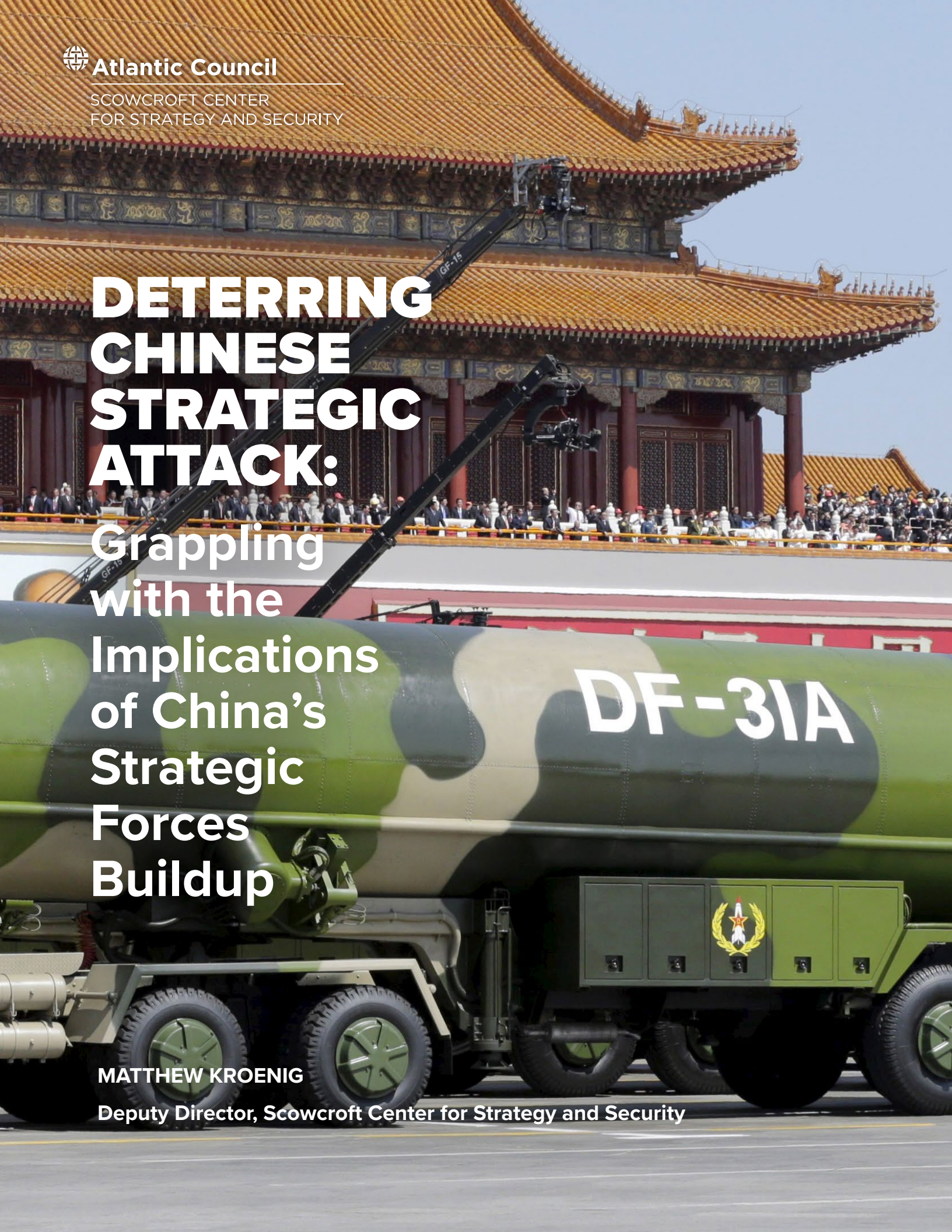


DETERRING CHINESE STRATEGIC ATTACK: Grappling with the Implications of China's Strategic Forces Buildup

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Scowcroft Center for Strategy and Security

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Cover image: Military vehicles carrying DF-31A long-range missiles drive past the Tiananmen Gate during a military parade to mark the 70th anniversary of the end of World War Two in Beijing, China, September 3, 2015. REUTERS/Jason Lee.

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Executive Summary

The United States' National Security Strategy (NSS) and National Defense Strategy (NDS) recognize the return of great-power competition with Russia and China as the foremost threat to US national security. Pressingly, the National Defense Strategy Commission warns that great-power war is possible and the United States could lose.

One major concern is China's growing strategic capabilities and the possibility that China could conduct a nuclear or nonnuclear strategic attack against the United States or its allies. Such an attack could inflict devastating damage, disrupt US warfighting capacity, sap US political will to continue a conventional military campaign, and constrain US military freedom of action.

Despite China's formal No First Use (NFU) policy, scholars have expressed concern that China could launch a nuclear attack on the United States in the event of a major war in the Indo-Pacific. In addition, the 2018 Nuclear Posture Review (NPR) states that China might conduct limited theater nuclear strikes. China may also use space and cyber capabilities to conduct "nonnuclear strategic attacks" against US space-based assets or US nuclear command, control, and communications (NC3). Indeed, China has oriented many of its anti-access/area denial (A2/AD) capabilities to target critical nodes employed by the US Joint Force, including space-based assets.

China's People's Liberation Army (PLA) possesses an expanding and modernizing strategic force and is opaque about its intentions. It possesses a triad of strategic delivery vehicles, including mobile missiles, and will soon begin (or may have already begun) submarine deterrence patrols. The US intelligence community estimates that China's nuclear arsenal will double within the decade, increasing US and allied vulnerability to nuclear attack. The PLA is rapidly testing and deploying nuclear-capable hypersonic glide vehicles, which can defeat US and allied missile defenses. China enjoys a large imbalance in theater nuclear forces over the United States. Finally, the PLA possesses counter-space and cyber capabilities that could be employed in a nonnuclear strategic attack.

The NPR articulates a "tailored and flexible" deterrence strategy for China that requires US strategy and capabilities

to adapt to a changing threat environment. Indeed, developments as of 2021 present many new challenges to US defense strategy that were not addressed in the 2018 NPR.

The rapid expansion of China's strategic and nuclear capabilities threatens several major US defense and deterrence goals articulated in recent US strategy documents. A growing Chinese nuclear arsenal will make it more difficult for the United States to maintain a favorable balance of power in the Indo-Pacific, deter nuclear and nonnuclear strategic attacks, assure allies, achieve objectives if deterrence fails, and hedge against an uncertain future. It also means that, for the first time, the United States will need to contend with two nuclear-armed major powers (Russia and China), both with substantial nuclear capabilities.

Main Themes Of The Recommended Strategy

To counter the threat from China's increasingly assertive foreign policy and its growing strategic and nuclear capabilities, this report outlines a strategy for Washington and its allies to reliably deter Chinese strategic attack. It argues that the United States must make it clear to Beijing that any strategic attack on the United States, its allies, or its forces will result in unacceptable costs for China. This strategy must also account for the nuclear posture of Russia, considering that perhaps Russia and China could work in collaboration against US interests. To support this strategy, Washington must maintain a favorable balance of power over China at each rung of the escalation ladder. This includes preserving a qualitative and quantitative edge at the strategic level, developing more flexible nonstrategic nuclear capabilities and concepts of operations for their use in the Indo-Pacific, and maintaining an effective conventional deterrent. Washington should also prioritize China in nuclear arms control efforts.

Pursuing this strategy will not be easy, but the consequences of failing to deter a Chinese strategic attack could be unacceptable. The United States and its allies should act now to prevent a potentially catastrophic deterrence failure.

Introduction

According to the most recent Annual Threat Assessment of the US Intelligence Community, China poses a serious threat to the national security of the United States.¹ Under Chairman Xi Jinping, China has pursued a much more assertive foreign policy that appears aimed to disrupt, or even displace, the US-led, rules-based international system.

China poses a comprehensive threat to US, allied, and partner interests across the economic, technological, political, diplomatic, and military domains.² The Chinese economy has grown rapidly in the past several decades, and economists predict that China could overtake the United States as the world's largest economy in the coming years. China uses its growing economic power to coerce the United States and its allies. It systematically preys on the international economic system, engaging in unfair trade practices, such as stealing intellectual property, subsidizing domestic firms, and restricting foreign firms' market access.³ The United States has been the world's leader in technology since the time of Thomas Edison, but China has a massive, state-led program to control the commanding heights of the global economy by dominating the emerging technologies of the Fourth Industrial Revolution, including artificial intelligence, quantum computing, 5G, and more.⁴ In the realm of domestic governance, China is engaging in genocide and crimes against humanity in Xinjiang, cracking down on traditional freedoms in Hong Kong, and exporting its authoritarian model overseas.⁵ Diplomatically, China is increasing its influence in every world region through its Belt and Road Initiative investments and other means.⁶ Beijing is acquiring sway in international institutions, such as the World Health Organization, to turn these bodies against their intended

purposes.⁷ China's diplomats engage in increasingly aggressive "wolf warrior" diplomacy aimed to silence any criticism of China.

Perhaps the greatest threat posed by China, however, is in the military domain. For the past several decades, Beijing has gone to school on the American way of war and formulated a military strategy and capabilities designed to prevent the United States from projecting military power into the Indo-Pacific.⁸ It has invested its economic gains in new military capabilities, and its rapid military buildup has shifted the balance of power in the Indo-Pacific, leading many defense experts to question whether the United States still has the ability to protect longstanding allies and partners in the region. Moreover, China has a number of ongoing border and maritime disputes with its neighbors, including with Taiwan, Japan, India, Bhutan, and states that hold interests in the South China Sea. It is engaging in increasingly aggressive military coercion in these disputes, and all have the potential to escalate into a major crisis or war that could involve the United States.

Among the highest-priority concerns for US military planners is a potential Chinese attack on Taiwan. Beijing views the island as a renegade province and has not ruled out the use of force to reincorporate it into mainland China. Given the geographic location of the island roughly 100 miles from mainland China, it could be difficult for the US military to either prevent an attack on the island or liberate it after a Chinese takeover.

To address the challenge of deterring Chinese strategic attack, this paper will proceed in five parts. First, it will assess

- 1 Office of the Director of National Intelligence, *Annual Threat Assessment of the US Intelligence Community*, April 9, 2021, <https://www.dni.gov/files/ODNI/documents/assessments/ATA-2021-Unclassified-Report.pdf>; Ash Jain and Matthew Kroenig, *Present at the re-creation: A global strategy for revitalizing, adapting, and defending a rules-based international system*, Atlantic Council, October 30, 2019, <https://www.atlanticcouncil.org/in-depth-research-reports/report/present-at-the-re-creation/>.
- 2 Matthew Kroenig and Jeffrey Cimmino, *Global Strategy 2021: An Allied Strategy for China*, Atlantic Council, 2020, <https://www.atlanticcouncil.org/wp-content/uploads/2020/12/Global-Strategy-2021-An-Allied-Strategy-for-China.pdf>.
- 3 White House Office of Trade and Manufacturing Policy, *How China's Economic Aggression Threatens the Technologies and Intellectual Property of the United States and the World*, June 19, 2018, <https://trumpwhitehouse.archives.gov/briefings-statements/office-trade-manufacturing-policy-report-chinas-economic-aggression-threatens-technologies-intellectual-property-united-states-world/>.
- 4 Arjun Kharpal, "In battle with U.S., China to focus on 7 'frontier' technologies from chips to brain-computer fusion," CNBC, March 5, 2021, <https://www.cnbc.com/2021/03/05/china-to-focus-on-frontier-tech-from-chips-to-quantum-computing.html>; David Sacks, "China's Huawei Is Winning the 5G Race. Here's What the United States Should Do To Respond," Council on Foreign Relations, March 29, 2021, <https://www.cfr.org/blog/china-huawei-5g>.
- 5 Bureau of Democracy, Human Rights, and Labor, *2020 Country Reports on Human Rights Practices: China (Includes Hong Kong, Macau, and Tibet)*, US Department of State, March 30, 2021, <https://www.state.gov/reports/2020-country-reports-on-human-rights-practices/china/>.
- 6 David Shullman, ed, *Chinese Malign Influence and the Corrosion of Democracy: An Assessment of Chinese Interference in Thirteen Key Countries*, International Republican Institute, 2019, https://www.iri.org/sites/default/files/chinese_malign_influence_report.pdf.
- 7 Hinnerk Feldwisch-Drentrup, "How WHO Became China's Coronavirus Accomplice," *Foreign Policy*, April 2, 2020, <https://foreignpolicy.com/2020/04/02/china-coronavirus-who-health-soft-power/>.
- 8 Ngo Minh Tri, "China's A2/AD Challenge in the South China Sea: Securing the Air From the Ground," *Diplomat*, May 19, 2017, <https://thediplomat.com/2017/05/chinas-a2ad-challenge-in-the-south-china-sea-securing-the-air-from-the-ground/>.

China's contemporary policy and strategy surrounding its strategic forces, including its growing capabilities. Second, it will examine how the expansion of Chinese strategic forces poses a challenge to US defense and deterrence goals, as articulated in recent US strategy documents. Third, it will contemplate plausible scenarios for nuclear use in contingencies with China that a US strategy would have

to address. Fourth, it proposes a tailored US strategy for deterring Chinese strategic attack, including US and allied strategy, policy, operations, and capabilities. The strategy also calls for arms control measures. Finally, the paper offers a brief conclusion and a summary of its key findings and recommendations.



Protesters attend a demonstration demanding Hong Kong's leaders step down and withdraw the extradition bill, in Hong Kong, China, June 16, 2019. Picture taken June 16, 2019. REUTERS/Stringer.

Assessing China's Strategic Forces Policy

For the past several years, there has been an apparent mismatch between China's aggressive foreign policy and its relatively restrained strategic forces policy, but that might be changing. Since the time of Mao Zedong, China has sought to develop a "lean and effective" deterrent aimed at deterring a nuclear attack and defending against perceived nuclear blackmail by the United States and other Western powers.⁹ For decades, however, China's capabilities fell well short of what Western analysts would describe as an assured retaliation posture. China did not field an intercontinental ballistic missile (ICBM) capable of striking Washington until 1981 and, without a credible launch-on-warning capacity or regular ballistic missile submarine (SSBN) patrols, its arsenal was likely not survivable in the event of a US first strike until the deployment of its first land-mobile missiles in 2008.¹⁰ With its formal NFU policy and lean and effective nuclear arsenal of only a couple hundred nuclear weapons, China aspired to a nuclear force capable of riding out an enemy nuclear attack and retaliating with a devastating second strike.¹¹ China was also believed to pursue a pure countervalue targeting strategy, meaning that, in the event of nuclear war, it would launch large-yield warheads on relatively inaccurate ICBMs at major US cities with the intent of killing as many people as possible.

Unlike Washington and Moscow, however, Beijing did not envision a more expansive role for its nuclear weapons or desire strategic nuclear parity with the other superpowers. Indeed, just a few years ago, specialists described the nuclear threat presented by China as the least severe of the three nuclear-armed adversaries (the other two being Russia and North Korea) facing the United States.¹²

For years, US defense officials worried that China might attempt to "sprint to parity."¹³ As it became a superpower in other domains, US analysts wondered, would Beijing also demand a superpower nuclear arsenal?

There was always the possibility, of course, that China's NFU was mere window dressing. It is easy to promise no first use in a policy document, but it is doubtful whether that position would remain in the midst of a heated crisis or war. In Track 1.5 dialogues, Chinese experts have stated that China might consider using nuclear weapons first under a narrow range of circumstances, such as if the United States conducted conventional strikes on the Chinese mainland against co-located nuclear and conventionally armed missiles.¹⁴ US defense officials increasingly discount China's NFU pledge.

US officials have also warned that China (and Russia) would likely employ cyber and counterspace attacks in the early stages of any conflict with the United States in an attempt to disrupt US NC3. The 2018 NPR labeled these types of attacks "nonnuclear strategic attacks," and, in a bid to deter such attacks, left on the table the option of responding with US nuclear weapons.¹⁵

Most importantly, China's significant nuclear buildup does not appear to be consistent with the country's traditional and longstanding relaxed nuclear posture. Some have argued that China's buildup is simply an effort to ensure the survivability of its force and keep pace with developments in the United States, such as US missile defense deployments.¹⁶ But the size and scope of the Chinese buildup may signal a major shift in Chinese nuclear strategy. For

9 Michael S. Chase, "China's Transition to a More Credible Nuclear Deterrent: Implications and Challenges for the United States," *Asia Policy* No. 16 (July 2013): 69–102, <https://www.jstor.org/stable/24905232>.

10 Missile Defense Project, "DF-5 (Dong Feng-5 / CSS-4)," Center for Strategic and International Studies, accessed July 2021, <https://missilethreat.csis.org/missile/df-5-ab/>; Missile Defense Project, "DF-31 (Dong Feng-31 / CSS-10)," Center for Strategic and International Studies, accessed July 2021, <https://missilethreat.csis.org/missile/df-31/>.

11 Hans M. Kristensen and Matt Korda, "Chinese nuclear forces, 2020," *Bulletin of the Atomic Scientists* 76 (6) (2020): 443–457, DOI: 10.1080/00963402.2020.1846432.

12 Matthew Kroenig, *Approaching Critical Mass: Asia's Multipolar Nuclear Future*, NBR Special Report No. 58, National Bureau of Asian Research, June 22, 2016.

13 Donald H. Rumsfeld, "Hearing on The Strategic Offensive Reductions Treaty," Committee on Armed Services, US Senate, July 25, 2002, quoted in Amy F. Woolf, *U.S. Strategic Nuclear Forces: Background, Developments, and Issues*, Congressional Research Service, February 23, 2009, <https://apps.dtic.mil/sti/citations/ADA493137>.

14 Author's conversations with Chinese officials under Chatham House Rule.

15 Office of the Secretary of Defense, *Nuclear Posture Review, 2018*, <https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF>.

16 Eric Heginbotham, Michael S. Chase, Jacob L. Heim, Bonny Lin, Mark R. Cozad, Lyle J. Morris, Christopher P. Twomey, Forrest E. Morgan, Michael Nixon, Cristina L. Garafola, and Samuel K. Berkowitz, *China's Evolving Nuclear Deterrent: Major Drivers and Issues for the United States*, RAND Corporation, 2017, https://www.rand.org/pubs/research_reports/RR1628.html.

example, as China increases the size and accuracy of its strategic forces and moves to multiple independent reentry vehicles (MIRVs), some experts believe Beijing may be reconsidering countervalue targeting and moving toward a

counterforce strategy designed to target the strategic forces of its nuclear-armed adversaries, including regional rivals, such as India, Russia, or even the United States.



Military vehicles carrying DF-31A long-range missiles drive past the Tiananmen Gate during a military parade to mark the 70th anniversary of the end of World War Two in Beijing, China, September 3, 2015. REUTERS/Jason Lee.

China's Strategic Forces

China is engaging in a significant buildup of its strategic forces. The US Department of Defense (DoD) assesses that China fields a nuclear arsenal numbered in the low two hundreds, and outside experts estimate that roughly half of these warheads are capable of intercontinental delivery.¹⁷ Moreover, the US government has projected that China will double the size of its nuclear arsenal in the coming decade.¹⁸ In congressional testimony, Adm. Charles Richard, commander of US Strategic Command assesses, that China's arsenal may even triple or quadruple in that time period.¹⁹ If these projections are correct, then China could have between four hundred and eight hundred nuclear weapons in the 2030s, with a large number of these ready for intercontinental delivery. While these numbers would not yet place China at parity with Russia or the United States (the New START Treaty limits both nuclear superpowers to no more than 1,550 strategic deployed nuclear warheads), it would move China closer in that direction. This buildup does not seem consistent with an intent to maintain a "lean and effective" deterrent.

China is also greatly expanding its means of delivery. Two decades ago, China possessed only twenty silo-based ICBMs capable of delivering nuclear weapons to the continental United States.²⁰ Since that time, Beijing has been building and deploying road-mobile ICBMs with MIRVed warheads. It may now be able to deliver roughly one hundred nuclear weapons to the United States.²¹ China is

making progress on hypersonic missiles of both intercontinental and theater ranges that could be used to deliver either conventional or nuclear warheads.²²

China has been improving the survivability of its nuclear forces, with its road-mobile missiles, a sea-based leg, and tunneling. "The Underground Great Wall" is an extensive network of two thousand miles of underground tunnels in which China can hide and protect its mobile missiles.²³ Most experts assess the purpose of the tunneling is to protect China's relatively small nuclear arsenal, but some have speculated that the true purpose may be to conceal a much larger nuclear force.²⁴

China is also moving toward the development of a triad. While China possessed nuclear-capable bombers for decades and placed its first nuclear-capable submarine in the water in 1986, it has essentially relied on a monad of missiles for nuclear delivery.²⁵ Chinese leaders have not relied on bombers, which were judged vulnerable to Soviet (later Russian) and US air defenses.²⁶ Its ballistic missile submarines do not conduct regular deterrence patrols.²⁷ There are current limits to the capacity of these delivery systems. China's H-6 bombers lack intercontinental range and will likely be available only for a regional role. With respect to their sea-based capabilities, Chinese submarines have notable survivability problems. Due to elevated noise levels, Chinese submarines may be especially vulnerable to US anti-submarine warfare. An additional challenge is range, with Chinese submarine-launched ballistic missiles

- 17 Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2020*, annual report to Congress, 2020, <https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF>.
- 18 Defense Intelligence Agency Director Lt. Gen. Robert P. Ashley, Jr., "Russian and Chinese Nuclear Modernization Trends," remarks at the Hudson Institute, May 29, 2019, <https://www.dia.mil/News/Speeches-and-Testimonies/Article-View/Article/1859890/russian-and-chinese-nuclear-modernization-trends/>.
- 19 "To receive testimony on United States Strategic Command and United States Space Command in review of the Defense Authorization Request for Fiscal Year 2022 and the Future Years Defense Program," Senate Armed Services Committee hearing, 117th Cong. (April 20, 2021) (testimony by Adm. Charles Richard, commander, United States Strategic Command), <https://www.armed-services.senate.gov/hearings/to-receive-testimony-on-united-states-strategic-command-and-united-states-space-command-in-review-of-the-defense-authorization-request-for-fiscal-year-2022-and-the-future-years-defense-program>.
- 20 Hans Kristensen and Matt Korda, "The Pentagon's 2020 China Report," Federation of American Scientists, September 1, 2020, <https://fas.org/blogs/security/2020/09/the-pentagons-2020-china-report/>.
- 21 Kristensen and Korda, "Chinese nuclear forces, 2020."
- 22 John T. Watts, Christian Trotti, and Mark J. Massa, *Primer on Hypersonic Weapons in the Indo-Pacific Region*, Atlantic Council, August 2018, <https://www.atlanticcouncil.org/wp-content/uploads/2020/08/Hypersonics-Weapons-Primer-Report.pdf>.
- 23 Hui Zhang, "The defensive nature of China's 'underground great wall,'" *Bulletin of the Atomic Scientists*, January 16, 2012, <https://thebulletin.org/2012/01/the-defensive-nature-of-chinas-underground-great-wall/>.
- 24 William Wan, "Georgetown students shed light on China's tunnel system for nuclear weapons," *Washington Post*, November 29, 2011, https://www.washingtonpost.com/world/national-security/georgetown-students-shed-light-on-chinas-tunnel-system-for-nuclear-weapons/2011/11/16/gIQA6AmKAO_story.html.
- 25 Rick Joe, "How the Descendants of a 1950s Bomber Transformed China's Strike Reach," *Diplomat*, November 18, 2020, <https://thediplomat.com/2020/11/how-the-descendants-of-a-1950s-bomber-transformed-chinas-strike-reach/>; Nuclear Threat Initiative, "China Submarine Capabilities," February 17, 2021, <https://www.nti.org/analysis/articles/china-submarine-capabilities/>.
- 26 Gregory Kulacki, "Red Guards and Nuclear Missiles," Union of Concerned Scientists, January 7, 2015, <https://allthingsnuclear.org/gkulacki/red-guards-and-nuclear-missiles>.
- 27 Nuclear Threat Initiative, "China Submarine Capabilities."



The Chinese H-6 bomber is nuclear capable. Photo courtesy Ministry of Defense of Japan. http://www.mod.go.jp/js/Press/press2015/press_pdf/p20151127_02.pdf.

(SLBMs) being unable to hit the continental United States from port or China's near seas.²⁸

In recent years, however, China has given strategic bombers a nuclear mission, and the DoD has estimated that China will soon begin regular submarine deterrence patrols.²⁹ China's new H-20 stealth long-range bomber and new nuclear-armed air-launched ballistic missiles (ALBMs) could give China an effective strategic air leg.³⁰ China's new conventionally armed *Shang*-class submarines are quieter and perhaps more survivable than previous generations of Chinese boats.³¹ Moreover, over time, as China's global relationships expand and deepen, it is possible that Beijing could attempt to forward-base ballistic missile submarines, placing SLBMs

within range of the continental United States.³²

At the theater level, Beijing possesses hundreds—or perhaps thousands—of short-, medium-, and intermediate-range nuclear-capable missiles that can hold at risk US bases, forces, and allies in the region.³³ Until its 2019 withdrawal from the Intermediate-Range Nuclear Forces (INF) Treaty, the United States was prohibited from developing intermediate-range missiles. In contrast, Beijing was not part of the agreement, which would have banned 90 percent of its ground-based missile arsenal.³⁴

Turning to nonnuclear strategic forces, China is developing or already possesses significant offensive cyber and

28 Joe Pappalardo, "What China's Nuclear Missile Subs Mean for the U.S.," *Popular Mechanics*, November 13, 2012, <https://www.popularmechanics.com/military/a8413/what-chinas-nuclear-missile-subs-mean-for-the-us-14726083/>.

29 Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2020*; Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2019*, annual report to Congress, 2019, https://media.defense.gov/2019/May/02/2002127082/-1/-1/1/2019_CHINA_MILITARY_POWER_REPORT.pdf.

30 Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2020*.

31 Caleb Larson, "Chinese Submarines Are Becoming Quieter: Here's What We Know About The New Type 093," *National Interest*, September 10, 2020, <https://nationalinterest.org/blog/reboot/chinese-submarines-are-becoming-quieter-heres-what-we-know-about-new-type-093-168647>.

32 John Grady, "Chinese Navy Faces Overseas Basing Weakness, Report Says," *USNI News*, January 22, 2021, <https://news.usni.org/2021/01/22/chinese-navy-faces-overseas-basing-weakness-report-says>.

33 Mike Yeo, "China could lose 95% of ballistic, cruise missiles under strategic arms control pact, says new analysis," *Defense News*, June 5, 2020, <https://www.defensenews.com/global/asia-pacific/2020/06/05/china-could-lose-95-of-ballistic-cruise-missiles-under-strategic-arms-control-pact-says-new-analysis/>.

34 Grzegorz Kuczyński, *The Collapse of the INF Treaty and the US-China Rivalry*, Warsaw Institute, January 3, 2020, <https://warsawinstitute.org/the-collapse-of-the-inf-treaty-and-the-us-china-rivalry/>.

counterspace capabilities. China's burgeoning counterspace arsenal includes capabilities and developmental programs for direct-ascent and co-orbital anti-satellite (ASAT) weapons capable of ranging all orbital regimes, electronic warfare, and directed energy weapons.³⁵ In the early stages of any conflict, US defense experts believe that Beijing would likely attack US cyber and space-based assets in an attempt to disrupt and degrade US NC3.

Despite its persistent complaints about US missile defenses, China is developing its own ballistic missile defense system. China already fields the HQ-19, S-300, and S-400 defenses, capable of intercepting short- and medium-range ballistic missiles and is flight testing its own land-based, exo-atmospheric midcourse defense against ICBMs.³⁶

35 Brian Weeden and Victoria Sampson, eds, *Global Counterspace Capabilities: An Open Source Assessment*, Secure World Foundation, April 2021, <https://swfound.org/counterspace/>.

36 Chelsie Boodoo, "China Flight-Tests Missile Interceptors," *Arms Control Today*, April 2021, <https://www.armscontrol.org/act/2021-04/news-briefs/china-flight-tests-missile-interceptors>.

China's Strategic Forces' Expansion And US Defense And Deterrence Goals

The expansion of China's strategic forces directly threatens US defense and deterrence goals, including the goal of maintaining a favorable balance of power in the Indo-Pacific, as articulated in the 2018 National Defense Strategy of the United States (NDS) and the four goals of the 2018 Nuclear Posture Review (NPR): 1) deterring nuclear and nonnuclear strategic attack; 2) assuring allies; 3) achieving objectives if deterrence fails; and 4) hedging against an uncertain future.³⁷

Moreover, China's nuclear buildup means, that for the first time in its history, the United States will need to contend with two nuclear-armed great powers (Russia and China), each with substantial nuclear capabilities. When China possessed a relatively small nuclear arsenal, the United States could develop a nuclear strategy and posture geared toward Russia and largely treat China as a lesser included case. Going forward, however, the United States will need to develop a truly tailored strategy and posture that can meet its various deterrence strategy and policy goals with regard to Russia and China at the same time and perhaps against those two countries working in collaboration against US interests.

Maintain A Favorable Regional Balance Of Power

The 2018 NDS vowed that the United States and its allies and partners would maintain a favorable regional balance of power over China in the Indo-Pacific.³⁸ That is the correct goal. The US military advantage in Asia has deterred competitors and maintained stability in the region for decades. But China's military buildup is threatening the US military edge. The conventional balance of power is shifting, and there are questions about Washington's ability to prevail in the event of a Chinese assault on Taiwan. Moreover, China possesses a theater nuclear advantage. It has hundreds of nonstrategic nuclear weapons that it could use in a regional war. Washington shed most of its nonstrategic nuclear weapons at the end of the Cold War, retaining only several hundred gravity bombs capable of delivery by dual-capable fighter aircraft (DCAs). In the event of a Chinese

attack with theater nuclear forces, Washington, with few nonstrategic nuclear options, might face a choice between continuing the fight at the conventional level, or escalating disproportionately to the strategic level. Finally China's strategic forces expansion renders the US homeland increasingly vulnerable to Chinese strategic attack. Washington now finds itself with a conventional balance of power in question, an inferiority in theater nuclear forces, and mutual (albeit asymmetric) vulnerability at the strategic level. This is not a favorable regional balance of power.

Deter Nuclear And Nonnuclear Attack

In order to conduct a disarming nuclear strike on the United States, China would need to launch a large-scale nuclear counterforce strike against roughly 450 to 500 strategic targets, including US ICBM silos, strategic submarine bases, strategic air bases, and other important sites. Presently, China does not possess such a capability. As China increases the number and accuracy of its intercontinental-range missiles, however, and if (as some in Washington advocate) the United States were to significantly reduce the size of its strategic forces, or even shed a leg of the triad, this capability could come within Beijing's reach.³⁹ If China quadruples the size of its nuclear arsenal, for example, it will possess roughly eight hundred nuclear warheads that could be employed in a counterforce strike. While a Chinese first strike in these conditions might not succeed in disarming US nuclear forces, it could significantly degrade them, potentially making it a more attractive option in a major crisis or war.

Moreover, China's growing nuclear capabilities could tempt Beijing to use nuclear weapons in a major theater war, such as in a conflict over Taiwan. Currently, Chinese leaders likely see its nuclear forces primarily as a deterrent to US nuclear weapons and to keep any regional fight at the conventional level. Still, there are rational reasons why Beijing might reconsider limited nuclear first use in a major crisis or war. China could conduct theater nuclear strikes in the region as part of a war-winning strategy to degrade vulnerable US and allied bases and forces. If China were losing a major

37 Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge*, 2018, <https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf>; Department of Defense, *Nuclear Posture Review*, 2018, <https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF>.

38 Department of Defense, *Summary of the 2018 National Defense Strategy*.

39 William J. Perry, "Why It's Safe to Scrap America's ICBMs," *New York Times*, September 30, 2016, <https://www.nytimes.com/2016/09/30/opinion/why-its-safe-to-scrap-americas-icbms.html>.



US, Australian, and Japanese naval vessels conduct a joint exercise. China's military rise threatens to upend the balance of power in the Indo-Pacific. US Navy photo by Mass Communication Specialist 2nd Class Codie L. Soule. <https://tinyurl.com/2e2yyx3w>.

conventional war, it might conduct a limited nuclear strike in a bid to shock US leaders into halting the conflict. This strike could be against US forces or bases or in the atmosphere as a demonstration shot.⁴⁰ Even though this does not appear to be China's current nuclear strategy, the imbalance of non-strategic nuclear forces in China's favor makes this a potentially attractive option for Beijing in the fog of an intense crisis or war. Facing a desperate situation, Beijing might assess that it possesses a favorable balance of stakes, resolve, and/or capabilities. It might be willing to gamble, therefore, that if it escalates a conflict to the nuclear level, Washington will not have the will or the capabilities to respond in kind. Such a Chinese approach would be similar to the feared Russian "escalate-to-de-escalate" strategy.⁴¹ Moreover, in the heat of a major theater war, with the United States conducting strikes on assets relevant to China's nuclear mission (such as NC3 and co-located missiles), nuclear weapons could be used due to miscalculation or inadvertent escalation.⁴²

The most likely cause of a Chinese strategic attack on the United States would not be a bolt-from-the-blue strike, but

rather escalation from a conventional war or crisis. Factors that contribute to an increased risk of crisis onset or escalation, therefore, also increase the risks of deterrence failure. A growing nuclear arsenal might strengthen Chinese resolve, making Beijing more willing to initiate and escalate crises against the United States and its allies in a way that could increase the risk of nuclear war.⁴³ China's growing nuclear forces might also serve as a backstop to conventional aggression. Beijing may believe (rightly or wrongly) that it has a free hand to engage in an armed attack against Taiwan or other US regional allies because it can press a local, conventional advantage and use nuclear threats to deter US intervention or escalation. In the event of such a conflict, there would be an inherent risk of nuclear escalation. It is likely that China would also conduct cyber and counterspace attacks against US assets. Beijing might assess that the United States' growing vulnerability to China's nuclear weapons makes less credible the US threat, articulated in the 2018 NPR, to keep the nuclear option on the table to deter and, if necessary, respond to Chinese attacks on US NC3.⁴⁴

40 Matthew Kroenig, *A strategy for deterring Russian de-escalation strikes*, Atlantic Council, April 24, 2018, <https://www.atlanticcouncil.org/in-depth-research-reports/report/a-strategy-for-deterring-russian-de-escalation-strikes/>.

41 Ibid.

42 Caitlin Talmadge, "Would China Go Nuclear? Assessing the Risk of Chinese Nuclear Escalation in a Conventional War with the United States," *International Security* 41 (4) (Spring 2017): 50–92, https://doi.org/10.1162/ISEC_a_00274.

43 Matthew Kroenig, *The Logic of American Nuclear Strategy: Why Strategic Superiority Matters* (New York: Oxford University Press, 2018).

44 *Nuclear Posture Review*, 2018, 56.

These deterrence challenges are exacerbated by the lurking presence of Russian strategic threats. 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 a opportunity to engage in military aggression in the Indo-Pacific.

Assure Allies And Partners

The second major goal of US nuclear strategy, assurance of allies and partners, might also be complicated by China's growing strategic forces. The US ability to extend deterrence in the Indo-Pacific has been facilitated for decades by the United States' favorable strategic balance of power over China. It was only a few years ago that US and Chinese experts calculated that the United States might have a splendid first strike capability against China's strategic forces.⁴⁵ As China's arsenal has grown, however, many outside analysts have come to the conclusion that Washington and Beijing now exist in a situation of "mutual vulnerability."⁴⁶ As China's arsenal continues to expand, it will be better able to hold the US homeland at risk and impose greater and arguably unacceptable costs on the continental United States. During the Cold War, Charles de Gaulle famously asked whether Washington would trade New York for Paris.⁴⁷ Today the question becomes: Would Washington trade Los Angeles for Tokyo, Seoul, Canberra, or Taipei?

Even if Washington is willing to accept some risk of conflict in order to extend deterrence over Japan, South Korea, Australia, and Taiwan, its resolve might weaken in a serious crisis after it has become more vulnerable.⁴⁸ As a nuclear war becomes more costly, Washington might be less willing to run risks of such a war and more likely to look for off-ramps early in a crisis.

Furthermore, regardless of the United States' true resolve to extend deterrence to nonnuclear allies in the Indo-Pacific, what is the perception of Washington's resolve in

allied capitals? If allies believe that the United States' growing vulnerability to a Chinese strategic attack will weaken Washington's resolve, then allies might not be assured. This could have negative consequences for US strategy in the region, including, in extreme cases, of US allies pursuing independent nuclear arsenals, weakening the global non-proliferation regime. Tokyo, Seoul, and Taipei likely possess the industrial capacity to build nuclear weapons if they decided to do so.⁴⁹

To be sure, the United States was able to successfully extend deterrence to Europe during the Cold War, despite US vulnerability to Soviet strategic forces. But its attempts to assure allies included failures. London and Paris both judged that they required independent nuclear arsenals to protect themselves from the Soviet nuclear threat. It is possible that capable Asian allies might make a similar calculation in the future.

Achieve Objectives If Deterrence Fails

A longstanding goal of US nuclear strategy is to achieve national objectives if deterrence fails. If China decides to use nuclear weapons, the United States will not simply sit back and accept assured destruction. Rather, it will take a variety of steps to attempt to limit damage to itself and its allies. This could include seeking to de-escalate the conflict. It could also include using counterforce strikes and missile defenses to blunt a Chinese nuclear attack. As China's strategic forces grow, it will be more difficult for the United States to cover the relevant Chinese strategic targets in order to limit damage to itself and its allies. Every additional Chinese nuclear warhead deployed is a nuclear warhead that may evade US counterforce strikes or missile defense interceptors in the event of a nuclear exchange. Every additional Chinese warhead deployed, therefore, is also a weapon that could increase US or allied lives lost by tens or hundreds of thousands.

Hedge Against An Uncertain Future

US nuclear strategy must also be prepared to hedge against an uncertain future. The United States has plans to

45 Keir A. Lieber and Daryl G. Press, "Superiority Complex," *Atlantic*, July/August 2007, <https://www.theatlantic.com/magazine/archive/2007/07/superiority-complex/305989/>.

46 Hugh White, "To Reassure U.S. Allies in Asia, Admit Mutual Vulnerability with China," *War on the Rocks*, June 8, 2018, <https://warontherocks.com/2018/06/to-reassure-u-s-allies-in-asia-admit-mutual-vulnerability-with-china/>.

47 Office of the Historian, 30. Memorandum of Conversation, President's Visit, *Foreign Relations of the United States, 1961–1963*, Volume XIV, Berlin Crisis, 1961–1962, US/MC/1, Paris, May 31, 1961, 12:30 p.m., <https://history.state.gov/historicaldocuments/frus1961-63v14/d30>.

48 See, for example: Kroenig, *The Logic of American Nuclear Strategy*; Robert Powell, "Nuclear Brinkmanship, Limited War, and Military Power," *International Organization* 69 (3) (Summer 2015): 589–626, <https://www.jstor.org/stable/24758314>.

49 Mark Fitzpatrick, *Asia's Latent Nuclear Powers: Japan, South Korea and Taiwan*, International Institute for Strategic Studies, February 2016, <https://www.iiss.org/publications/adelphi/2015/asia39s-latent-nuclear-powers-japan-south-korea-and-taiwan>.



Military vehicles carrying underwater drones travel past Tiananmen Square during the military parade marking the 70th founding anniversary of People's Republic of China on its National Day in Beijing, China October 1, 2019. REUTERS/Jason Lee.

modernize its nuclear forces, and these forces must serve as the US nuclear deterrent over the coming half-century. US nuclear posture, therefore, must not only be designed with today's security environment in mind, but must also be able to adapt to changed future circumstances. The growing Chinese threat presents both technological and geopolitical risk to US nuclear strategy and posture. China's nuclear buildup and investments in new strategic technology may upend longstanding assumptions of US nuclear strategy. For example, Chinese investments in new technology could make it easier for Beijing to track US nuclear submarines or to disrupt US NC3, potentially calling into question the survivability of US nuclear forces.⁵⁰

Moreover, China's nuclear buildup will also put upward pressure on the size of the US nuclear arsenal. The United States has for decades pursued a counterforce targeting

strategy that requires the ability to cover the nuclear-related targets of its principal nuclear-armed adversaries. Washington requires, therefore, a nuclear arsenal capable of deterring Russia, China, and North Korea at the same time. The size of the current US nuclear arsenal was set in 2010 with the assumption that China possessed a couple hundred nuclear weapons. As China's arsenal size increases, however, the number of nuclear-related targets that the United States must cover also increases, requiring the United States to increase the number of its nuclear weapons to counter Chinese nuclear capabilities. Analysts assume that a nuclear-armed state must allocate two offensive warheads for every enemy target.⁵¹ If China increases its arsenal by several hundred, then Washington might also need to increase its strategic deployed arsenal by nearly twice that much to maintain its counterforce strategy.

50 Martin Giles, "The US and China are in a quantum arms race that will transform warfare," *MIT Technology Review*, January 3, 2019, <https://www.technologyreview.com/2019/01/03/137969/us-china-quantum-arms-race/>.

51 Keir A. Lieber and Daryl G. Press, "The New Era of Counterforce: Technological Change and the Future of Nuclear Deterrence," *International Security* 41 (4) (Spring 2017): 9–49, <https://www.belfercenter.org/publication/new-era-counterforce-technological-change-and-future-nuclear-deterrence>.

Scenarios For Chinese Strategic Attack

The foremost goal of US nuclear strategy is to deter a nuclear or nonnuclear strategic attack. It is useful to consider, therefore, the conceivable types of strategic attack that the United States and its allies might need to deter.

Chinese Strategic Nuclear Attack

China could conduct a countervalue or counterforce strike on the US mainland. This is the least likely of the scenarios considered in this section but is at least possible in the event of a major war in the Indo-Pacific. China could conduct such an attack, for example, if the Chinese mainland became the target of large-scale US and allied conventional strikes due to accident or inadvertent escalation resulting from US and allied strikes on Chinese NC3 or co-located missiles, or in retaliation for US nuclear use.

Chinese Theater Nuclear Attack

China could conduct a nuclear attack in the Indo-Pacific

theater against US allies, bases, or forces. Such an attack could take the form of a countervalue strike on a US ally, such as Japan, for its participation in any regional conflict, such as in a dispute over the Senkaku Islands. It could be part of a war-winning strategy to degrade US capability in the region by striking US bases, aircraft carriers, or other major military assets. China might also conduct a limited nuclear strike in a bid to force Washington to sue for peace on terms favorable to Beijing. This would be similar to Russia's "escalate-to-de-escalate" strategy. If Beijing were losing a major war over Taiwan, for example, it might see a limited nuclear strike as an option to frighten the United States into halting the conflict to prevent further damage. This strike could take the form of a limited strike on military or civilian targets, or as a demonstration shot in the atmosphere.

Deterring Chinese Nuclear Retaliation

Washington might need to deter Chinese nuclear retaliation following a US first strike. The United States does not possess an NFU policy and reserves the right to use nuclear weapons first. Analysts have written about how



Chinese amphibious transport docks, like the *Yimeng Shan*, seen here taking part in a naval parade off the eastern port city of Qingdao to mark the 70th anniversary of the founding of Chinese People's Liberation Army Navy, would be essential to an invasion of Taiwan. Thus, to credibly deter strategic attack on Taiwan, the United States may need the ability to target these ships. April 23, 2019. REUTERS/Jason Lee.



A US ballistic missile submarine test fires the Trident submarine-launched ballistic missile. The Trident can carry a low-yield W76-2 nuclear warhead, one option which contributes to US deterrence of nonstrategic nuclear attack. US Navy Photo by Mass Communication Specialist 2nd Class Thomas Gooley. <https://tinyurl.com/5k898zye>.

the United States could rely on nuclear threats to deter, for example, a Chinese invasion of Taiwan.⁵² If that threat were to fail, Washington could use theater nuclear weapons against China's invading forces to prevent a takeover of the island. As mentioned above, this would be similar to the US strategy during the Cold War of relying on the threat of nuclear weapons to offset the Soviet Union's conventional superiority in Central Europe.⁵³ This strategy could become more attractive to Washington if the conventional balance of power in the Taiwan Strait continues to shift in Beijing's favor. If Washington were to use nuclear weapons in this manner, however, China might seek to retaliate either in a proportional manner or with a large-scale strategic strike, and the United States would want to deter such retaliation.

Deterring Nonnuclear Strategic Attacks

Beijing might also conduct a nonnuclear strategic attack on the United States or its allies. These are attacks that, while conducted with nonnuclear weapons, would have strategic effects equivalent to nuclear weapons. This could mean a large-scale conventional attack on, or invasion of, US allies.

Such an attack might be backstopped by nuclear threats. While such an attack is unlikely, there are many plausible flashpoints for conventional conflict between Beijing and Washington, including Taiwan, the Senkaku Islands, the Korean Peninsula, and the South China Sea.

Washington would also like to deter China from launching a major cyber or counterspace attack with strategic effect. This could include a large-scale cyberattack on the United States and its allies, such as an operation to shut down the power grid on the Eastern Seaboard of the United States. Washington would also want to deter China from conducting a cyberattack on US NC3, or from attacking US space-based assets, which also serve a strategic role for the civilian economy, the US military, and US NC3.

Finally, despite its international commitments to the contrary, it is possible that China possesses chemical or biological weapons. In the event of a large-scale war, Beijing might be tempted to use these weapons against the United States and its allies, and Washington would want to deter such an attack.

52 Elbridge Colby, "If You Want Peace, Prepare for Nuclear War," *Foreign Affairs*, November/December 2018, <https://www.foreignaffairs.com/articles/china/2018-10-15/if-you-want-peace-prepare-nuclear-war>.

53 John J. Mearsheimer, "Nuclear Weapons and Deterrence in Europe," *International Security* (9) (3) (Winter, 1984–1985): 19-46, <https://doi.org/10.2307/2538586>.

A Strategy For Deterring Chinese Strategic Attack

What kind of strategy and posture do the United States and its allies need to deter a Chinese strategic attack? Answering that question will be the subject of this, the second half of the report. It will begin with issues of strategy and policy, then turn to operational concepts, before finishing with a discussion of capabilities.

US And Allied Strategy And Policy

Washington should aim to deter nuclear and nonnuclear strategic attacks on the United States and its allies by making it clear to Beijing that any such attack would result in unacceptable costs for China. Washington should continue to leave the option of a nuclear response on the table to a Chinese nonnuclear strategic attack, including in space or against US NC3. While it might be somewhat incredible that the United States would launch a nuclear reprisal in response to a cyberattack against US NC3 or a US satellite, there may be some deterrent value to leaving the threat on the table. Moreover, there is nothing to be gained by the opposite policy of reassuring Beijing that it can get away with such attacks without worrying about US nuclear weapons. In the cyber and space domains, the United States should also practice deterrence-by-denial by strengthening the security and resilience of these capabilities to Chinese attack.

US nuclear forces should support a defense strategy for China that aims to deny China the ability to invade US allies and security partners by maintaining a favorable balance of power in the Indo-Pacific region.⁵⁴ The US nuclear umbrella currently extends over several US allies in the Indo-Pacific, including Japan, South Korea, and Australia. Deterring and, if necessary, defeating a Chinese attack on Taiwan is also among the DoD's highest priorities. A successful Chinese invasion of Taiwan would weaken the credibility of US commitments globally and provide China with a platform from which to more easily threaten US allies and bases in the region. The greatest risk of war comes from a Chinese miscalculation. The US commitment to Taiwan is ambiguous, and the conventional balance of power is narrowing. If Beijing calculates incorrectly that it can invade Taiwan without a US response, then it might be more tempted to do so. US policy should aim to prevent miscalculation in Beijing. The United States should clarify its defense commitment

to Taiwan as other experts have recently recommended. Moreover, as part of the process of clarifying its commitment, the United States should consider clarifying whether its nuclear umbrella also potentially extends over Taiwan.

The United States should assure allies that it will contribute to their self-defense and that there is no reason for them to develop independent nuclear arsenals. While a central goal of US nuclear policy is to deter strategic attacks, if deterrence fails, then Washington must be prepared to achieve its objectives. Finally, Washington's strategic forces must be designed to hedge against an uncertain future.

As discussed above, however, each of these objectives is threatened by Chinese force developments that are cutting into the US military advantage. To reverse these trends, the United States should aim to possess a quantitative and qualitative military advantage at each rung of the escalation ladder, from the conventional to the strategic nuclear level, such that Beijing does not believe that it can gain an advantage by escalating a military conflict.

Rather than a radical change in US policy, this would essentially be formalizing the status quo that existed in the Sino-US balance of power for the past several decades. This process begins by reinforcing the conventional balance of power in support of a defense strategy of denial.⁵⁵ The United States and its allies and partners must be capable of denying China a successful invasion of US allies and security partners, especially Taiwan. Beijing can be deterred if it assesses that such an attack is likely to fail. As argued above, the most worrisome potential gap in the escalation ladder currently may be at the theater nuclear level. The United States and its allies must therefore possess useable nonstrategic nuclear options to respond to any limited Chinese nuclear strike. The purpose would not be to fight a nuclear war but to deter Beijing from going down this path in the first place. There are questions about whether the United States currently has sufficient nonstrategic nuclear capabilities, and Washington may need to strengthen nonstrategic nuclear capabilities to support a military strategy of denial. Finally, at the strategic level, the United States should seek to maintain its quantitative and qualitative edge over China. Some have argued that the United States is already vulnerable to a strategic exchange with China and that, therefore, the United States

⁵⁴ Elbridge A. Colby, *The Strategy of Denial: American Defense in an Age of Great Power Conflict* (New Haven: Yale University Press, 2021).

⁵⁵ Ibid.

should recognize and accept this “mutual vulnerability.” China’s leaders also desperately want the United States to explicitly acknowledge this vulnerability. It is true that the United States is vulnerable to China’s strategic forces and that recapturing a guaranteed first strike capability would be impossible and inadvisable. Still, this mutual vulnerability remains highly asymmetric, and Washington should aim to preserve asymmetric vulnerability. Washington should make it clear that any strategic exchange would result in unacceptable costs for China, while preserving counterforce capabilities that can meaningfully limit damage to the United States and its allies and partners.

The Chinese strategic threat does not exist in isolation. The United States needs a tailored and flexible strategy and force that is capable of deterring strategic threats simultaneously from China, Russia, North Korea, and Iran.

US And Allied Operations

The United States and its allies should develop new operational concepts for deterring and defeating China at every level of conflict. The DoD and many outside experts are developing new concepts of operations for nonnuclear conflict with China. Concepts for operations at the strategic level are also relatively straightforward. If strategic deterrence fails, Washington should execute its deterrent threat and conduct a large-scale strategic attack on China’s strategic and military targets to limit damage to the United States and its allies and to impose unacceptable costs on Beijing. The most difficult intellectual challenge will be operational concepts for the use of nuclear weapons in the midst of a conventional war, or what some are calling “conventional-nuclear integration.”⁵⁶

US Nuclear Response To A Chinese Nuclear Attack

If China uses a nuclear weapon first, how should the United States and its allies respond? Imagine, for example, that China uses a nuclear-armed intermediate-range missile against a US aircraft carrier or allied base in the event of a major theater war. Some might argue that the United States should respond with a massive nuclear retaliation, but such an action would risk prompting Chinese nuclear retaliation against more valuable targets, including population centers on the US mainland. Others might argue that the United

States should turn the other cheek and continue to fight at the conventional level. But this could incentivize China to continue to use nuclear weapons, because its leaders might conclude that they need not fear US nuclear retaliation. Moreover, it would likely weaken US nuclear deterrence and assurance policy broadly if enemies and allies alike perceive US declaratory policy as an elaborate bluff and the US nuclear weapons arsenal as unusable. The solution is that Washington needs to cultivate serious options for limited nuclear strikes.

To conduct these strikes in the midst of a broader conventional conflict, Washington would face a number of difficult questions, such as: How many nuclear weapons should it use? Which nuclear weapons should it choose? Should they be sent from a certain delivery platform or be of a certain yield? What types of Chinese targets should the United States strike with these nuclear weapons?

As it contemplates these questions, the United States should keep the overarching goals of this operation in mind: to deny successful Chinese aggression and restore intra-war deterrence. The United States will want to demonstrate to China that the use of nuclear weapons will be too costly for Beijing and thus persuade China’s leaders not to order additional nuclear strikes. At the same time, Washington will not want its nuclear retaliation to be so devastating or provocative that Beijing feels it has nothing left to lose or that it faces domestic or international pressures to launch a larger nuclear counterattack. In sum, the United States will need to walk the tightrope between doing too much and doing too little.

The following principles help, therefore, to answer the above questions about which weapons could be used on which targets. The United States should aim for a nuclear retaliation that is more devastating than China’s initial use, but that is not wildly disproportionate. A tit-for-tat response might lead Beijing to believe that it can set the pace of escalation. Retaliating more forcefully will help to convince Beijing that it will incur steep and growing costs for any nuclear attack. This could be achieved by using two warheads in response to one, selecting larger yield warheads for retaliation, or by destroying a more sensitive Chinese target. Consistent with this principle, the Chinese mainland cannot be an absolute sanctuary from US nuclear retaliation. If China targets the homeland of the United States, its territories, or its allies and partners (including Japan, Taiwan, or Guam, for example) in a

56 See, for example: John K. Warden, “Conventional-Nuclear Integration in the Next National Defense Strategy,” Center for a New American Security, October 26, 2020, <https://www.cnas.org/publications/commentary/conventional-nuclear-integration-in-the-next-national-defense-strategy>; Justin Anderson and James R. McCue, “Deterring, Countering, and Defeating Conventional-Nuclear Integration,” *Strategic Studies Quarterly* 15 (1) (Spring 2021): 28–60, https://www.airuniversity.af.edu/Portals/10/SSQ/documents/Volume-15_Issue-1/Anderson.pdf; Vincent A. Manzo and Aaron R. Miles, “The Logic of Integrating Conventional and Nuclear Planning,” *Arms Control Today*, November 2016, <https://www.armscontrol.org/act/2016-10/features/logic-integrating-conventional-nuclear-planning>; Al Mauroni, “Tearing Down the Nuclear Firewall,” *War on the Rocks*, October 15, 2019, <https://warontherocks.com/2019/10/tearing-down-the-nuclear-firewall/>.

limited nuclear strike, then the United States should prioritize retaliation against the Chinese mainland. Striking purely military targets with minimal collateral damage, such as ships at sea, could be seen as a US de-escalation, which could again cause Chinese leaders to believe they can control the scale and pace of escalation.

At the same time, Washington should seek to show restraint with any nuclear retaliation. It does not want Beijing to conclude that Washington is launching a full-scale nuclear attack; it wants Beijing to have attractive off-ramps from continued nuclear use. The strike should not be so out of proportion with China's initial nuclear first use that Beijing's leaders choose a larger nuclear third strike. This means that the United States should retain low-yield weapons on nonstrategic delivery systems. It would be difficult for Beijing to misperceive the use of such a weapon as the prelude to a large-scale, disarming, strategic attack.⁵⁷ If Beijing's initial target is a purely military asset with minimal collateral damage (such as a ship at sea), then the United States should seek to retaliate against a similar target set, but perhaps in larger numbers.

Some critics will almost certainly counter that it is impossible to signal with nuclear strikes, but they are incorrect.⁵⁸ Critics will say that the use of any nuclear weapon against a Chinese target would be seen as highly escalatory and that officials in Beijing will not appreciate that the use of a relatively low-yield nuclear weapon, for example, signaled restraint. Instead, these critics will argue, Beijing will be outraged that it suffered a nuclear attack. This may be true, but the relevant question is not whether Beijing sees a nuclear strike as provocative, but would Chinese leadership perceive a different type of nuclear attack (such as employing multiple megaton warheads against Chinese cities) as more provocative? Would Chinese officials respond differently to a low-yield strike against a Chinese military target than to a high-yield strike on Chinese cities? The answer to these questions is almost certainly "yes," meaning that the United States and its allies can attempt to control escalation by signaling through nuclear employment.

US Nuclear First Use

The United States might also need to use nuclear weapons first. The United States has always retained the option of using nuclear weapons first in its declaratory policy.

The most likely scenario for a US nuclear first use against China would be in the event of a Chinese invasion of Taiwan that Washington believed it could not repulse using conventional forces alone. Former senior US government officials have stated that to stop a Chinese invasion, the United States and its allies would need the ability to sink the Chinese navy within 72 hours.⁵⁹ Currently, the United States lacks the conventional firepower for such a mission. There are efforts to strengthen US strike capabilities in the region, including through the development of ground-launched and hypersonic missiles, but it is unclear whether these and other moves will be sufficient to close the gap. If, however, the United States were willing to use nonstrategic nuclear weapons against an invading Chinese force, the United States could almost certainly be guaranteed of the ability to prevent a Chinese invasion, albeit with all the attendant risks of nuclear use.

To some, this might be an overly provocative and risky approach. It is, however, parallel to the US policy of deterring a Soviet conventional invasion of Western Europe during the Cold War with the threat of early nuclear retaliation.⁶⁰ Nuclear-armed powers facing a conventionally superior opponent have often relied on threats of early nuclear use as a deterrent. The purpose would not be to fight a nuclear war, but to deter the Chinese invasion by making it clear to the People's Liberation Army (PLA) that it cannot fight through a US nuclear onslaught to take Taiwan.

This approach would raise many of the same targeting questions addressed above with many of the same answers. Washington would want to use low-yield weapons delivered from platforms positioned in theater against Chinese military targets as they are making their way across the Taiwan Strait. The more difficult questions arise when it comes to attacks on the Chinese mainland to degrade capabilities supporting the invasion force, such as ports on the Chinese side of the Taiwan Strait. The tradeoff in such a case would be military effectiveness versus escalation risks, and the decision could likely only be made at the highest levels of government based on the specific circumstances at that time.

US Strategic Capabilities

To support this strategy, the United States will need to maintain a robust strategic force. At the strategic level, the

57 Matthew Kroening and Mark J. Massa, *Are dual-capable weapon systems destabilizing? Questioning nuclear-conventional entanglement and inadvertent escalation*, Atlantic Council, June 16, 2021, <https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/are-dual-capable-weapon-systems-destabilizing/>.

58 For a summary of arguments against low-yield nuclear weapons, see: Vincent Manzo, "A Closer Look at the Arguments against the Low-Yield SLBM," *Defense One*, June 21, 2019, <https://www.defenseone.com/ideas/2019/06/closer-look-arguments-against-low-yield-slbm/157925/>.

59 Liu Zhen, "A harder US line? Potential Pentagon chief floated idea to sink China fleet in 72 hours," *South China Morning Post*, November 14, 2020, <https://www.scmp.com/news/china/military/article/3109852/harder-us-line-potential-pentagon-chief-floated-idea-sink-china>.

60 Colby, "If You Want Peace."

United States should continue with the program of record to modernize its nuclear force. This will require investments in all three legs of the nuclear triad, including ICBMs, bombers, the Long Range Stand Off (LRSO) weapon, and submarines. It should also pursue the “supplemental” capabilities called for in the 2018 NPR. Washington must also make the necessary investments in the nuclear enterprise and upgrade NC3.

To maintain a strategic edge over China, additional steps may be required as China expands the size of its arsenal. The United States should size its force so that it can cover the nuclear and strategic targets in its principal nuclear-armed adversaries—Russia, China, and North Korea. The current US force size of 1,550 strategic deployed warheads was deemed to be sufficient in 2010 at a time when the nuclear threat environment was relatively benign. It is hard to imagine that this is still the force Washington needs in 2021. The nuclear threat environment has greatly changed since 2010 and continues to deteriorate. The number of nuclear and strategic targets in the United States’ principal nuclear-armed adversaries continues to grow, but the US strategic deployed arsenal has remained constant. Russia is building and deploying exotic and nonstrategic nuclear weapons not covered in New START, China is set to increase its nuclear arsenal by multiples of 2010 levels, and North Korea has dozens of additional warheads capable of reaching the United States.⁶¹ It is increasingly clear that 1,550 nuclear warheads are, or will soon be, insufficient. The United States must re-evaluate whether it can meet its deterrence requirements at current force levels. In the short term, an expansion of the deployed strategic arsenal can best be achieved by uploading additional warheads on US ICBMs and SLBMs. Over time, the United States might need to consider additional measures to keep pace with adversaries’ growing arsenals and it will have the benefit of warm production lines as it pursues its planned modernization program.

The United States should also include missile defenses as part of its mix of strategic capabilities for China. Washington should continue to declare that its homeland missile defenses will be designed to keep pace with the North Korean threat and will not be sized to meaningfully blunt a Russia or Chinese attack. It should also declare, however, that, in the event of a crisis or war with China, it will draw on its existing missile defenses as needed to protect itself and its

allies. It should rely on the current system of Ground-Based Interceptors (GBIs) even as it invests in next-generation missile defense technology, including directed energy and space-based sensors. It should also explore new modes for the deployment of interceptors, including on military aircraft and in space.

The United States and its allies should also continue to deploy theater missile defenses in the Indo-Pacific. Comprehensive protection of the region is not possible, but they should strive for a point defense of key population centers and important military assets, including US and allied bases and major ports of embarkation and debarkation. A near-term priority should be the deployment of missile defenses on Guam as recommended by Adm. Phil Davidson, then-commander of US Indo-Pacific Command.⁶²

The greatest US capability gap with China at present may be in nonstrategic nuclear forces. The 2018 NPR called for the United States to maintain “flexible” nuclear forces, capable of deterring a variety of contingencies.⁶³ But, the United States does not currently have forward-deployed, nonstrategic nuclear weapons in the Indo-Pacific. Nonetheless, it does have forward “deployable” nuclear weapons. In the event of a crisis or a war, Washington could bring forward its stockpile of B61 gravity bombs that could be delivered by DCAs.⁶⁴ In practice, however, the United States and its allies do not often exercise this capability, and many weapons storage areas (WSAs) in the Indo-Pacific need maintenance and updating. Moreover, gravity bombs require aircraft to arrive directly over their targets, but US and allied aircraft are potentially vulnerable to existing and planned future Chinese air defenses. Furthermore, US allies might not want B61s deployed on their territory as it could make them a more inviting target for a Chinese nuclear attack.

The United States also has plans, announced in the 2018 NPR, to build a new, nuclear-armed sea-launched cruise missile (SLCM-N). This capability is still likely years away, however, and it is possible that the program could be terminated altogether in an effort to make progress toward the stated US goal of “tak[ing] steps to reduce the role of nuclear weapons in [US] national security strategy.”⁶⁵

The 2018 NPR also resulted in a new, low-yield SLBM. Some nuclear experts have expressed concern, however, that the

61 Matthew Kroenig, Mark Massa, and Christian Trotti, *Russia's exotic nuclear weapons and implications for the United States and NATO*, Atlantic Council, March 6, 2020, <https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/russias-exotic-nuclear-weapons-and-implications-for-the-united-states-and-nato/>.

62 Mallory Shelbourne, “Davidson: Aegis Ashore on Guam Would ‘Free Up’ 3 Navy Destroyers,” USNI News, March 4, 2021, <https://news.usni.org/2021/03/04/davidson-aegis-ashore-on-guam-would-free-up-3-navy-destroyers>.

63 *Nuclear Posture Review*, 2018.

64 Hans M. Kristensen and Matt Korda, “United States nuclear weapons, 2021,” *Bulletin of the Atomic Scientists*, 77 (1) (2021): 56, <https://doi.org/10.1080/00963402.2020.1859865>.

65 White House, *Interim National Security Strategic Guidance*, March 2021, <https://www.whitehouse.gov/wp-content/uploads/2021/03/NSC-1v2.pdf>.

use of a strategic platform for nuclear attack could be perceived by adversaries as the prelude to a strategic nuclear attack and, therefore, poses escalation risks.⁶⁶

Another option for delivering nuclear weapons in a conflict in the Indo-Pacific would be by strategic bomber. The United States could deliver gravity bombs from the B-2 strategic bomber (and, in the future, the B-21 strategic bomber). The United States could also use the B-52 strategic bomber to deliver variable-yield nuclear weapons on an air-launched cruise missile (ALCM) and, in the future, the LRSO. These capabilities also come with several downsides. Aircraft may be vulnerable to enemy air defenses, as pointed out above. Some will claim that the use of strategic bombers raises nuclear escalation risks not posed by nonstrategic delivery platforms. And the reported lowest yield on the W80 warhead of the nuclear ALCM is still fairly high at 5 kilotons.⁶⁷

The United States should maintain effective nonstrategic nuclear capabilities in the Indo-Pacific to ensure a flexible force capable of deterring Chinese theater nuclear use. At a minimum, Washington should continue with existing plans to build the LRSO. It should also continue to build and deploy the SLCM-N and not abandon it in order to achieve the goal of “reducing the role” of nuclear weapons. Some will argue that the SLCM-N will detract from the number of missile-launching tubes available for the conventional mission or that it will be resisted by the US Navy. But the United States need not build a large SLCM-N capability. Several tubes dedicated to this capability may suffice. Moreover, the United States enjoys civilian oversight of the military. If civilian policy makers decide that SLCM-N is necessary for US defense strategy, then the navy will follow orders and deploy this capability, despite the complications, as it did during the Cold War.

Following through on existing plans and upgrading existing capabilities may not be enough, however. In addition, the DoD should carefully study whether other nonstrategic nuclear capabilities may be appropriate for likely China conflict scenarios. Options might include, for example, ground-launched, intermediate-range, nuclear-capable missiles. China has hundreds of nuclear-capable missiles in this category, and, with the demise of the INF Treaty, these capabilities are no longer treaty restricted for the United States. Some have argued that no country will host these capabilities in Asia, but this is a shortsighted view. With careful diplomacy over time, and as the Chinese military threat grows, several US allies and partners in Asia might eagerly accept this addition to their defense and regional



The Advanced Extremely High Frequency (AEHF) satellite provides the US military with command and control of conventional and nuclear operations. China may target nodes in the US nuclear command, control, and communications (NC3) network. Courtesy photo from Lockheed Martin. <https://www.flickr.com/photos/usairforce/9824585713/in/photolist-fYaz3R>.

security. Alternatively, these capabilities could be built, stockpiled, and maintained in the United States ready for rapid deployment to the theater in the event of crisis or conflict. Furthermore, the DoD could consider the development of a nuclear-capable ALCM that could be delivered by fighter aircraft, providing DCAs with a standoff capability. If the United States wishes to use nonstrategic nuclear weapons to deter a Chinese attack on Taiwan, then the development of a broader range of capabilities might be required. These would be nuclear forces optimized to degrade an invading amphibious Chinese force, such as nuclear-armed torpedoes or anti-ship missiles.

66 For example, see: Vipin Narang, “The Discrimination Problem: Why Putting Low-Yield Nuclear Weapons On Submarines Is So Dangerous,” *War on the Rocks*, February 8, 2018, <https://warontherocks.com/2018/02/discrimination-problem-putting-low-yield-nuclear-weapons-submarines-dangerous/>; for a summary of the counterpoint, see Kroeving and Massa, *Are dual-capable weapon systems destabilizing?*

67 Hans Kristensen, “W80-1 Warhead Selected for New Nuclear Cruise Missile,” *Federation of American Scientists*, October 10, 2014, [https://fas.org/blogs/security/2014/10/w80-1_lrso/](https://fas.org/blogs/security/2014/10/w80-1_lrs/).

The United States and its allies must also make these capabilities real by exercising with them in realistic scenarios for conventional-nuclear integration. This would include, for example, exercising the use of a small number of nuclear weapons against Chinese military targets in the context of a larger conventional warfighting scenario.

To deter attacks on its NC3, space, and cyber capabilities, the United States should keep the option of nuclear retaliation on the table. More importantly, however, the United States should also develop serious options for other forms of retaliation, including in-kind. In addition, the United States should focus on resilience and deterrence-by-denial for its NC3, space, and cyber capabilities. Critical NC3 space payloads—for missile launch warning, strategic communication, and nuclear detonation detection—are currently concentrated on large, expensive satellites vulnerable to attack. The United States should leverage the revolution in small satellites (“smallsats”) to distribute the functionality of its strategic space assets among a constellation of satellites that would be harder to destroy and easier to replace in a crisis. Further, the United States should consider the national security applications of cislunar space (the space between geosynchronous Earth orbit [GEO] and the Moon), an area which current adversary antisatellite weapons cannot range.⁶⁸

The cybersecurity of NC3 systems must be a top priority of the DoD. To that end, the annual reporting of Strategic Command and Cyber Command to the congressional defense committees will remain critical, especially as DoD continues to develop the “NC3 Next” architecture, which builds in cybersecurity measures.⁶⁹ Incorporating cyber resilience into NC3 systems—such as by relying on redundant digital and analogue communications methods—can serve to enhance deterrence-by-denial of cyberattacks on NC3 systems.⁷⁰ Finally, communicating effectively with US allies will be key to ensuring that prudent recognition of the cyber threat to NC3 does not unduly degrade allied confidence in US extended deterrence.⁷¹

Arms Control

China's growing strategic forces should be a priority for US arms control efforts. Russia is no longer the United States' most fearsome strategic competitor, and, if arms control is to be meaningful for the remainder of the twenty-first century, then it must include China.

Convincing Beijing to make effective and verifiable arms control commitments, however, will be difficult. Unlike the United States and Russia, China has no history of negotiating constraints on its nuclear forces. Chinese strategic culture prizes secrecy and deception, which is at odds with arms control's emphasis on transparency.⁷² Moreover, it is difficult to imagine what a desirable arms control treaty might look like, given the asymmetries in US and Chinese forces. Modern strategic arms control has been based on locking in quantitative parity between US and Russian forces, but Washington does not want parity with Chinese forces. Washington would like to preserve its quantitative and qualitative nuclear advantages, but Beijing would be loath to sign an unequal treaty.

Despite these challenges, Washington should pursue arms control with China. There are a number of imaginable arms control arrangements with China that would advance US interests and international security.⁷³ In addition, there are several motivations for Beijing to consider arms control with Washington (and Moscow), including international prestige and the opportunity to constrain a likely coming expansion of Russian and possibly US nonstrategic nuclear forces. That said, it is difficult to foresee the establishment of binding, negotiated constraints on China's nuclear forces in the immediate future. Washington and its allies should proceed, therefore, with a number of small steps. They should engage Beijing in strategic stability talks and invite Chinese officials to participate in New START verification visits to learn how arms control is implemented in practice. The US Defense Threat Reduction Agency should make plans to facilitate such visits. US allies in Europe concerned about the future state of international arms control arrangements should place this issue near the top of the agenda for their bilateral relations with Beijing.

68 Clementine G. Starling, Mark J. Massa, Christopher P. Mulder, and Julia T. Siegel, *The Future of Security in Space: A Thirty-Year US Strategy*, Atlantic Council, April 11, 2021, <https://www.atlanticcouncil.org/content-series/atlantic-council-strategy-paper-series/the-future-of-security-in-space/>.

69 Theresa Hitchens, “Congress Fears DoD Not Prepared for NC3 Cyber Attacks,” *Breaking Defense*, December 11, 2020, <https://breakingdefense.com/2020/12/congress-fears-dod-not-prepared-for-nc3-cyber-attacks/>.

70 Beyza Unal and Patricia Lewis, *Cybersecurity of Nuclear Weapons Systems: Threats, Vulnerabilities and Consequences*, Chatham House, January 2018, <https://www.chathamhouse.org/sites/default/files/publications/research/2018-01-11-cybersecurity-nuclear-weapons-unal-lewis-final.pdf>; Ann E. Hammer, Trisha H. Miller, and Eva C. Uribe, *Cyber Resilience as a Deterrence Strategy*, Sandia National Laboratories, September 2020, <https://www.osti.gov/servlets/purl/1668133>.

71 Yasmin Afina, Calum Inverarity, and Beyza Unal, *Ensuring Cyber Resilience in NATO's Command, Control and Communication Systems*, Chatham House, July 2020, https://www.chathamhouse.org/sites/default/files/2020-07-17-cyber-resilience-nato-command-control-communication-afina-inverarity-unal_0.pdf.

72 Thomas G. Mahnken, *Secrecy & Stratagem: Understanding Chinese Strategic Culture*, Lowy Institute for International Policy, February 2011, https://archive.loyyinstitute.org/sites/default/files/pubfiles/Mahnken%2C_Secrecy_and_stratagem_1.pdf.

73 Matthew Kroenig and Mark J. Massa, *Toward trilateral arms control: Options for bringing China into the fold*, Atlantic Council, February 4, 2021, <https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/toward-trilateral-arms-control-options-for-bringing-china-into-the-fold/>.

Conclusion

Just a few years ago, China could have plausibly been described as posing the least significant nuclear threat of the United States' three nuclear-armed rivals. That has changed. This report describes how the rapid projected growth of Chinese strategic forces threatens to undermine all major US defense and deterrence goals. Unfortunately, there are a variety of plausible scenarios for Chinese nuclear or nonnuclear attack against the United States, its allies, and its forces.

To counter this threat, this report outlined a strategy for Washington and its allies to reliably deter Chinese strategic

attack. Washington should strive to maintain a favorable balance of power at every rung of the escalation ladder. This will require that the United States strengthens its own offensive and defensive nuclear and strategic capabilities, even as it pursues arms control in earnest to constrain the buildup of Chinese forces.

Pursuing this strategy will not be easy, but the consequences of failing to deter a Chinese strategic attack could be unacceptable. The United States and its allies should act now to prevent a potentially catastrophic deterrence failure.

Author Biography



Dr. Matthew Kroenig is the deputy director of the Atlantic Council's Scowcroft Center for Strategy and Security and the director of the Center's Scowcroft Strategy Initiative. In these roles, he leads the Center's global strategy unit and supports the director in managing a bipartisan team of over 40 resident staff and an extensive network of nonresident experts. His own research focuses on US national security

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Dr. Kroenig has served in several positions in the US Department of Defense and the intelligence community in the Bush, Obama, and Trump administrations, including in the Strategy, Middle East, and Nuclear and Missile Defense offices in the Office of the Secretary of Defense and the CIA's Strategic Assessments Group. From 2017-2021, he was a Special Government Employee (SGE) and Senior Policy Adviser to the Office of the Assistant Secretary of Defense for Strategy, Plans, and Capability/Nuclear and Missile Defense Policy. In this role, he provided advice on matters relating to the formulation, drafting, coordination, and implementation of nuclear deterrence policy and strategy in support of the 2018 US Nuclear Posture Review. He was a major contributor to formulating tailored deterrence strategies for China, Russia, North Korea, and Iran. In 2011, he developed strategic options for addressing Iran's nuclear program. In 2005, he was the principal author of the first-ever, US-government-wide strategy for deterring terrorist networks. For this work, he received the Office of the Secretary of Defense's Award for Outstanding Achievement. He is a featured character in the New York Times-bestselling book, *Counterstrike: The Untold Story of America's Secret Campaign against Al Qaeda*, by Eric Schmitt and Thom Shanker. He was a national security adviser on the presidential campaigns of Mitt Romney (2012) and Marco Rubio (2016). He has testified before Congress and regularly consults with the White House, State Department, Pentagon, Congress, the intelligence community, and allied governments.

Dr. Kroenig is also a tenured professor of government and foreign service at Georgetown University. A 2019 study in *Perspectives on Politics* ranked him one of the top 25 most-cited political scientists of his generation.

He is the author or editor of seven books, including *The Return of Great Power Rivalry: Democracy versus Autocracy from the Ancient World to the US and China* (Oxford University Press, 2020), which was Amazon's #1 New Release in International Relations. *The Logic of American Nuclear Strategy: Why Strategic Superiority Matters* (Oxford University Press, 2018) was selected by the US Air Force for its professional reading list and was translated into Chinese and Korean. *Exporting the Bomb: Technology Transfer and the Spread of Nuclear Weapons* (Cornell University Press, 2010) was awarded the International Studies Association Best Book Award, Honorable Mention.

Dr. Kroenig co-authors the bi-monthly "Its Debatable" column at *Foreign Policy*. His articles and commentary have appeared in many other publications, including: *American Political Science Review*, *Annual Review of Political Science*, *Foreign Affairs*, *Foreign Policy*, *International Organization*, *International Security*, *Journal of Conflict Resolution*, *Journal of Peace Research*, *Journal of Strategic Studies*, *Politico*, *Security Studies*, *Strategic Studies Quarterly*, *the Atlantic*, *the New Republic*, *the New York Times*, *the Wall Street Journal*, and *the Washington Post*, among others. He provides regular commentary for major broadcast media outlets, including on PBS Newshour, Fareed Zakaria GPS, CBS, BBC, CNN, Fox News, NPR All Things Considered, and C-SPAN.

Previously, he was the Stanton Nuclear Security Fellow at the Council on Foreign Relations, and a research fellow at the Belfer Center for Science and International Security at Harvard University, and the Center for International Security and Cooperation at Stanford University. His work has been supported by the National Science Foundation, the Carnegie Corporation of New York, the Smith Richardson Foundation, the Hertog Foundation, and the Stanton Foundation. He is a life member of the Council on Foreign Relations and holds an MA and PhD in political science from the University of California at Berkeley. Follow him on Twitter @matthewkroenig.

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