

**Testimony before the U.S.-China Economic and Security Review
Commission**

Hearing on

“China’s Nuclear Forces”

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Co-chair Fiedler, Co-chair Wong, members of the commission, thank you for inviting me to appear before you today to discuss the nuclear forces of the People's Liberation Army (PLA). My testimony draws on authoritative Chinese sources and recent scholarly work to examine aspects of continuity and change in China's nuclear doctrine, the features and drivers of China's nuclear strategy, and the way China might use nuclear weapons. I conclude with recommendations for Congress.

Continuity and Change in China's Nuclear Forces

China's nuclear doctrine may be understood through its declaratory policy, force structure, and operational practices.

Declaratory Policy

The basic tenets of China's public declaratory nuclear policy, including a No-First-Use policy and negative security assurances, have remain unchanged. After conducting its first successful nuclear test in 1964, China publicly declared that "The Chinese Government hereby solemnly declares that China will never at any time and under any circumstances be the first to use nuclear weapons."¹ China has reiterated the policy ever since. As an extension of its NFU policy, China also declares negative security assurances, undertaking "not to use or threaten to use nuclear weapons against non-nuclear-weapon States or nuclear-weapon-free zones at any time or under any circumstances."² In addition to its NFU policy and negative security assurances, China's declaratory nuclear policies include commitments not to engage in arms races and to eventual complete disarmament and the prohibition of nuclear weapons.³ These policies have been reiterated in authoritative texts, including China's most recent defense white paper,⁴ and Chinese officials continue to publicly reaffirm the NFU policy.⁵

¹ 中华人民共和国政府声明 [Declaration of the government of the People's Republic of China], 人民日报 [Renmin Ribao], 17 October 1964, p. 1. For English translation, see "Statement by Peking on Nuclear Test," *The New York Times*, 17 October 1964, p. 10, available at <https://www.nytimes.com/1964/10/17/archives/statement-by-pekings-on-nuclear-test.html>.

² A/50/155-S/1995/265, Letter dated 6 April 1995 from the Permanent Representative of China to the United Nations addressed to the Secretary-General, Annex, Paragraph 2, available at <https://undocs.org/pdf?symbol=en/A/50/155>. For the initial formulation, see A/S-10/AC.1/17, Letter dated 7 June 1978 from the Permanent Representative of China to the United Nations addressed to the Secretary-General, Annex, Paragraph 7, available at <https://unoda-web.s3-accelerate.amazonaws.com/documents/library/A-S10-AC1-17.pdf>.

³ Statement by Vice Foreign Minister Li Baodong, Head of the Chinese Delegation at The General Debate in 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, 27 April 2015, p. 4.

⁴ *China's National Defense in the New Era* (Beijing, State Information Council, 2019).

⁵ See, for example, "Foreign Ministry Spokesperson Zhao Lijian's Regular Press Conference on April 14, 2021," Embassy of the People's Republic of China in the United States of America, 14 April 2021, <http://www.china-embassy.org/eng/fyrth/t1868920.htm>; "Foreign Ministry Spokesperson Hua

Despite consistency in official public statements and documents describing the unconditional nature of the NFU policy, there remains ambiguity about whether there are conditions under which both the NFU policy and negative security assurance might not hold. Chinese experts and officials and American researchers have suggested that China might use nuclear weapons first in certain situations.⁶ For instance, authoritative Chinese texts envision threatening nuclear use in response to conventional attacks against high-value targets within China, such as major cities, nuclear power reactors, or the Three Gorges Dams; however, these sections do not describe China actually launching a nuclear strike.⁷ Chinese experts and retired officials have publicly argued that conventional strikes against China's nuclear forces could (or should) justify a Chinese nuclear response.⁸ Some Chinese interlocutors have further suggested that this ambiguity is a deliberate attempt to confuse China's adversaries and enhance deterrence, reflecting China's emphasis on concealment and deception in the nuclear realm.⁹ There are also questions about whether or not China's NFU policy and negative security assurances would apply to non-nuclear states hosting U.S. military facilities such as Japan.¹⁰

Much of this ambiguity and debate about the NFU policy existed prior to Xi Jinping's tenure as General Secretary.¹¹ However, increasing Chinese concerns about U.S. capabilities in the nuclear domain, including ballistic missile defense systems and

Chunying's Regular Press Conference on January 22, 2021," Ministry of Foreign Affairs of the People's Republic of China, 22 January 2021,

https://www.fmprc.gov.cn/mfa_eng/xwfw_665399/s2510_665401/t1847956.shtml; and "Statement by Director-General FU Cong at the EU Non-proliferation and Disarmament Conference," Ministry of Foreign Affairs of the People's Republic of China, 13 November 2020, https://www.fmprc.gov.cn/mfa_eng/wjbxw/t1832223.shtml.

⁶ Office of the Secretary of Defense, *Annual Report to Congress, 2020: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2020), p. 86.

⁷ 于际训 [Yu Xijun], ed., 第二炮兵战役学 [*The Science of Second Artillery Campaigns*] (Beijing: 解放军出版社 [Liberation Army Publishing House], 2004), pp. 294-296.

⁸ David Santoro and Robert Gromoll, "On the Value of Nuclear Dialogue with China," *Issues & Insights*, Vol. 20, No. 1 (November 2020), pp. 12-14; 王大可 [Wang Dake], 中国核政策与核心利益 [China's Nuclear Policy and Core Interests], 东方早报 [*Oriental Morning Post*], 17 January 2013, <http://news.sina.com.cn/c/2013-01-17/064926054455.shtml>; and 王洪光: 如何应对美在亚太部署中导 [Wang Hongguang: How to Respond to U.S. Deployments of Intermediate-Range Missiles in the Asia-Pacific], 环球时报 [*Global Times*], 9 August 2019, <https://opinion.huanqiu.com/article/9CaKrnKm4SW>.

⁹ Interviews with Chinese experts cited in Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and U.S.-China Strategic Stability," *International Security*, Vol. 40, No. 2 (Fall 2015), p. 21.

¹⁰ Tong Zhao, "Conventional long-range strike weapons of US allies and China's concerns of strategic instability," *The Nonproliferation Review*, (2020), p. 8.

¹¹ Alastair Iain Johnston, "China's New 'Old Thinking': The Concept of Limited Deterrence," *International Security*, Vol. Vol. 20, No. 3 (Winter, 1995-1996), pp. 5-42; and Eric Heginbotham et al., eds., *China's Evolving Nuclear Deterrent: Major Drivers and Issues for the United States* (Santa Monica, CA: RAND Corporation, 2017), pp. 129-133.

advanced conventional precision-strike weapons appear, to have intensified these debates in recent years.¹²

Force Structure

The nuclear force structure of the PLA has experienced moderate quantitative and significant qualitative change over time and, in particular, over Xi's tenure as General Secretary.

China has steadily increased the size of its nuclear forces. In 2011, the year prior to Xi's ascension to the office of General Secretary, the Defense Department estimated that China deployed roughly 60 ICBMs, including the relatively shorter-range DF-3 systems.¹³ In 2020, roughly a decade later, the Defense Department estimated China deployed 100 ICBMs.¹⁴ Over the same period, credible public estimates of China's warhead stockpile grew from 178 to 272.¹⁵

In addition to this moderate growth in the size of its nuclear forces, China has made significant qualitative enhancements to its nuclear arsenal. For several decades after China's first nuclear test, the country deployed only a small and rudimentary nuclear force consisting of immobile, liquid-fueled, and highly vulnerable missiles. Today, China's nuclear forces increasingly consist of advanced solid-fueled and road-mobile missiles.¹⁶ Some of these systems, such as the DF-31AG and the DF-41 are believed to have off-road capability and the ability to fire without pre-prepared launch sites,

¹² Rong Yu and Peng Guangqian, "Nuclear No-First-Use Revisited," *China Security*, Vol. 5, No. 1, 2009, pp. 85-87; 龙兴春 [Long Xingchun], "中国核政策, 不妨讲清楚 [There Is No Harm in Speaking Clearly About Chinese Nuclear Policy]," *环球时报*[*Global Times*], 15 January 2013, <https://opinion.huanqiu.com/article/9CaKrnJyEYd>; and Zhenqiang Pan, "A Study of China's No-First-Use Policy on Nuclear Weapons," *Journal for Peace and Nuclear Disarmament*, Vol. 1, No. 1 (2018), pp. 130-132.

¹³ Office of the Secretary of Defense, *Annual Report to Congress, 2011: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2011), p. 34.

¹⁴ Office of the Secretary of Defense, *Annual Report to Congress, 2020: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2020), p. 86.

¹⁵ In 2011, the *Bulletin of Atomic Scientists* estimated China's arsenal at 178 operational and 240 total warheads. Hans M. Kristensen and Robert S. Norris, "Chinese Nuclear Forces, 2011," *Bulletin of the Atomic Scientists*, Vo. 67, No. 6 (2011), p. 85. In 2020, the *Bulletin of Atomic Scientists* estimated China's arsenal at 272 operational and 350 total warheads. Hans M. Kristensen and Matt Korda, "Chinese Nuclear Forces, 2020," *Bulletin of the Atomic Scientists*, Vo. 76, No. 6 (2020), p. 444.

¹⁶ David C. Logan, "Making Sense of China's Missile Forces," in Phillip C. Saunders, Arthur S. Ding, Andrew Scobell, Andrew N. D. Yang, and Joel Wuthnow, eds., *Chairman Xi Remakes the PLA: Assessing Chinese Military Reforms* (Washington, D.C.: National Defense University Press, 2019), pp. 393-435.

greatly increasing their mobility, concealment, and, therefore, survivability.¹⁷ China has equipped some of its ICBMs with multiple independent reentry vehicle (MIRV) capability, which enhances their potential to penetrate missile defenses.¹⁸ China's nuclear-armed theater missile systems possess enhanced accuracy, potentially providing nuclear precision-strike capabilities.¹⁹ It has also deployed new missile systems capable of being armed with either conventional or nuclear warheads.²⁰ There is limited evidence of Chinese interest in tactical nuclear weapons, though there is no indication that China ever fully developed or deployed these capabilities.²¹

In addition to the growth and modernization of its land-based nuclear forces, the PLA is also developing sea and air legs of a nuclear triad with the fielding of a fleet of nuclear ballistic missile submarines (SSBNs) and the development of both a new nuclear-capable strategic bomber and an air-launched nuclear-capable ballistic missile.²²

Operational Practices

China has historically maintained relatively restrained operational practices for its nuclear forces. China has emphasized strict centralized control of its nuclear weapons

¹⁷ 王卫东 [Wang Weidong], “东风-31 甲改核导弹方队: 倚天长剑裹雷挟风 [DF-AG Nuclear Missile Unit: The Long Sword Envelopes the Thunder and Carries the Wind],” 解放军报 [PLA Daily], 2 October 2019.

¹⁸ 李彬 [Li Bin], “分导式多弹头: 自己够用就好 [MIRVs: Just Enough],” 澎湃 [The Paper], 8 October 2019, https://www.thepaper.cn/newsDetail_forward_4619177; and Jeffrey Lewis, “China's Belated Embrace of MIRVs,” in Michael Krepon, Travis Wheeler, and Shane Mason, eds., *The Lure & Pitfalls of MIRVs: From the First to the Second Nuclear Age* (Washington, D.C.: Stimson Center, May 2016), pp. 95-117.

¹⁹ “阅兵首次公开: 新型东风 26 导弹具备反舰能力 [Revealed Publicly at the Military Review: The New DF-26 has Anti-ship Capability],” 新浪军事 [Sina Military], 5 September 2015 <http://mil.news.sina.com.cn/2015-09-03/1411838409.html>; and Office of the Secretary of Defense, *Annual Report to Congress, 2016: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2016), p. 25.

²⁰ Joshua H. Pollack and Scott LaFoy, “China's DF-26: A Hot-Swappable Missile,” *Arms Control Wonk*, 17 May 2020, <https://www.armscontrolwonk.com/archive/1209405/chinas-df-26-a-hot-swappable-missile/>.

²¹ Jonathan Ray, “Red China's ‘Capitalist Bomb’: Inside the Chinese Neutron Bomb Program,” *China Strategic Perspectives* No. 8 (Washington, D.C.: Institute for National Strategic Studies, National Defense University, January 2015); and Phillip C. Saunders and David C. Logan, “China's Regional Nuclear Capability, Nonnuclear Strategic Systems, and Integration of Concepts and Operations,” in James M. Smith and Paul J. Bolt, eds., *China's Strategic Arsenal: Worldview, Doctrine, and Systems* (Washington, D.C.: Georgetown University Press, 2021), pp. 127-129.

²² Office of the Secretary of Defense, *Annual Report to Congress, 2020: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2020), pp. 85-87.

and generally kept them at very low alert levels, with warheads and delivery systems stored separately.²³

Recently, however, there is evidence that China might be adjusting some of these practices in ways which make its nuclear forces more capable. With help from Russia, China is reportedly planning to develop an early warning system, potentially consisting of ground-based radars and space-based platforms, which could help support a launch-on-warning nuclear posture.²⁴ U.S. government reports suggest China may be moving to a launch-on-warning posture and increasing peacetime readiness, though these developments remain to be seen.²⁵ The PLA has set goals, according to a defense white paper, “to improve strategic early warning, command and control ... [and] rapid reaction,”²⁶ and a retired Rocket Force researcher has alleged that the reaction time of the missile forces has been reduced “from days and hours to minutes.”²⁷ The U.S. government has cited a Chinese defense industry publication and signs of activity at China’s nuclear testing site as evidence of possible interest in developing new warheads, including low-yield ones, though this evidence is not definitive.²⁸

Future Trajectory

The future of China’s nuclear forces remains uncertain. As is explained later in this testimony, many of the recent shifts in China’s doctrine, structure, and operations

²³ On China’s nuclear command and control, see Fiona Cunningham, “Nuclear Command, Control, and Communications Systems of the People’s Republic of China,” NAPSNet Special Reports, 18 July 2019, <https://nautilus.org/napsnet/napsnet-special-reports/nuclear-command-control-and-communications-systems-of-the-peoples-republic-of-china/>. On China’s nuclear warhead handling practices, see For more on the former Second Artillery’s base organization, see Mark Stokes, “China’s Nuclear Warhead Storage and Handling System,” *Project 2049 Institute*, 12 March 2010, https://project2049.net/documents/chinas_nuclear_warhead_storage_and_handling_system.pdf.

²⁴ Dmitry Stefanovich, “Russia to Help China Develop an Early Warning System,” *The Diplomat*, 25 October 2019, <https://thediplomat.com/2019/10/russia-to-help-china-develop-an-early-warning-system/>.

²⁵ Office of the Secretary of Defense, *Annual Report to Congress, 2020: Military and Security Developments Involving the People’s Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2020), p. 88.

²⁶ *China’s Military Strategy* (Beijing: State Information Council, 2015).

²⁷ 杨承军 [Yang Chengjun], “核战略专家杨承军: 不宜在网上炒作涉核问题 [Nuclear strategy expert Yang Chengjun: It Is Not Appropriate to Hype Nuclear-Related Issues on the Internet],” 祖国 [Motherland], 13 May 2020.

²⁸ Office of the Secretary of Defense, *Annual Report to Congress, 2020: Military and Security Developments Involving the People’s Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2020), pp. 87-88; Bureau of Arms Control, Verification, and Compliance, *2021 Adherence to and Compliance With Arms Control, Nonproliferation, and Disarmament Agreements and Commitments* (Washington, D.C.: U.S. Department of State, 2021), pp. 40-41; and Stephen Chen, “China Steps Up Pace in New Nuclear Arms Race with US and Russia as Experts Warn of Rising Risk of Conflict,” *South China Morning Post*, 28 May 2018, <https://www.scmp.com/news/china/society/article/2147304/china-steps-pace-new-nuclear-arms-race-us-and-russia-experts-warn>.

are consistent with both a continued nuclear strategy of assured retaliation and with the adoption of a shift to a new and more expansive nuclear strategy.²⁹ However, together, these changes cast doubt on elements of China's nuclear doctrine and ease the technical constraints which, in the past, would have made it more difficult for the PLA to adjust its nuclear doctrine.³⁰ Regardless of the limited strategic aims for which China might design its nuclear doctrine, forces, and operations, Chinese capabilities today can increasingly support more than merely an assured retaliation posture.

China's nuclear forces are likely to continue to grow and become more capable. The Defense Intelligence Agency estimates that over the next decade China is likely to double its nuclear stockpile.³¹ The number of missile brigades has increased from 29 to 40 in just three years (though this growth includes conventional missile brigades as well).³² The addition of credible sea and air legs of the nuclear deterrent will further expand China's nuclear forces.

Ongoing trends within China's nuclear forces will likely increase pressures for raising their alert status. The fielding of a SSBN fleet may motivate China to adopt peacetime mating and may encourage pre-delegation of launch authority.³³ The continued vulnerability of silo-based ICBMs and nuclear aircraft also increase pressures for peacetime mating and higher alert status, lest China confront a use-or-lose scenario.³⁴ The growing entanglement of conventional and nuclear forces may lead nuclear units to adopt practices and policies previously isolated to the

²⁹ Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and U.S.-China Strategic Stability," *International Security*, Vol. 40, No. 2 (Fall 2015), pp. 7-50.

³⁰ David C. Logan, "The Dangerous Myths About China's Nuclear Weapons," *War On the Rocks*, 18 September 2020, <https://warontherocks.com/2020/09/the-dangerous-myths-about-chinas-nuclear-weapons/>; and Austin Long, "Myths or Moving Targets? Continuity and Change in China's Nuclear Forces," *War On the Rocks*, 4 December 2020, <https://warontherocks.com/2020/12/myths-or-moving-targets-continuity-and-change-in-chinas-nuclear-forces/>.

³¹ Lt. Gen. Robert P. Ashley, Jr., "Russian and Chinese Nuclear Modernization Trends," Remarks at the Hudson Institute, 29 May 2019, <https://www.dia.mil/News/Speeches-and-Testimonies/Article-View/Article/1859890/russian-and-chinese-nuclear-modernization-trends/>.

³² P. W. Singer and Ma Xiu, "China's Missile Force Is Growing at an Unprecedented Rate," *Popular Science*, 25 February 2020, <https://www.popsci.com/story/blog-eastern-arsenal/china-missile-force-growing/>; and Hans Kristensen, "China's Expanding Missile Training Area: More Silos, Tunnels, and Support Facilities," *Strategic Security* (blog), *Federation of American Scientists*, 24 February 2021, <https://fas.org/blogs/security/2021/02/plarf-jilantai-expansion/>.

³³ Tong Zhao, *Tides of Change: Nuclear Ballistic Missile Submarines and Strategic Stability* (Washington, D.C.: Carnegie Endowment for International Peace, 2018), pp. 16-18; and David C. Logan, "China's Future SSBN Command and Control Structure," *Strategic Forum* No. 299 (Washington, D.C.: Institute for National Strategic Studies, National Defense University, November 2016).

³⁴ Office of the Secretary of Defense, *Annual Report to Congress, 2020: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2020), pp. 87-89.

conventional forces which could also lead to increased readiness among nuclear units.³⁵

However, there would be technological and organizational challenges to some of these changes. For instance, adopting a launch-on-warning posture would require the development of a sophisticated early warning system consisting of space-based sensors, ground-based radars, intelligence fusion capabilities, and a command and control structure to quickly disseminate launch orders. To permit the rapid response necessary for a launch-on-warning posture, China would also have to place its forces on continuous alert and either pre-delegate launch authority or exclude some members of the CMC or the Politburo Standing Committee from nuclear launch decisions.³⁶ Given China's traditionally strong centralized civilian control over nuclear weapons, these would constitute significant changes.

Drivers of China's Nuclear Strategy

China's nuclear strategy is best characterized as one of "assured retaliation."³⁷ Under this strategy, the PLA would use nuclear weapons against an adversary's strategic targets, typically understood to be major cities, in order to inflict unacceptable punishment and only after China has suffered a nuclear strike (though, as discussed earlier, there remains some ambiguity about whether the NFU policy might not hold under certain conditions).³⁸ China claims to have the goals of maintaining a "lean and effective" nuclear force and to "keep[] its nuclear capabilities at the minimum level required for national security."³⁹ In authoritative texts describing the PLA's operational nuclear doctrine, the only campaign involving the use of nuclear weapons is the nuclear counterstrike.⁴⁰

³⁵ Eric Heginbotham et al., eds., *China's Evolving Nuclear Deterrent: Major Drivers and Issues for the United States* (Santa Monica, CA: RAND Corporation, 2017), pp. 114-117.

³⁶ I thank Phillip C. Saunders for this point.

³⁷ Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and U.S.-China Strategic Stability," *International Security*, Vol. 40, No. 2 (Fall 2015), pp. 7-50; and Vipin Narang, *Nuclear Strategy in the Modern Era: Regional Powers and International Conflict* (Princeton, N.J.: Princeton University Press, 2014), pp. 121-152.

³⁸ 孙向丽 [Sun Xiangli], 核时代的战略选择: 中国核战略问题研究 [*Strategic Choices in the Nuclear Age: Research On Questions of China's Nuclear Strategy*] (Beijing: 中国工程物理研究院 [China Academy of Engineering Physics Research Center], 2013), pp. 137-139.

³⁹ *China's National Defense in the New Era* (Beijing, State Information Council, 2019).

⁴⁰ Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and U.S.-China Strategic Stability," *International Security*, Vol. 40, No. 2 (Fall 2015), p. 13. For a description of such a campaign, see 于际训 [Yu Xijun], ed., 第二炮兵战役学 [*The Science of Second Artillery Campaigns*] (Beijing: 解放军出版社 [Liberation Army Publishing House], 2004, pp. 297-316; and 寿晓松 [Shou Xiaosong], 战略学 [*The Science of Military Strategy*], 3rd ed., (Beijing: Military Science Press [军事科学出版社], 2013), pp. 172-176.

As discussed, signs of (potential) change in China's approach to nuclear weapons, including the pursuit of a nuclear triad, enhanced readiness, and a potential move to a launch-on-warning posture might be understood as efforts to maintain its assured retaliation strategy in the face of perceived threats to its nuclear deterrent, though they nonetheless ease long-standing technical constraints. China's nuclear doctrine and strategy, including changes to them, are shaped by strategic, bureaucratic, and status drivers.

Strategic Drivers

Strategic drivers are primarily responsible for China's ongoing modernization efforts, which largely aim at maintaining a credible secure second-strike nuclear capability to deter and respond to nuclear use against China. However, the size and type of nuclear forces necessary to maintain a secure second-strike capability depend on the perceived threat to China. Concerns about the vulnerability of its nuclear deterrent and U.S. pursuit of absolute security have centered on U.S. advances in ballistic missile defense, precision-guided conventional weapons, and intelligence, surveillance, and reconnaissance (ISR) capabilities.⁴¹ By increasing the size, mobility, and readiness of its nuclear forces, China likely hopes to increase their survivability to a potential U.S. strike. MIRV capabilities increase the ability of Chinese warheads to penetrate U.S. ballistic defense systems.⁴² Chinese scholars have cited the ability of SSBNs to potentially evade the coverage areas of U.S. homeland BMD capabilities.⁴³ In addition, ongoing nuclear modernization by other states, including the United States, provides additional impetus for China's own modernization.

In this respect, U.S. policy choices may shape China's nuclear trajectory. In particular, continued U.S. advancements in BMD, including the development of the SM-3 Block IIA interceptor with higher burnout velocities and the forward deployment in East Asia of systems such as Aegis Ashore and the Long-Range Discrimination Radar, might further heighten Chinese threat perceptions, providing stronger impetus for the continued expansion and modernization of China's nuclear forces.⁴⁴

⁴¹ 寿晓松 [Shou Xiaosong], *战略学 [The Science of Military Strategy]*, 3rd ed., (Beijing: Military Science Press [军事科学出版社], 2013), p. 172; 陈岳 [Chen Yue], "萨德入韩破坏地区战略平衡 [THAAD Deployment in South Korea Undermines the Region's Strategic Balance]," *解放军报 [PLA Daily]*, 5 August 2016; and 吴日强 [Wu Riqiang], "国亚太反导系统对中国安全的影响及中国的对策 [The Impact of U.S. Missile Defense Systems in the Asia-Pacific on Chinese Security and Chinese Countermeasures]," *中国国际战略评论 [China International Strategy Review]*, (2014), pp. 331-348.

⁴² Tong Zhao, *Narrowing the U.S.-China Gap on Missile Defense: How to Help Forestall a Nuclear Arms Race* (Washington, D.C.: Carnegie Endowment for International Peace, 2020), pp. 46-48.

⁴³ Wu Riqiang, "Survivability of China's Sea-Based Nuclear Forces," *Science & Global Security*, Vol. 19, No. 2 (2011), p. 13.

⁴⁴ Tong Zhao, *Narrowing the U.S.-China Gap on Missile Defense: How to Help Forestall a Nuclear Arms Race* (Washington, D.C.: Carnegie Endowment for International Peace, 2020).

Bureaucratic Drivers

Bureaucratic drivers are important secondary factors shaping China's nuclear forces and strategy. During Xi's tenure, nuclear constituencies have been created or elevated across the PLA, creating more domestic political actors with an interest in expanding nuclear capabilities. In 2015, the military arm that controls China's land-based nuclear weapons was renamed the Rocket Force and promoted in rank to the status of a full service, for the first time making it equal to the Army, Navy, and Air Force.⁴⁵ The addition of sea and air components of a nuclear triad create new communities with an interest in expanding the nuclear mission set. Interservice rivalry, particularly in the face of possible slower growth in military spending, encourages the creation of new operational requirements and forces in the nuclear domain. For instance, the development of a new nuclear-capable strategic bomber and air-launched ballistic missile for the PLA Air Force, which make little sense strategically, may be better understood as a result of bureaucratic dynamics.⁴⁶ The potential "bleeding" of operational practices from conventional to nuclear communities provides opportunities and pressures for adjusting nuclear forces and practices, including through greater accuracy, dynamic retargeting, realistic battlefield training, and higher readiness levels.⁴⁷

Status Drivers

Status drivers are less important in shaping China's nuclear forces and strategy but there is some evidence to suggest they reinforce strategic and bureaucratic drivers.⁴⁸ Chinese officials frequently highlight the international prestige generated by China's nuclear forces and Xi Jinping has referred to the Rocket Force as "the strategic pillar of China's great power status."⁴⁹ Developments like MIRV capability and the SSBN fleet are seen as important technological achievements.⁵⁰ To the extent that Chinese officials believe that advances in the nuclear domain demonstrate China's technological superiority to domestic and international audiences, they will be more

⁴⁵ David C. Logan, "Making Sense of China's Missile Forces," in Phillip C. Saunders, Arthur S. Ding, Andrew Scobell, Andrew N. D. Yang, and Joel Wuthnow, eds., *Chairman Xi Remakes the PLA: Assessing Chinese Military Reforms* (Washington, D.C.: National Defense University Press, 2019), pp. 393-435.

⁴⁶ Eric Heginbotham et al., eds., *China's Evolving Nuclear Deterrent: Major Drivers and Issues for the United States* (Santa Monica, CA: RAND Corporation, 2017), p. 110.

⁴⁷ *Ibid.*, pp. 114-117.

⁴⁸ Susan Turner Haynes, "The Power of Prestige: Explaining China's Nuclear Weapons Decisions," *Asian Security*, Vol. 16, No. 1 (2020), pp. 35-52.

⁴⁹ "火箭军方队：首次以战略军种名义亮相国庆阅兵 [Rocket Force Units: First Appearance in the National Day Parade with the Status of a Strategic Service]," 新华社 [*Xinhua News*], 11 October 2019, http://www.gov.cn/xinwen/2019-10/01/content_5435643.htm.

⁵⁰ Tong Zhao, *Narrowing the U.S.-China Gap on Missile Defense: How to Help Forestall a Nuclear Arms Race* (Washington, D.C.: Carnegie Endowment for International Peace, 2020), pp. 13-14.

likely to push for further growing and advancing the nuclear force, including potentially in ways which make less sense from a purely strategic perspective.

Chinese Use of Nuclear Weapons

The Central Military Commission tightly controls China's nuclear weapons and any decision to use them would be made by the CMC and the Politburo Standing Committee.⁵¹ This tight control is reflected in the separation of the PLA's warhead handling infrastructure from the missile bases which command the Rocket Force's brigades, the comparatively restrained operational practices of China's nuclear forces, and the PLA's strong emphasis on political reliability of military personnel assigned to nuclear units.⁵²

China emphasizes the ability to retain a survivable second-strike capability as the cornerstone of nuclear deterrence.⁵³ However, beyond simply maintaining the *capability* to deter, Chinese writings emphasize “displaying the *will* and capability to use force as the key means of deterring an enemy” [italics added].⁵⁴ PLA doctrinal and curricular texts envision several types of missile signaling operations to enhance deterrence.⁵⁵ These include raising the alert level of missile forces, dispersing mobile systems from their garrisons, test launches of strategic missiles, and publicly suggesting a willingness to lower the nuclear threshold.⁵⁶ Some of the more escalatory deterrence signaling measures include launching ICBMs without nuclear warheads toward maritime areas and launching ICBMs armed with conventional

⁵¹ Fiona Cunningham, “Nuclear Command, Control, and Communications Systems of the People's Republic of China,” NAPSNet Special Reports, 18 July 2019, <https://nautilus.org/napsnet/napsnet-special-reports/nuclear-command-control-and-communications-systems-of-the-peoples-republic-of-china/>.

⁵² On warhead handling practices and infrastructure, see Mark Stokes, “China's Nuclear Warhead Storage and Handling System,” *Project 2049 Institute*, 12 March 2010, https://project2049.net/documents/chinas_nuclear_warhead_storage_and_handling_system.pdf. On personnel reliability, see David C. Logan, “Rocket Force Personnel in the Age of Xi Jinping,” in Roy Kamphausen, ed., *The People in the PLA 2.0* (Carlisle, PA: U.S. Army War College Press, 2021).

⁵³ Eric Heginbotham et al., eds., *China's Evolving Nuclear Deterrent: Major Drivers and Issues for the United States* (Santa Monica, CA: RAND Corporation, 2017), pp. 23-24.

⁵⁴ *Ibid.*, p. 23.

⁵⁵ For a general discussion of Chinese deterrence signaling practices, see Nathan Beauchamp-Mustafaga, et al., *Deciphering Chinese Deterrence Signaling in the New Era: An Analytic Framework and Seven Case Studies* (Santa Monica, CA: RAND Corporation, 2021).

⁵⁶ 于际训 [Yu Xijun], ed., 第二炮兵战役学 [*The Science of Second Artillery Campaigns*] (Beijing: 解放军出版社 [Liberation Army Publishing House], 2004), pp. 282-296; 肖天亮 [Xiao Tianliang], ed., 战略学 [*Science of Military Strategy*] (Beijing: 国防大学出版社 [National Defence University Press], 2015), pp. 129-131; and 曹正荣 [Cao Zhengrong], 吴润波 [Wu Runbo], and 孙建军 [Sun Jianjun], 信息化联合作战 [*Informationized Joint Operations*] (Beijing: 解放军出版社 [PLA Press], 2008), p. 260.

warheads against key targets on the adversary's homeland.⁵⁷ These measures could easily be misinterpreted as preparations for an actual nuclear launch, potentially escalating a crisis or conflict and leading to nuclear use.

China's nuclear forces are intended primarily to prevent nuclear coercion and deter nuclear attack; Rocket Force training largely reflects these purposes and indicates that the PLA envisions using nuclear weapons in retaliation for a nuclear strike.⁵⁸ Public military reporting of Rocket Force training involving nuclear units consistently describes the simulated launches occurring after China has already suffered a nuclear strike.⁵⁹ Rocket Force training has operators spend several days (or longer) in protected underground facilities to simulate the need to shelter from the aftermath of a nuclear strike before executing China's own retaliatory nuclear launches.⁶⁰ Rocket Force units are frequently described as operating under conditions of nuclear attack or in a post-attack environment.⁶¹ There is little to no information about nuclear training involving either the Navy or the Air Force, though flushing of

⁵⁷ 于际训 [Yu Xijun], ed., 第二炮兵战役学 [The Science of Second Artillery Campaigns] (Beijing: 解放军出版社 [Liberation Army Publishing House], 2004), pp. 291 and 402.

⁵⁸ Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and U.S.-China Strategic Stability," *International Security*, Vol. 40, No. 2 (Fall 2015), pp. 7-50.

⁵⁹ See, for example, 宗世航 [Zong Shihang], "火箭军某旅细化完善合成训练考评体系 [A Rocket Force Brigade Refines and Improves the Training Evaluation System]," 解放军报 [PLA Daily], 14 April 2019, p. 2; 刘王虎 [Liu Wanghu], 宋波 [Song Bo], and 冯金源 [Feng Jinyuan], "战斗在子夜打响 [The Battle Begins at Midnight]," 火箭兵报 [Rocket Force News], 6 September 2018, p. 4; 中国军队核常兼备导弹部队 [China's Military: Nuclear-Conventional Dual-Capable Missile Unit], 央视网 [CCTV], 22 July 2017, <http://military.cctv.com/2017/07/22/ARTISRZrXEl1cztSrXJ9rZSw170722.shtml>; and Minnie Chan, "Chinese Military: Rocket Force Drills Prepare for Possible US Nuclear Weapons Attack," *South China Morning Post*, 25 August 2020, <https://www.scmp.com/news/china/military/article/3098727/chinese-military-rocket-force-drills-prepare-possible-us>.

⁶⁰ 刘王虎 [Liu Wanghu], "二炮士兵隐蔽在地下洞库 8 天生吃韭菜甜椒 [Second Artillery Soldiers Hidden in Underground Caverns for 8-Day Exercise Eat Leeks and Sweet Peppers]," 解放军报 [PLA Daily], 6 May 2013, <http://mil.news.sina.com.cn/2013-05-06/0420723740.html>; "二炮部队 58 名女兵进驻大山隐蔽洞库发射导弹 [58 Female Soldiers of the Second Artillery Stationed in Dashan Concealed Cavern to Launch Missiles]," 新浪军事 [Sinica Military], 17 May 2013, <http://mil.news.sina.com.cn/2013-05-17/1509724974.html>; and Larry M. Wortzel, *China's Nuclear Forces: Operations, Training, Doctrine, Command, Control, and Campaign Planning* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, 2007), p. 21.

⁶¹ 李忠 [Li Zhong] and 张帆 [Zhang Fan], "雪域战场演兵忙: 某旅冬训场营营对抗演练目击记 [Snowy Battlefield Military Exercises Are Busy: Account of a Brigade's Winter Training Camp Confrontation Exercise]," 火箭兵报 [Rocket Force News], 7 January 2017, p. 1; 牛小立 [Niu Xiaoli], 肖云舰 [Xiao Yunjian], and 田亮 [Tian Liang], "艰难一夜 [One Difficult Night]," 火箭兵报 [Rocket Force News], 14 January 2017, p. 2; and 毛建彬 [Mao Jianbin], et al., "Bravely Charge the Contaminated Zone," 解放军报 [PLA Daily], 19 January 2021, http://www.81.cn/bz/2021-01/19/content_9970056.htm.

SSBNs from home ports or scrambling nuclear bombers could both be important deterrence signals.⁶²

No Clear Distinction between Strategic and Theater Forces

China's land-based nuclear forces consist of both strategic and theater systems. China does not deploy tactical nuclear weapons of the kind typically conceptualized in the United States with very small yields and very short ranges.⁶³ China's strategic and theater systems are distinguished by their basing, ranges, locations, and, to a lesser extent, yields. The strategic systems consist of primarily silo-based and some road-mobile intercontinental-range systems garrisoned in the heart of the country and armed with warheads of a few hundred to a few thousand kilotons. The theater systems consist of road-mobile systems with ranges of a few thousand kilometers, garrisoned largely near China's borders and armed with warheads of a few hundred kilotons.⁶⁴ The available evidence does not indicate that China distinguishes between the roles assigned to these strategic and theater nuclear forces.⁶⁵

It is unclear precisely how China envisions using its theater nuclear forces, though they might be used in several ways.⁶⁶ First, China might use them as part of a limited nuclear counterstrike campaign, presumably against U.S. military forces in the region. Although China does not appear to plan for limited nuclear strikes, some language from doctrinal materials suggests the PLA envisions at least two waves of nuclear counterstrikes and that they might involve one or more than one missile base, implying that Chinese nuclear strikes might have some flexibility in how they are conducted.⁶⁷ Chinese decision-makers could always attempt to order a tailored nuclear strike in a contingency. Second, China might use its theater nuclear forces to threaten a nuclear strike or engage in nuclear signaling operations to reestablish deterrence during a conflict, though this might violate China's NFU policy. The

⁶² Tong Zhao, *Tides of Change: Nuclear Ballistic Missile Submarines and Strategic Stability* (Washington, D.C.: Carnegie Endowment for International Peace, 2018), p. 80.

⁶³ Phillip C. Saunders and David C. Logan, "China's Regional Nuclear Capability, Nonnuclear Strategic Systems, and Integration of Concepts and Operations," in James M. Smith and Paul J. Bolt, eds., *China's Strategic Arsenal: Worldview, Doctrine, and Systems* (Washington, D.C.: Georgetown University Press, 2021), pp. 126-129.

⁶⁴ For some discussion on distinguishing these systems, see David C. Logan, "Are They Reading Schelling in Beijing? The Dimensions, Drivers, and Risks of Nuclear-Conventional Entanglement in China," *Journal of Strategic Studies* (2020), pp. 27-30.

⁶⁵ Tong Zhao, "Conventional long-range strike weapons of US allies and China's concerns of strategic instability," *The Nonproliferation Review*, (2020), p. 8; and Fiona S. Cunningham, *Managing U.S.-China Nuclear Risks: A Guide for Australia* (Sydney: United States Studies Centre, 2020), p. 6.

⁶⁶ For some discussion, see Fiona S. Cunningham, *Managing U.S.-China Nuclear Risks: A Guide for Australia* (Sydney: United States Studies Centre, 2020), pp. 3-6.

⁶⁷ 于际训 [Yu Xijun], ed., 第二炮兵战役学 [*The Science of Second Artillery Campaigns*] (Beijing: 解放军出版社 [Liberation Army Publishing House], 2004), p. 145. For some discussion, see Fiona S. Cunningham and M. Taylor Fravel, "Dangerous Confidence? Chinese Views on Nuclear Escalation," *International Security*, Vol. 44, No. 2 (Fall 2019), pp. 84-85.

location of China's theater nuclear forces suggests they are oriented toward missions involving India, the South China Sea, and the East China Sea.⁶⁸

Recommendations for Congress

Based on the above analysis, I make the following recommendations for Congress.

First, Congress should support open-source collection and analysis on China's nuclear weapons. Research on any state's nuclear weapons policies and practices is difficult. This is especially true of China, which is remarkably opaque about its nuclear forces. Open-source research, including from military reporting, news media, PLA doctrinal and curricular materials, public-facing government documents, and academic reports, is incredibly valuable to better understanding China's nuclear weapons programs, including the roles China assigns to its theater nuclear weapons systems, the drivers and future trajectory of China's nuclear forces, and the role of the emerging air and sea legs of China's nuclear triad. However, the U.S. government has erected obstacles to open-source research. In June 2019, the Open Source Enterprise (OSE) was decommissioned and its contents transferred to restricted networks.⁶⁹ The OSE had previously provided valuable access to open source information about the Chinese military and its nuclear forces. This access is particularly valuable given the increasing challenges of conducting fieldwork in China. In its 2019 annual report to Congress, the Commission recommended "direct[ing] the Office of the Director of National Intelligence to restore the unclassified Open Source Enterprise website to all of its original functions for U.S. government employees. Access to the Open Source Enterprise should also be expanded by making appropriate materials available to U.S. academic and research institutions."⁷⁰ However, the Commission's 2020 annual report omitted this recommendation and there has been no indication of movement in restoring OSE or a replacement service. Congress should direct the Director of National Intelligence to restore the unclassified OSE, make it available to U.S. academic and research institutes, and ensure appropriate funding for the secure collection, translation, and dissemination of open sources.

⁶⁸ Phillip C. Saunders and David C. Logan, "China's Regional Nuclear Capability, Nonnuclear Strategic Systems, and Integration of Concepts and Operations," in James M. Smith and Paul J. Bolt, eds., *China's Strategic Arsenal: Worldview, Doctrine, and Systems* (Washington, D.C.: Georgetown University Press, 2021), pp. 129-131; and David C. Logan, "Are They Reading Schelling in Beijing? The Dimensions, Drivers, and Risks of Nuclear-Conventional Entanglement in China," *Journal of Strategic Studies* (2020), p. 20.

⁶⁹ Steven Aftergood, "Improved Access to Open Source Intelligence Urged," *Secrecy News* (blog), *Federation of American Scientists*, 2 December 2019, <https://fas.org/blogs/secrecy/2019/12/osint-access/>.

⁷⁰ *2019 Annual Report to Congress* (Washington, D.C.: U.S.-China Economic and Security Review Commission, 2019), p. 541.

Second, Congress should facilitate strategic nuclear dialogue between China and the United States. Dialogues, whether official or at the Track-1.5 and Track-2 levels, can be incredibly valuable in gaining insights into Chinese nuclear weapons issues and communicating the policies and views of the U.S. government.⁷¹ The United States can use dialogues to seek clarity about the role of China's theater nuclear forces, the drivers and extent of Chinese conventional-nuclear entanglement, Chinese views of escalation and signaling dynamics, and China's requirements and goals for nuclear forces. In the past, the Defense Threat Reduction Agency (DTRA) played an important role in funding and supporting U.S.-China dialogues on nuclear issues. In 2019, however, DTRA ended its support amid frustration with inconsistent Chinese participation and the Chinese government's continued refusal to commit to an official dialogue.⁷² Congress can support dialogue in several ways. First, Congress can direct the Secretary of Defense, through DTRA, to fund and support unofficial and official dialogues between the United States and China on nuclear weapons issues. Second, Congress should provide the appropriate funding necessary to realize this goal. Third, Congress can investigate the role of U.S. policy in facilitating or hindering official dialogues, including, for instance, the costs and benefits of the United States acknowledging nuclear mutual vulnerability with China, which has been a key Chinese prerequisite for initiating official dialogue.

Third, Congress should investigate the role of U.S. BMD developments in driving undesirable Chinese nuclear policy choices and consider options to appropriately adjust U.S. BMD policy. As discussed, Chinese concerns about U.S. BMD capabilities are a key driver of China's nuclear insecurity. While these concerns may be misplaced or disputable, they appear sincerely held.⁷³ Recent U.S. actions on BMD have only exacerbated those concerns. For instance, the 2017 National Defense Authorization Act (NDAA) revised the 1999 National Missile Defense Act by removing the word "limited" from descriptions of planned U.S. BMD deployments. This deletion, along with analogous statements from administration officials, signaled a more expansive BMD goal, one which might potentially impact China's nuclear forces and further drive China's nuclear expansion.⁷⁴ The 2018 NDAA reinforced this move by

⁷¹ David Santoro and Robert Gromoll, "On the Value of Nuclear Dialogue with China," *Issues & Insights*, Vol. 20, No. 1 (November 2020); Brad Roberts, ed., *Taking Stock: U.S.-China Track 1.5 Nuclear Dialogue* (Livermore, CA: Center for Global Security Research Lawrence Livermore National Laboratory, 2020); and author's own experiences.

⁷² Brad Roberts, "A Review and Assessment from an American Perspective," in Brad Roberts, ed., *Taking Stock: U.S.-China Track 1.5 Nuclear Dialogue* (Livermore, CA: Center for Global Security Research Lawrence Livermore National Laboratory, 2020), p. 26; and Responses of Hon. Andrea L. Thompson to Questions Submitted by Senator Jeff Merkley, hearing before the Senate Foreign Relations Committee on the Intermediate Range Nuclear Forces Treaty, 15 May 2019, <https://www.congress.gov/event/116th-congress/senate-event/LC65208/text?s=1&r=5>.

⁷³ Tong Zhao, *Narrowing the U.S.-China Gap on Missile Defense: How to Help Forestall a Nuclear Arms Race* (Washington, D.C.: Carnegie Endowment for International Peace, 2020).

⁷⁴ Kingston Reif, "Trump Seeks Missile Defense Buildup," *Arms Control Today*, Vol. 49, No. 2 (March 2019), pp. 30-32.

significantly expanding the work of the Missile Defense Agency (MDA).⁷⁵ Congress can direct appropriate U.S. government agencies to study issues such as the role of U.S. BMD capabilities in driving Chinese nuclear programs, the potential threat U.S. BMD capabilities might present to China's nuclear deterrent, the technical feasibility of distinguishing between theater and strategic BMD capabilities, and the potential strategic costs and benefits of specific BMD programs. This may help the U.S. government better balance the benefits of BMD developments with their potential costs.

Finally, Congress can lay the foundation for cooperative nuclear arms control with China, focused on crisis stability mechanisms. The United States government has expressed an interest in enlisting China's participation in nuclear arms control, which could address many U.S. concerns. The near-term likelihood of any formal U.S.-China arms control agreements is very low, but the United States can work now to lay the groundwork for future initiatives. Areas of possible cooperation include crisis-communications and crisis-management capabilities such as through the National and Nuclear Risk Reduction Center, joint technical assessments of BMD systems, Chinese observer participation in (mock) New START inspections, and advanced notification agreements covering major exercises and launches. Congress could eventually support the development of relationships between the National Nuclear Security Administration (NNSA) and the U.S. National Laboratories and Chinese counterparts.⁷⁶ Some of these efforts might be hampered by current legal restrictions on U.S.-China military-to-military exchanges. Section 1201 of the 2000 NDAA states that "The Secretary of Defense may not authorize any military-to-military exchange or contact ... if that exchange or contact would create a national security risk due to an inappropriate exposure," including in the areas of nuclear operations, advanced combined-arms and joint combat operations, surveillance and reconnaissance operations, military space operations, release of classified or restricted information, and access to a Department of Defense laboratory. Although the current level of military-to-military contacts does not come close to violating the restrictions, the U.S. government might desire future contacts which might be restricted. For instance, in 2014, the Chairman of the Joint Chiefs of Staff suggested that, depending on Chinese participation in the RIMPAC exercises, Congress might reconsider the 1201 restrictions.⁷⁷ Congress could direct the Congressional Research Service or the Secretary of Defense to investigate whether and to what extent the

⁷⁵ Eric Gomez, "Missile Defense in the 2018 NDAA," *Cato at Liberty* (blog), *Cato Institute*, 20 November 2017, <https://www.cato.org/blog/missile-defense-2018-ndaa>.

⁷⁶ Frank A. Rose, "Bringing China into the Fold on Arms Control and Strategic Stability Issues," *Order from Chaos* (blog), *The Brookings Institution*, 25 September 2019, <https://www.brookings.edu/blog/order-from-chaos/2019/09/25/bringing-china-into-the-fold-on-arms-control-and-strategic-stability-issues/>; and Sarah Bidgood, "Risky Business: Four Ways to Ease U.S.-Russian Nuclear Tension," *Arms Control Today*, Vol. 49, No. 7 (September 2019), pp. 6-11.

⁷⁷ Jeanette Steele, "Historic Moment for Naval War Games," *San Diego Union-Tribune*, 6 July 2014, <https://www.sandiegouniontribune.com/military/sdut-rimpac-china-japan-naval-exercises-harry-harris-2014jul06-story.html>.

Section 1201 restrictions would hamper potentially beneficial cooperation and consider revising the restrictions as necessary.⁷⁸

⁷⁸ For some more suggestions about reexamining U.S.-China military-to-military contacts, see Joel Wuthnow, “Projecting Strength in a Time of Uncertainty: China’s Military in 2020,” Testimony before the U.S.-China Economic and Security Review Commission, 9 September 2020, pp. 22-23.