from its allies by using its regional nuclear forces to

threaten allies while sparing the U.S. homeland. This strategy would mimic the Soviet strategy of deploying SS-20 missiles in Europe in the 1970s in an attempt to exclude the U.S. homeland from a European conflict.[49]

Moreover, failing to develop a more credible nuclear strategy in the face of rising threats could signal to allies a lack of commitment and make them uneasy about relying on the U.S. nuclear umbrella. Former Japanese Prime Minister Shinzo Abe called for Japan to consider hosting U.S. nuclear weapons,[50] and a senior Japanese ruling party lawmaker recently called for a national debate on the adequacy of the U.S. nuclear umbrella.[51] Additionally, a significant majority of South Koreans continue to express support for an indigenous nuclear weapons capability or nuclear-sharing agreement with the United States as they face increasing nuclear threats from both China and North Korea.[52] U.S. allies can do more to advance their own conventional capabilities in response to the growing threats, but if Japan, South Korea, and Taiwan believe the United States will not come to their defense in the event of a strategic attack, they have the ability to develop nuclear capabilities of their own, which would jeopardize the longstanding U.S. commitment to nonproliferation and risk greater global instability.[53]

- Failing to mount an effective response to China's or Russia's nuclear buildups will likely reinforce their view that expanding their nuclear forces gives them a military advantage. A lack of any consequences for nuclear expansion will telegraph weakness to adversaries, further encouraging them if they believe they can continue their buildups unabated. It also will diminish the likelihood of any future meaningful arms control because doing nothing only removes any incentive to negotiate. Instead, strengthening our own deterrence posture will demonstrate to Russia and China that their actions have consequences.

  Critics might argue that strengthening U.S. nuclear forces will incentivize Russia and China to continue to build up their nuclear forces and that the United States will find itself in a serious arms race, but this theory of action-reaction dynamics often does not stand up to scrutiny. The United States has stopped building or has even reduced its nuclear forces several times, and adversaries have continued to build up their own arsenals. For example, when the

Obama Administration pursued a reduction in the role of U.S. nuclear weapons and retired capabilities like the Tomahawk Land Attack Missile-Nuclear,[54] leaving the United States with only one type of weapon (tactical gravity bombs) unconstrained by New START, Russia expanded both the numbers and types of its nuclear weapons that were unconstrained by New START.[55] Russia and China are already on an upward trajectory, and it is highly unlikely that deferring the strengthening of America's nuclear forces will stop them.

## Prioritization

To prevent these dangerous outcomes, the United States needs to strengthen its nuclear capabilities and develop a strategy that is capable of deterring two nuclear peer competitors simultaneously. This is no simple task that can be completed in the short term or with little analysis and investment; the resizing of U.S. nuclear forces that an unprecedented threat environment has made necessary will likely remain a significant challenge for many years. In this connection, arms control should remain a key component of U.S. strategy, but it should be pursued as a way to strengthen America's ability to deter its adversaries, not as an end in itself.

Therefore, in building this strategy to maintain deterrence in an increasingly threatening environment, the United States should focus on three priorities:

- **Increasing the *size* of the U.S. nuclear arsenal.** As adversaries add to their nuclear arsenals, the United States will simply need more nuclear weapons to cover more targets. The current modernization plan based on New START will not suffice to meet the U.S. counterforce strategy with the same levels of confidence and flexibility to which the United States has been accustomed. The Senate affirmed this point in its resolution of advice and consent to ratification of New START in 2010:

> [I]f, during the time the New START Treaty remains in force, the President determines that there has been an expansion of the strategic arsenal of any country not party to the New START Treaty so as to jeopardize the supreme interests of the United States, then the President should consult on an urgent basis with the Senate to determine whether adherence to the New START Treaty remains in the national interest of the United States.[56]

- **Developing the right *capabilities* to deter the advancing threats.** The current mix of capabilities designed in 2010 to deter the expectation of a more benign Russia as the only nuclear peer may not suffice to deter China as well. The United States needs to consider what additional capabilities it needs to address the unique Chinese threat in addition to the advanced Russian threat that has expanded beyond its 2010 manifestation.

- **Strengthening U.S. *hedging* ability.** Given the uncertainty of both the future Russian and Chinese threat and the dynamics of a tripolar nuclear environment, the ability to change our nuclear forces as threats evolve—to hedge—increases in importance. The United States should prioritize improving its ability to adjust its force posture and size quickly in response to changes in the threat environment. The ability to hedge against technical failure in warheads or delivery platforms will also remain critical as systems reach the ends of their lifetimes.

Unfortunately, because of decisions that have limited the capabilities of the nuclear enterprise, the range of options available to the United States in deciding how best to adjust its nuclear force structure is limited. For example, decisions to defer efforts to restore plutonium pit production since the closure of the Rocky Flats pit production facility in 1989 have left the United States scrambling to reconstitute this capability, which is essential to remaining a nuclear power,[57] and the decision to rely on life extension programs (LEPs) to modernize warheads instead of developing new designs has also allowed critical skills and expertise to dwindle.

## What Congress and the Administration Should Do

In light of these limitations and priorities, it is essential that the U.S. nuclear deterrent be strengthened in as timely a manner as possible. Specifically, Congress and the Administration should:

- **Keep existing modernization programs on track to meet their scheduled delivery dates.** Replacing aged nuclear systems is the bare minimum that is needed to maintain nuclear deterrence.[58] The risks involved in failing to complete these programs on time include being forced to rely on systems that are approaching obsolescence, which reduces credibility, or decreasing the numbers of existing systems. For

example, failing to deliver the Sentinel missile on time could result in the retirement of aged Minuteman III missiles from the arsenal without replacement. Or the United States could be compelled to rely on missiles that it is not certain would function reliably in a harsher missile defense environment.[59] Such capability gaps would increase the risk of deterrence failure.

To keep these programs on track, Congress should continue to provide on-time funding and seek opportunities to accelerate programs where feasible. Additionally, as this Administration makes decisions that involve these programs, modernization should be its top priority. For example, future proposals to delay tests of the Minuteman III ICBM should be rejected, because these tests help to inform the Sentinel design as it goes through the acquisition process.

- **Increase procurement plans for modernized delivery platforms such as the Sentinel missile, Long Range Standoff (LRSO) weapon, *Columbia*-class submarine, and/or B-21 bomber.** The Department of Defense (DOD) should buy more systems than originally planned to increase U.S. nuclear capacity. In the near term, the DOD should conduct a review to determine how many more of which systems are needed, factoring in tradeoffs like cost, capability, and schedule. For instance, procuring more LRSOs might be desirable because of the system's lower cost, but because the air leg of the triad is not kept on alert during peacetime, procuring more Sentinel missiles might contribute more to deterrence. Procuring more *Columbia*-class submarines, although it could probably not be accomplished before 2040, in the long term would help to offset its lesser firing capacity compared to the *Ohio*-class.[60] Rear Admiral Scott Pappano, Program Executive Officer for Strategic Submarines, has stated that "It clearly makes more sense to have more than 12 [*Columbia*-class SSBNs] to meet the current requirements that [U.S.] Strategic Command has defined for us."[61]

  Increasing procurement of these systems will require more funds than planned, but future budgets should reflect the determination that nuclear deterrence is America's top national security priority, as affirmed by Secretary of Defense Lloyd Austin.[62] Prioritizing nuclear deterrence means funding it first in the budget and making cuts elsewhere, as outlined in The Heritage Foundation's Budget Blueprint.[63]

- **Improve the ability to utilize the triad's upload capacity in case of a crisis.** The United States maintains an upload capacity on its bombers, SLBMs, and ICBMs for use in case of technological surprises or changes in the geopolitical environment.[64] However, uploading warheads to existing systems cannot be done quickly or efficiently in practice. Due to limited personnel, security forces, and equipment, uploading warheads on the Minuteman III would take significant time. Adding warheads to SLBMs would require a simpler and feasible process, but the ability to utilize the full upload capacity is limited by weight constraints that would affect the missile's range as well as the maintenance of certain capabilities like low-yield strike options. While the nuclear-capable bomber force retains the ability to upload rapidly in a crisis, sustaining this posture for any extended period of time is likely to prove incredibly challenging for a fleet that has not been on full-time alert status since the end of the Cold War and has been significantly reduced since that time.[65]

  Given the rapidly worsening security environment and the potential for technological failures in aging systems, the United States should ensure that its upload strategies are feasible and responsive to the changing threat landscape.[66] Uploading warheads could mean violating New START if done before its expiration in 2026, but the United States reserves the right to withdraw from the treaty should the threat environment make withdrawal necessary.[67] The U.S. Air Force should minimize the time required to upload warheads onto Minuteman III missiles and to bombers. For instance, it can exchange W87-0 warheads with W78 warheads on ICBMs, because only the W78 was designed to be deployed in a multiple independently targeted reentry vehicle (MIRV) configuration. It should also consider what steps of the MIRVing process can be carried out in advance, such as planning now to transport additional warheads to ICBM bases, since doing so could be time-consuming.

  Additionally, an investment in necessary personnel and facilities associated with bomber alert status would make this posture a more viable option for our triad's most flexible leg. Uploading to existing forces would not provide a long-term solution to the need to address capacity shortfalls, but it should be an option in case of a crisis or significantly degraded threat environment, especially in the near term before the United States can procure additional systems to increase nuclear capacity.

- **Accelerate development of the Sea-Launched Cruise Missile-Nuclear (SLCM-N).** The SLCM-N, initially proposed by the 2018 Nuclear Posture Review, would begin to fill a critical gap in U.S. non-strategic capabilities compared to those of adversaries.[68] Despite the Biden Administration's attempt to cancel this program in the fiscal year (FY) 2023 budget request, the House of Representatives, full Senate Armed Services Committee, and Senate Appropriations Subcommittee on Defense rejected this decision and included $45 million for SLCM-N in FY 2023.[69] Although this amount would continue research and development for SLCM-N, higher levels of funding will be required to field the weapon by the end of the decade.

- **In addition to pursuing the SLCM-N, the DOD should consider additional capabilities that are needed to address other potential perceived gaps in U.S. deterrence and assurance.** While SLCM-N will help to fill an identified capability gap and reduce the significant imbalance in non-strategic arsenals between the United States and its adversaries, additional capabilities may be needed to contribute to deterrence of Russian or Chinese limited nuclear use. For instance, a nuclear-armed long-range anti-ship missile or torpedo could help to deter Chinese tactical nuclear employment in a conflict over Taiwan by demonstrating an ability to threaten a more proportional response to some of China's graduated capabilities.[70] In addition, STRATCOM will need to account for Russia's and China's improving missile defense systems and consider a future need for advanced capabilities that can penetrate those defenses. In an increasingly uncertain nuclear environment, the President would benefit from greater flexibility in potential response options, and the DOD should explore what other capabilities would help address the new threats.

- **Identify capabilities that will be needed to defeat hard and deeply buried targets (HDBTs).** Currently, the B83 gravity bomb is the best anti-HDBT weapon in the U.S. stockpile. The Biden Administration plans to retire this capability eventually, but as adversaries continue to improve their hardening and tunneling capabilities to protect critical assets, the United States will need an alternative means for holding these targets at risk.[71] The Administration, led by the DOD's Nuclear Weapons Council, should work to identify a plan for holding HDBTs at risk in the future and should forgo retiring the B83 until a replacement capability is fielded.

- **Increase funding for plutonium pit production activities at the Savannah River Site and take other steps to minimize the delay in full production.** The ability to produce plutonium pits—the core of nuclear weapons—is essential if the United States is to remain a nuclear power. The United States is currently the only nuclear weapons state—including North Korea—without this production capability since the closure of the Rocky Flats plant in 1989. While life-extension programs have replaced many other components in our nuclear warheads, the pits themselves date to the Cold War. Newly produced pits are planned for use in future warhead modernization programs, and a robust production capability is necessary in order to recapitalize the entire stockpile before confidence in the effectiveness of aging pits erodes to unacceptable levels.

  Last year, the National Nuclear Security Administration (NNSA) revealed that a delay at the Savannah River site will prevent it from meeting the requirement to produce 80 plutonium pits per year by 2030.[72] NNSA Administrator Jill Hruby has testified that additional resources included in the NNSA's unfunded priorities list for activities at the Savannah River Site will help to minimize this delay.[73] Congress should include this additional funding in FY 2023 appropriations and continue to prioritize funding for this capability in future years. The NNSA should also consider the feasibility of reducing delays by relaxing the stringent requirements for pit production.

- **Improve the responsiveness of the nuclear enterprise.** To enable a strong hedging strategy, the United States needs the ability to change its capabilities or deployed forces as threats evolve. However, the nuclear enterprise is currently unable to respond to changes in the geopolitical environment or to technical surprises expeditiously. To develop a new warhead, for example, the NNSA must undergo a seven-phase process that, as it stands, cannot pace the rapidly changing threat environment. Just the studying and engineering phases for the modern W93/Mark 7 warhead, for instance, will "take at least 12 years."[74] The Senate version of the National Defense Authorization Act for FY 2023 included a provision directing the NNSA to review ways to shorten this process, which would be an important step.[75]

  The NNSA, with the support of Congress, should also find ways to minimize bureaucracy so that scientists at the national labs can use

their creativity to find ways to improve America's nuclear capabilities more quickly. Importantly, the ability to alter U.S. nuclear forces in a responsive manner will enhance global stability. Adversaries, aware that the United States can adjust its forces accordingly, will be less likely to conclude that expanding their arsenals gives them a significant advantage and therefore will be disincentivized to undertake such an expansion.

- **Commission a study to examine how plans to modernize the nuclear command, control, and communications (NC3) system may need to adapt to emerging Chinese and Russian threats.** Because NC3 enables the early detection of a nuclear attack and the organization of a retaliatory response, it is a fundamental component of U.S. nuclear deterrence. Yet systems like the Chinese FOBS and Russian Avangard intercontinental hypersonic weapon that reduce early warning time could threaten the command and control of U.S. nuclear forces. In addition to continuing investment in current NC3 modernization plans, the DOD should consider whether the current plan will suffice in a more advanced nuclear threat environment and identify steps to improve the system's resilience in deterring or responding to a possible Chinese or Russian decapitating first strike.

## Conclusion

The forgoing recommendations describe a select number of initial steps that the United States must take to strengthen its nuclear forces. Getting it right requires a long-term commitment, which means sufficient budget requests from the current and future Administrations and consistent funding from Congress. This undertaking should also address all areas of the aging nuclear enterprise, to include aging NNSA infrastructure and nuclear component production capabilities. Given that nuclear weapons pose the only existential threat to the United States and that nuclear deterrence remains our top national security priority, the United States must be prepared to meet the challenge.

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71. Michaela Dodge, "Out of Sight Should Not Mean Out of Reach: Deterrence and the Proliferation of Hard and Deeply Buried Targets," National Institute for Public Policy *Information Series*, Issue No. 492, June 10, 2021, https://nipp.org/wp-content/uploads/2021/06/IS-492-final.pdf (accessed October 29, 2022).
72. U.S. Department of Energy, Office of Chief Financial Officer, *Department of Energy FY 2022 Congressional Budget Request, Volume 1, National Nuclear Security Administration, Federal Salaries and Expenses, Weapons Activities, Defense Nuclear Nonproliferation, Naval Reactors*, May 2021, p. [211], https://www.energy.gov/sites/default/files/2021-05/doe-fy2022-budget-volume-1.pdf (accessed October 29, 2022).

73. Testimony of the Honorable Jill M. Hruby, Administrator, National Nuclear Security Administration, in stenographic transcript of *Hearing to Receive Testimony on the Department of Energy's Atomic Defense Activities and Department of Defense's Nuclear Weapons Programs in Review of the Defense Authorization Request for Fiscal Year 2023 and Future Years Defense Program*, Subcommittee on Strategic Forces, Committee on Armed Services, U.S. Senate, April 27, 2022, pp. 22–24, https://www.armed-services.senate.gov/imo/media/doc/22-32_04-27-2022.pdf (accessed October 29, 2022).
74. Report No. 117-130, *James M. Inhofe National Defense Authorization Act for Fiscal Year 2023*, p. 371.
75. Ibid.