Maximizing Leverage:
Explaining China's Strategic Force Postures in Limited Wars

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ABSTRACT

How do nuclear-armed states maximize strategic leverage to coerce their adversaries in limited wars? Although the existing literature has examined how states have used their nuclear weapons as sources of strategic leverage, it has not fully explored the challenges states face in using these extremely destructive weapons in limited wars. China's approach to maximizing strategic leverage offers one possible solution to these challenges. It has pledged not to use nuclear weapons unless it first suffers a nuclear attack from an adversary. Instead it threatens to use space, cyber and conventional missile weapons to maximize strategic leverage against an adversary in a limited war.

I develop a theory of strategic substitution to explain why states might substitute space, cyber, and conventional missile weapons for nuclear weapons as sources of strategic leverage in limited wars and how they select force postures for each of these weapons. First, I develop a typology of force postures for these non-nuclear strategic weapons based on how much they increase the risk of the state using its most destructive space, cyber or conventional missile weapons. Second, I outline two variables that determine whether a state pursues a non-nuclear strategic weapons capability and, if so, which force posture it selects. States pursue a coercive capability if they have a need for strategic leverage because they cannot respond to changes for the worse in their threat environment with credible threats to use nuclear weapons or their conventional military forces. States select postures by estimating the expected cost of an adversary's retaliation if they have to carry out a threat to use a non-strategic nuclear weapon.

To demonstrate the explanatory power of the theory, I conduct comparative case studies of all seven Chinese decisions about its space, cyber and conventional missile postures since 1988. Using original Chinese-language sources, I provide the most comprehensive account of China's post-Cold War strategic force posture choices in the existing literature. I show how China's nuclear posture, conventional military power, and its force postures for new military technologies are related, although they are often examined independently of one another in the existing literature.

Thesis Supervisor: M. Taylor Fravel
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List of Abbreviations

AMS	Academy of Military Sciences
ASAT	Anti-satellite
ASBM	Anti-ship ballistic missile
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance
CAEP	Chinese Academy of Engineering Physics
CEP	Circular Error Probability
CMC	Central Military Commission
COSTIND	Commission on Science, Technology and Industry
CSC	Central Special Commission
ERW	Enhanced radiation weapon
GSD	General Staff Department
GAD	General Armaments Department
GEO	Geosynchronous earth orbit
ICBM	Inter-continental ballistic missile
ICP	Integrated Command Platform
ICT	Information and communications technology
IRBM	Intermediate-range ballistic missile
ISR	Intelligence, surveillance and reconnaissance
LEO	Low earth orbit
LSG	Leading small group
MRBM	Medium-range ballistic missile
NDU	National Defense University
PLA	People's Liberation Army
PLAAF	People's Liberation Army Air Force
PLARF	People's Liberation Army Rocket Force
PRC	People's Republic of China
SDI	Strategic Defense Initiative

SLBM	Submarine-launched ballistic missile
SRBM	Short-range ballistic missile
SSBN	Ballistic missile submarine
SSF	Strategic Support Force
TRB	Technical Reconnaissance Bureau
UN	United Nations

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While working on this dissertation, I have been the beneficiary of the extraordinary generosity of many people and organizations with their ideas, time, support, and financial assistance.

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Introduction

When the United States accidentally bombed the Chinese Embassy in Belgrade on May 6, 1999 during the Kosovo conflict, many Chinese analysts saw the incident as an undeniable sign of U.S. hostility. The attack galvanized China's People's Liberation Army (PLA) to look for immediate solutions to remedy the problem that China would face in its main conflict scenario, a war over Taiwanese independence. Beijing did not have the army, navy and air force to prevail if the United States intervened. China therefore needed to deter Taipei from taking any steps towards formal independence. If war broke out across the Taiwan Straits, Beijing needed to deter Washington from intervening. If Washington intervened, China needed to compel both Taipei and Washington to negotiate an end to a conflict that restored the political status quo ex ante across the Taiwan Strait. Beijing could then achieve a political victory even if it could not achieve a military victory over the U.S. and Taiwanese militaries. But China has not changed its longstanding pledge not to use nuclear weapons first in order to gain the coercive leverage to achieve that political victory. Instead, China has relied on threats to use space, cyber and conventional missile weapons first to maximize its strategic leverage to coerce Taipei and Washington. Why and how does China substitute space, cyber, and conventional missile weapons for nuclear weapons as sources of strategic leverage in limited wars?

Space weapons, cyber weapons, and conventional missiles are strategic weapons because they can be used to attack important targets such as an adversary's satellites, its homeland critical infrastructure, its aircraft carriers, and an adversary's forward-deployed forces and allies in a

conflict. They are more similar to nuclear weapons than conventional bombs and bullets because they can inflict a lot of damage on these targets rapidly and efficiently across great distances, and are difficult to defend against. But they are still not as destructive as nuclear weapons. But despite the similarities of space, cyber and conventional missiles, and their similar role as China's sources of strategic leverage in a limited war, China has demonstrated different degrees of risk tolerance in how it plans to use these weapons in a crisis or conflict.

Most states in China's situation have relied on their nuclear weapons as a source of strategic leverage to coerce an adversary with superior conventional military forces. Nuclear coercion allowed those states to level the playing field and compensate for their inability to win a war with their weaker conventional militaries. During the Cold War, NATO threatened to use nuclear weapons first to deter the Warsaw Pact from using its massive land army to invade Western Europe. Pakistan threatens to use nuclear weapons first to counter an Indian offensive across its land borders. But all nuclear-armed states face the difficult problem of how to gain strategic leverage in a limited war, given that the obvious solution, their highly destructive nuclear weapons, are not well-suited to this task.

The Puzzle – Leverage without Nuclear Weapons

China's decision not to use nuclear weapons to gain strategic leverage in a limited war over Taiwan reflects more general questions about warfare as an extension of politics in the nuclear age. States want to maximize their strategic leverage to increase their chances of achieving their political aims using coercion. Strategic leverage refers to the ability of a state to deter the

outbreak of a conventional war or to compel a more favorable end to a war using threats of violence to change an adversary's calculations about taking those actions. A limited war is a conflict in which both states pursue more modest political aims than conquest or regime change. In limited wars, states fight over things that they can live without. Those conflicts do not threaten their survival. Further, the political aims they pursue in those conflicts are not so important that a state would risk its survival to achieve them, for example seizing or defending segments of territory, preventing weapons proliferation, or upholding humanitarian principles. The limited aims that states pursue in limited wars usually lead them to restrict the geographical location, types of weapons used, casualties, or resources used to fight.

States can make threats to use nuclear weapons to force an adversary to comply with their demands. Those threats can force an adversary to comply with their demands even when the threatening state cannot achieve those same aims with its conventional military forces. Before the nuclear age, a state with superior conventional military power could coerce a weaker state in international politics by threatening to defeat it on the battlefield. In the nuclear age this is no longer necessarily true because nuclear weapons can be used to achieve political aims using strategic coercion, regardless of a state's conventional military power.[1]

There are, however, some disadvantages to using nuclear weapons as a source of strategic leverage, which are accentuated in limited wars. Nuclear-armed states who want to use their nuclear weapons as a source of strategic leverage face two challenges. First, nuclear threats are hard to make credible. The task of making them credible only becomes harder as the stakes of

[1] Thomas C. Schelling, *Arms and Influence* (New Haven, C.T.: Yale University Press, 1966), 22.

a conflict diminish. Using nuclear threats to gain leverage is overkill or mutual kill for interests that do not affect a state's survival. Nuclear weapons could cause damage to both parties that is completely out of proportion to the stakes of the conflict. Second, nuclear threats increase the risk of a total, nuclear war. In wartime, if an adversary ignored a nuclear threat, a state could trigger a large-scale nuclear war by carrying out its threat. In peacetime, nuclear threats can send a strong signal of a state's hostile intentions to an adversary. If they are taken seriously, they could convince an adversary that a limited war will quickly escalate into a total war.

States cannot easily use their nuclear weapons as a source of strategic leverage in a limited war, especially against nuclear-armed adversaries. But they still want to maximize their strategic leverage to help them deter the outbreak of war or compel an end to a limited war using threats of violence. The question of how nuclear-armed states maximize strategic leverage in a limited war is puzzling because on the one hand, nuclear weapons seem to equip those states with such a potent coercive tool that they should have no problem bending their adversaries to their will. On the other hand, given the credibility and escalation challenges associated with nuclear coercion, it is surprising that any nuclear state would try to use nuclear weapons to achieve limited war aims.

The question of how nuclear-armed states gain strategic leverage in a limited war has not been fully explored in the existing literature for a number of reasons. First, the literature has focused on the role of nuclear weapons as guarantors of state survival, either against conventional invasion or nuclear attack. Scholars have found that nuclear weapons can give states strategic leverage in total wars to deter an adversary from waging a conventional war of conquest or

regime change.[2] The existing literature has understandably focused on the role of nuclear weapons in total wars because states generally acquire nuclear weapons to address the gravest threats to their survival. Theories of nuclear strategy were also laid during the Cold War, where any crisis or conflict between the two superpowers was expected to become a total war.

Second, the existing literature has focused on a narrower question of how nuclear-armed states can use their nuclear weapons as sources of strategic leverage in a limited war, rather than the broader question of how nuclear-armed states maximize strategic leverage in limited wars. Some states have used nuclear weapons as source of strategic leverage in conflicts that do not threaten their survival by deploying tactical nuclear weapons. During the Cold War, the United States and Soviet Union deployed low-yield, short-range nuclear weapons that they intended to use to fight limited wars. But strategists quickly recognized that the use of tactical nuclear weapons also created a serious risk of escalation to a more serious nuclear exchange, which could have easily turned a limited war into a total war. In other words, tactical nuclear weapons were a solution to the credibility problem associated with nuclear coercion, but not the escalation problem. The Cold War superpowers could, however, still manipulate this risk of nuclear escalation to maximize strategic leverage against each other in a limited war. Scholars have also examined whether states can use compellent nuclear threats to change the status quo and pursue non-survival interests, but they have not articulated the implications of their findings for limited wars.[3]

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[2] Robert Jervis, *The Meaning of the Nuclear Revolution: Statecraft and the Prospect of Armageddon* (Ithaca, N.Y.: Cornell University Press, 1989), 6–8; Vipin Narang, *Nuclear Strategy in the Modern Era* (Princeton, N.J.: Princeton University Press, 2014).

[3] See, for example, Richard K. Betts, *Nuclear Blackmail and Nuclear Balance* (Washington, D.C.: Brookings Institution Press, 1987); Matthew Kroenig, "Nuclear Superiority and the Balance of Resolve: Explaining Nuclear Crisis Outcomes," *International Organization* 67 (Winter 2013): 141–71; Todd S. Sechser and Matthew Fuhrmann, *Nuclear Weapons and Coercive Diplomacy* (New York, N.Y: Cambridge University Press, 2017).

A third reason for this omission may be that there is no such thing as a "limited war" in the nuclear age. Any war between nuclear-armed powers could end in nuclear Armageddon. But limited wars continued throughout the Cold War and have arguably become the dominant type of war in the Post-Cold War era. Russia's annexation of Crimea in 2014 and invasion of Georgian territory in 2008 were limited wars over a segment of territory. Western interventions in Kosovo in 1998-9 and Libya in 2011 were limited wars over international principles. The United States and Israel have conducted air strikes to enforce principles of nuclear non-proliferation in Iraq in 1998 and Syria in 2007. In 1991, the United States drove Iraqi forces out of Kuwait to enforce a principle of sovereignty. The most likely great power conflict scenarios today would involve limited aims such as a Russian seizure of segments of the Baltic states, a war in which the United States backed Taipei in a war with China over the island's independence, or a war between China and U.S. East Asian allies over disputed maritime territories in the East and South China Sea. Maximizing strategic leverage in a limited war is, therefore, a real and important problem for nuclear-armed states today because they cannot use their nuclear weapons in the same way as a total war to coerce an adversary in a limited war.

The China Puzzle

The general problem of maximizing strategic leverage in a limited war is perhaps the most challenging for China among all nuclear-armed states because it has foresworn the first-use of nuclear weapons. Nuclear weapons may not be well-suited to the task of giving states strategic leverage to deter or win a limited war, but a poor tool is better than no tools at all. China has maintained its longstanding pledge not to use nuclear weapons first despite its strong need for

strategic leverage in a limited war, to compensate for its conventional military disadvantage compared to Taiwan and the United States. Moreover, a war over Taiwan would be a limited war with unusually high stakes for China. Beijing would view the formal independence of the island as a violation of its "core interests," although it has lived with the status quo of de facto Taiwanese independence for almost seven decades and could continue to live with that status quo for the foreseeable future. The combination of China's conventional inferiority and retaliatory nuclear posture is surprising when compared to the first-use nuclear postures of other states facing adversaries with more powerful conventional forces, such as NATO during the Cold War.

China's decision not to rely on its nuclear weapons to gain strategic leverage in a Taiwan scenario has puzzled scholars and policymakers for the past two decades, who assume that Chinese leaders have a choice: would they rather lose a war over Taiwan or use nuclear threats to gain strategic leverage to deter U.S. intervention and risk a nuclear war? While scholars do not think China would initiate a nuclear war over Taiwan,[4] doubts that Beijing would accept defeat in a conventional war led them to scrutinize China's nuclear No First-Use pledge for exceptions and signs of change.[5] As Richard Betts and Thomas Christensen wrote in 2000, "although it is unimaginable that China would use nuclear weapons in an effort to gain political

[4] Robert S. Ross, "Navigating the Taiwan Strait: Deterrence, Escalation Dominance, and U.S.-China Relations," *International Security* 27, no. 2 (Fall 2002): 48–85.

[5] Alastair Iain Johnston, "China's New 'Old Thinking': The Concept of Limited Deterrence," *International Security* 20, no. 3 (Winter 1995/6): 5–42; Andrew S. Erickson, Michael S. Chase, and Christopher Yeaw, "Chinese Theater and Strategic Missile Force Modernization and Its Implications for the United States," *Journal of Strategic Studies* 32, no. 1 (2009): 67–114; Thomas J. Christensen, "The Meaning of the Nuclear Evolution: China's Strategic Modernization and US-China Security Relations," *Journal of Strategic Studies* 35, no. 4 (2012): 447–87; David Wright, "More Confusion About China," All Things Nuclear, December 19, 2010, https://allthingsnuclear.org/dwright/more-confusion-about-china; James M. Acton, "Is China Changing Its Position on Nuclear Weapons?," *The New York Times*, April 18, 2013.

concessions from Taiwan, it might threaten their use to deter U.S. military action on behalf of the island." They continued, "if a conventional engagement leaves U.S. naval forces in control of the Taiwan Strait, can anyone be confident that Beijing would not dream of using a nuclear weapon against the Seventh Fleet?"[6] The empirical puzzle of China's conventional inferiority and retaliatory nuclear posture suggests that there must be another way for states to gain strategic leverage in a limited war than nuclear first-use, given the importance Beijing attaches to Taiwan's status.

In a limited war over Taiwanese independence, China threatens to paralyze American computer networks serving everything from the military to the electricity grid with cyber attacks, turn American satellites into shards of hazardous space debris with anti-satellite weapons, and sink a U.S. aircraft carrier deployed off China's shores with a ballistic missile. But it does not threaten to use a nuclear weapon first on the United States or Taiwan. Beijing calculates that these weapons would threaten enough pain and disruption to make Taiwanese leaders hesitant to take any steps towards formal independence and U.S. decision-makers hesitate to intervene in a cross-Strait war, but not so much damage that the United States would view China as an existential threat to the United States. Chinese leaders have also shown a varying level of the risk tolerance across its force postures for its space, cyber and conventional missile weapons and over time for its cyber and missile weapons. This variation in China's risk tolerance is also puzzling, given that these weapons play similar roles as China's sources of strategic leverage in a limited war.

[6] Richard K. Betts and Thomas J. Christensen, "China: Getting the Questions Right," *National Interest*, no. 62 (Winter 2000/01): 19, 27.

Summary of the Argument

Constrained by its No First-Use policy, China has found a novel solution to the challenges all nuclear-armed states face to maximize strategic leverage in limited wars. Rather than finding ways to make nuclear coercion more credible, such as deploying tactical nuclear weapons, it combines a retaliatory nuclear posture with first-use space, cyber and conventional missile postures. China's approach of strategic substitution to maximizing its coercive leverage avoids both the credibility and escalation challenges of nuclear coercion.

The dependent variable of the theory of strategic substitution is (1) China's pursuit of a coercive space, cyber and conventional missile capability and (2) the type of first-use force posture it selects for each of these three strategic weapons. A force posture for a strategic weapon is a doctrine for how a state would use that weapon in a crisis or conflict, combined with a series of capabilities and organizational arrangements to realize that plan. States can select from two force postures for their non-nuclear strategic weapons: brinkmanship and calibrated escalation. A brinkmanship posture manipulates risk a lot by threatening attacks that will induce uncontrolled escalation if coercive demands are ignored by an adversary. A calibrated escalation posture manipulates risk a little because the state limits the intensity of its own attacks, if its demands are ignored by an adversary. The intensity of any further attacks is calibrated to the damage the state suffers from an adversary's retaliatory strikes and the value it places on the stakes of the limited conflict. Force postures also have coercive effects in

peacetime because they affect an adversary's calculations about taking actions that could trigger a crisis or conflict in the first place.[7]

Decision-makers go through a two-step decision-making process to pursue a strategic weapons capability and adopt a force posture for each type of non-nuclear strategic weapon. First, variation in a state's need for strategic leverage explains why decision-makers pursue a coercive capability for their space, cyber or conventional weapons. A state has a need for strategic leverage at certain times and not others because its threat environment changes for the worse following a crisis or conflict involving its adversary. The deterioration in a state's threat environment exposes the inadequacy of its existing sources strategic leverage. But a state only has a need for strategic leverage following that threat event if it also has one of two motivations for pursuing a non-nuclear strategic weapons capability: strategic credibility or conventional inferiority. These two motivations preclude the state from using its nuclear or conventional weapons to respond to that change. States are able to make more credible threats to use space, cyber and conventional missile weapons than threats to use nuclear weapons in wars that do not threaten their survival. Moreover, pursuing a coercive capability for these non-nuclear strategic weapons is a faster, easier and cheaper pathway to maximizing strategic leverage than trying to catch up with an adversary's superior conventional military power.

The second step is to select the force posture that allows a state to use its space, cyber or conventional missile weapons to maximize its strategic leverage, while ensuring that threats to use those weapons are credible to an adversary. Variation in a state's expected cost of

[7] Narang, *Nuclear Strategy in the Modern Era*, 18–19.

retaliation explains which coercive force posture it selects. If a state has to carry out a threat to use a strategic weapon, its adversary is likely to retaliate. The state is unlikely to be able to protect itself from that retaliatory strike because strategic weapons by definition are hard to defend against. As a result, decision-makers are sensitive to the expected cost of retaliation for using a particular strategic weapon.

Two factors determine a state's expected cost of retaliation: its exposure to a retaliatory attack and the feasibility of controlling escalation using a strategic weapon. A state selects a brinkmanship posture if it is less exposed to attack than an adversary using a non-nuclear strategic weapon. In that situation, the state faces a low cost of retaliation, which makes its threats to use that type of weapon very credible. States are less exposed to attack than their adversary if they have a monopoly on a strategic weapon or are much less dependent on space or cyberspace than an adversary. A state selects a calibrated escalation posture if it is equally exposed to attacks as its adversary and it is feasible to control escalation using that type of strategic weapon. In that situation it faces a moderate cost of retaliation, which makes its threats to use force credible only if the effects of its attacks can be carefully controlled.

Importance and Contribution

Explaining China's approach to maximizing strategic leverage in a limited war is important to both international relations scholarship and policy-makers for several reasons. First, this dissertation begins to fill an important gap in the existing theoretical literature of how nuclear-armed states gain strategic leverage in limited wars in which their nuclear weapons may not be

well-suited to the task. China's approach may differ from other nuclear-armed states for a number of reasons, including the constraints of its No First-Use nuclear policy and asymmetries in the stakes of its Taiwan conflict scenario with the United States. Nevertheless, there are signs that other states may be reluctant to use their nuclear weapons in limited wars. Other states also want to use their space, cyber and conventional missiles to gain strategic leverage, even if those capabilities complement rather than substitute for a first-use nuclear policy.[8] Furthermore, other states may also consider the same factors as China when selecting their force postures for non-nuclear weapons, regardless of how those weapons relate to their nuclear weapons in their overall strategic postures.

Second, the theory of strategic substitution outlined in this dissertation offers a new way of viewing states' use of new technologies to compel, deter and defend, compared to the existing literature on "cross-domain deterrence." That literature argues that new technologies create new opportunities for states to pursue their security. This dissertation suggests that the pursuit of security drives states to develop new technologies. The cross-domain deterrence literature presents space weapons, cyber weapons, conventional missiles, and unmanned aerial vehicles, among other new technologies, as providing states with new opportunities to coerce one another more effectively, exploiting their comparative advantages in different technologies.[9] The argument presented by this dissertation flips the view of cross-domain deterrence as an

[8] See, for example, the Obama Administration's 2010 Nuclear Posture Review Report, which recommended that the United States "maintaining an effective nuclear umbrella while placing increased reliance on non-nuclear deterrence capabilities (e.g., missile defenses and conventional long-range missiles)." U.S. Department of Defense, "2010 Nuclear Posture Review Report," April 2010, 46. Russian analysts were also reportedly concerned that Moscow needed a conventional missile capability to compensate for its conventional inferiority, in addition to a first-use nuclear posture, in the early 2000s. See Kristin Ven Bruusgaard, "Russian Strategic Deterrence," *Survival* 58, no. 4 (September 2016): 12.

[9] Erik Gartzke and Jon R. Lindsay, "Cross-Domain Deterrence: Strategy in an Era of Complexity," Working Paper, July 15, 2014, https://quote.ucsd.edu/deterrence/files/2014/12/EGLindsay_CDDOverview_20140715.pdf.

opportunity on its head. China's use of new technologies for compellence and deterrence is a result of is a result of the exigencies of its security environment, rather than the availability of technology. In brief, "cross-domain deterrence" is necessity rather than an opportunity for China, to deal with a change in its main conflict scenario from a total war to a limited war.

Third, this dissertation contributes to the broader international relations literature on technology and choices of military strategy. It develops a broader concept of a "strategic weapon" than nuclear weapons and a typology for strategic weapons force postures that is applicable to space, cyber, and conventional missile weapons. It also demonstrates how cyber, space and conventional missile weapons can be used on their own as sources of strategic leverage, rather than as part of a state's overall conventional military power. It advances debates in the cyber security literature about whether cyber coercion is possible by providing a nuanced theoretical argument about the conditions under which states might view cyber coercion as possible and effective. Unlike much of the existing literature on cyber coercion, which uses examples or analogies to support arguments about cyber coercion,[10] the arguments presented in this dissertation are supported with a detailed empirical study of China's approach to military coercion using cyber attacks.

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[10] See, for example, Martin Libicki, *Cyberdeterrence and Cyberwar* (Santa Monica, C.A.: RAND Corporation, 2009); Erica D. Borghard and Shawn W. Lonergan, "The Logic of Coercion in Cyberspace," *Security Studies* 26, no. 3 (2017): 452–81; Emily O. Goldman and John Arquilla, eds., *Cyber Analogies* (Monterrey, C.A.: Naval Postgraduate School, 2014); Erik Gartzke, "The Myth of Cyberwar: Bringing War in Cyberspace Back Down to Earth," *International Security* 38, no. 2 (Fall 2013): 41–73; Lucas Kello, "The Meaning of the Cyber Revolution: Perils to Theory and Statecraft," *International Security* 38, no. 2 (Fall 2013): 7–40; Herbert Lin, "Escalation Dynamics and Conflict Termination in Cyberspace," *Strategic Studies Quarterly* 6, no. 3 (Fall 2012): 46–70; Joseph S. Nye Jr., "Deterrence and Dissuasion in Cyberspace," *International Security* 41, no. 3 (Winter 2016): 44–71; Rebecca Slayton, "What Is the Cyber Offense-Defense Balance? Conceptions, Causes, and Assessment," *International Security* 41, no. 3 (January 1, 2017): 72–109. For exceptions, see Nadiya Kostyuk and Yuri M. Zhukov, "Invisible Digital Front: Can Cyber Attacks Shape Battlefield Events?," *Journal of Conflict Resolution*, November 10, 2017; Jon R. Lindsay, "Stuxnet and the Limits of Cyber Warfare," *Security Studies* 22, no. 3 (2013): 365–404.

Fourth, this dissertation offers the most complete account of China's post-Cold War strategic force posture in the existing literature. Not only is China an important state in international relations, but its military strategy choices have been nowhere near as influential on existing theories about nuclear strategy, military strategy, and coercion, as the United States, Russia, and other Western European countries. The empirical material in this dissertation may help to refine these cross-national theories. This dissertation offers the first account of the motivations behind China's post-Cold War posture choices for its nuclear, conventional missile, space and cyber weapons. It also provides a detailed description of China's force postures for each of those weapons that allows for comparisons among them. Existing studies of Chinese cyber and conventional missile postures are largely descriptive and do not explain why or how China uses those weapons to gain strategic leverage.[11] The dissertation also adds to existing scholarly

[11] On China's conventional missile posture, see Michael S. Chase and Andrew S. Erickson, "The Conventional Missile Capabilities of China's Second Artillery Force: Cornerstone of Deterrence and Warfighting," *Asian Security* 8, no. 2 (2012): 115–37; Mark A. Stokes, "The People's Liberation Army and China's Space and Missile Development: Lessons from the Past and Prospects for the Future," in *The Lessons of History: The Chinese People's Liberation Army at 75*, ed. Laurie Burkitt, Andrew Scobell, and Larry Wortzel (Carlisle, P.A.: Strategic Studies Institute and Army War College Press, 2003), 193–250. On China's cyber posture, see Dean Cheng, *Cyber Dragon: Inside China's Information Warfare and Cyber Operations* (Santa Barbara, C.A.: Praeger, 2016); Nigel Inkster, *China's Cyber Power*, vol. 456, Adelphi Book 55 (London: Institute for International Strategic Studies, 2015); Mark A. Stokes, "The Chinese People's Liberation Army and Computer Network Operations Infrastructure," in *China and Cybersecurity: Espionage, Strategy, and Politics in the Digital Domain*, ed. Jon R. Lindsay, Tai Ming Cheung, and Derek S. Reveron (New York, N.Y: Oxford University Press, 2015), 163–87; Joe McReynolds and James Mulvenon, "The Role of Informationization in the People's Liberation Army under Hu Jintao," in *Assessing the People's Liberation Army in the Hu Jintao Era*, ed. Roy Kamphausen, David Lai, and Travis Tanner (Carlisle, P.A.: Strategic Studies Institute and Army War College Press, 2014), 207–56; Joe McReynolds, "China's Military Strategy for Network Warfare," in *China's Evolving Military Strategy*, ed. Joe McReynolds (Washington, D.C.: Jamestown Foundation, 2016), 195–240; Kevin Pollpeter, "Chinese Writings on Cyberwarfare and Coercion," in *China and Cybersecurity: Espionage, Strategy, and Politics in the Digital Domain*, ed. Jon R. Lindsay, Tai Ming Cheung, and Derek S. Reveron (New York, N.Y: Oxford University Press, 2015), 138–62; Mark A. Stokes, "The PLA General Staff Department Third Department Second Bureau" (Washington, D.C.: Project 2049 Institute, July 27, 2015); Mark A. Stokes and L. C. Russell Hsiao, "Countering Chinese Cyber Operations: Opportunities and Challenges for U.S. Interests" (Washington, D.C.: Project 2049 Institute, October 29, 2012). On China's space posture, see Eric Hagt and Matthew Durnin, "Space, China's Tactical Frontier," *Journal of Strategic Studies* 34, no. 5 (October 1, 2011): 733–61; Kevin Pollpeter, "Space, the New Domain: Space Operations and Chinese Military Reforms," *Journal of Strategic Studies* 39, no. 5–6 (2016): 709–27; Kevin Pollpeter, "Controlling the Information Domain: Space, Cyber and Electronic Warfare," in *Strategic Asia 2012-13: China's Military Challenge*, ed. Ashley J. Tellis and Travis Tanner (Washington, D.C.:

accounts of China's nuclear strategy by focusing on debates over changes to China's strategy in the early 1980s, early 1990s, and early 2000s.[12] It provides the first evidence that the availability of space, cyber and conventional missile weapons, which could be used as substitutes for nuclear first-use, may have influenced the outcomes of those debates.

Finally, this dissertation is of practical importance for understanding China's current military strategy and anticipating how China might use its most destructive capabilities in a conflict. It corrects conventional wisdoms based on China's past cyber espionage activities and anti-satellite missile test in 2007 that that it would use space and cyber weapons in a reckless manner. The theory also provides insights into the conditions under which China might adjust or change its space, cyber, and conventional missile postures in the future.

National Bureau of Asian Research, 2012), 163–96; Kevin Pollpeter, Jordan Wilson, and Fan Yang, "China Dream, Space Dream: China's Progress in Space Technologies and Implications for the United States," Report Prepared for the U.S.-China Economic and Security Review Commission, March 2, 2015; Stokes, "The People's Liberation Army and China's Space and Missile Development: Lessons from the Past and Prospects for the Future." On the relationship between these capabilities and China's nuclear posture, see Dennis Blasko, "China's Evolving Approach to Strategic Deterrence," in *China's Evolving Military Strategy*, ed. Joe McReynolds (Washington, D.C.: Jamestown Foundation, 2016), 279–97; Michael S. Chase and Arthur Chan, "China's Evolving Approach to 'Integrated Strategic Deterrence'" (Santa Monica, C.A.: RAND Corporation, 2016).

[12] Michael S. Chase, Andrew S. Erickson, and Christopher Yeaw, "Chinese Theater and Strategic Missile Force Modernization and Its Implications for the United States," *Journal of Strategic Studies* 32, no. 1 (2009): 67–114; Christensen, "The Meaning of the Nuclear Evolution"; M. Taylor Fravel and Evan S. Medeiros, "China's Search for Assured Retaliation: The Evolution of Chinese Nuclear Strategy and Force Posture," *International Security* 35, no. 2 (Fall 2010): 48–87; Avery Goldstein, *Deterrence and Security in the 21st Century: China, Britain, France, and the Enduring Legacy of the Nuclear Revolution* (Stanford, CA: Stanford University Press, 2000); Johnston, "China's New 'Old Thinking': The Concept of Limited Deterrence"; John Wilson Lewis and Xue Litai, *China Builds the Bomb* (Stanford, CA: Stanford University Press, 1988); Wu Riqiang, "Certainty of Uncertainty: Nuclear Strategy with Chinese Characteristics," *Journal of Strategic Studies* 36, no. 4 (2013): 579–614.

Overview of the Chapters

Chapter One outlines the theory of strategic substitution and the empirical strategy used in the dissertation to test the theory. First, I draw on the existing international relations literature to define the key concepts of limited war and strategic leverage, and develop a general concept of a strategic weapon. Second, I describe the dependent variable, force posture for non-nuclear strategic weapons, and develop a typology of force postures that make up the possible values of the dependent variable. Third, I outline the two independent variables that explain why China decided to pursue coercive capabilities for their non-nuclear weapons and how China it selected which force posture to adopt: its need for strategic leverage and the expected cost of retaliation. Changes for the worse in a state's threat environment interact with a leaders' concerns about strategic credibility and their conventional military inferiority, giving them a need for strategic leverage at certain times but not others. They satisfy that need by pursuing coercive capabilities for non-nuclear strategic weapons. The expected cost of retaliation determines a state's choice of force posture, if it has a need for strategic leverage.

Chapter Two examines China's current nuclear posture and its nuclear force posture during the Cold War when it faced a total war of invasion. This chapter establishes two of the scope three conditions of the theory of strategic substitution: China's retaliatory nuclear posture and its limited war scenario. First, the chapter outlines China's retaliatory nuclear posture. Second, the chapter demonstrates that although China's choice of a No First-Use policy during the Cold War is overdetermined, it had a sound strategic logic. China faced a total war with two superpowers with superior conventional military forces, the Soviet Union or United States, and

relied on the size of its territory and population to thwart an invasion. It used its nuclear weapons only to counter nuclear attacks because its leaders did not assess that it was possible to use nuclear weapons to gain strategic leverage against a nuclear-armed adversary. Third, the chapter demonstrates that, during the Cold War, China did not have a need for strategic leverage and therefore did not have a coercive space weapons or conventional missile capability.

Chapter Three examines China's decision to maintain its No First-Use nuclear posture in the post-Cold War era by analyzing two debates over changes to China's nuclear force posture and highlighting the third scope condition, China's conventional military inferiority compared to its adversary in a limited war. The chapter illustrates China's choice not to use its nuclear weapons as a source of strategic leverage as its conflict scenario shifted from a total war to a limited war around 1988. This decision left China with a strong credibility motivation to develop non-nuclear strategic force postures to satisfy its need for strategic leverage following any subsequent changes for the worse in its threat environment. Chinese strategists were doubtful that making nuclear threats against a nuclear-armed adversary would give China strategic leverage. The chapter uses new sources to build on Alastair Iain Johnston's account of a debate within China about the merits of shifting to a limited warfighting nuclear posture in the early 1990s. It also examines a debate among Chinese analysts in the early 2000s after the Belgrade Embassy Bombing about adding conditions to its No First-Use policy to gain strategic leverage, which ultimately resulted in no changes to its nuclear posture.

Chapter Four examines China's conventional missile posture. In 1988, Chinese leaders decided to pursue a coercive conventional missile capability to maximize its strategic leverage in a war over Taiwanese independence. Its leaders made a decision to expand the range of China's conventional missiles and adopt a brinkmanship posture after the Taiwan Straits crisis in 1995-6. They fully implemented plans to expand the range and number of Chinese missiles in 1999 by increasing the resources allocated to developing the conventional missile force. On both of these occasions, Chinese leaders had a need for strategic leverage because of changes in threat their environment, namely the Taiwan Straits Crisis and 1999 U.S. bombing of the Chinese Embassy in Belgrade. China faced a moderate expected cost of retaliation. Despite Taiwan's lack of a ground-based short-range ballistic missile capability and the constraints the United States faced under the INF Treaty, the United States could use aircraft, ships and submarines to retaliate with its own conventional missiles if China carried out a threat to use its missile force. The increasing precision of China's conventional missile capabilities in recent years have gradually shifted its force posture from brinkmanship to calibrated escalation, which the theory of strategic substitution cannot explain. China's conventional missile posture decision-making offers particularly strong evidence of the credibility motivation. Missile force officers stated that they would have no role in a Taiwan conflict if the force was only equipped with nuclear weapons.

Chapter Five analyzes China's cyber posture. The Belgrade embassy bombing prompted the PLA to pursue a coercive cyber weapons capability and adopt a brinkmanship cyber force posture at roughly the same time around 2000. Chinese leaders changed its cyber posture to a calibrated escalation posture after 2014 because its expected cost of cyber retaliation increased

from low in 2000 to moderate in 2014. In that period, China became more dependent on computer networks and more exposed to cyber attacks. Around 2014, Washington also demonstrated that cyber attacks could be attributed to their perpetrators, making it feasible to control escalation from a small-scale cyber attack. China's cyber force posture decision-making provides the most persuasive evidence that the expected cost of retaliation variable determines China's choice of non-nuclear strategic force posture. Changes in the value of that independent variable explain the within-case variation in China's cyber force posture over time.

Chapter Six examines China's space posture. Prompted by the 1999 Belgrade embassy bombing, Chinese leaders decided to pursue a coercive space capability around 2002. China intended to adopt a calibrated escalation space posture since the mid-2000s because it faced a moderate expected cost of retaliation. At that time Beijing had valuable space assets, including dozens of satellites, a manned space program and a lucrative commercial launch business, that an adversary could counter-attack. But it is not clear that China has fully adopted that posture as there is no evidence to indicate it has deployed space weapons. Chinese leaders ordered a review of China's space posture at the end of 2012, which led to course-corrections in the doctrine and organization of China's space force, to allow ensure it could fully implement a calibrated escalation posture. In doing so, Chinese leaders warded off competing proposals for China's space force posture put forward by the PLA Air Force pursuing its organizational interests. China's space force posture demonstrates how a calibrated escalation posture can help states to manage the tension between using non-nuclear strategic weapons to gain strategic leverage in the face of damaging retaliatory attacks for any use of force, even if those retaliatory strikes are not as damaging as a nuclear counter-attack.

The conclusion summarizes the key findings of this dissertation and examines the implications of the theory of strategic substitution for international relations scholarship and for policy-makers. It examines whether the theory of strategic substitution can explain the decisions of other nuclear-armed states to develop non-nuclear force postures and which force postures they select for those weapons, if its scope conditions are relaxed. The theory of strategic substitution may be able to explain how Israel and India maximize strategic leverage in a limited war because they also have retaliatory nuclear force postures. It may even be able to explain the approaches of latent nuclear states like Japan or Iran that cannot use nuclear weapons because of alliance or non-proliferation constraints. States with first-use nuclear postures may, however, take a different approach to maximizing strategic leverage in a limited war because they may rely primarily on nuclear coercion. Nevertheless, they may also complement their threats to use nuclear weapons first with coercive postures for their space, cyber and conventional missile weapons because they would be reluctant to actually use their nuclear weapons to pursue limited war aims. The conclusion also suggests steps to further develop the international relations literature on limited war and nuclear strategy, and the implications of my empirical findings for policy-makers looking to understand China's strategic force postures.

Chapter 1: A Theory of Strategic Substitution

Introduction

How does China maximize its strategic leverage to coerce adversaries in a limited war without using nuclear weapons? Even though China might lose a conventional war to stop Taiwan from achieving independence if the United States intervened to help Taipei, it has pledged not to use its nuclear weapons first in that contingency or any other conflict. Beijing found a third option to deter its adversaries from initiating or compel them to stop fighting a limited war without using nuclear weapons first or matching its adversaries' conventional military power. That third option is to adopt first-use postures for its space and cyber weapons, and conventional missiles. This chapter develops a theory of strategic substitution to explain why China developed these non-nuclear weapons with strategic effects and how it plans to use them as sources of strategic leverage in limited wars.

Given China's pledge not to use nuclear weapons first, examining its post-Cold War strategic posture is one useful way to explore how nuclear-armed states maximize strategic leverage in limited wars. In total wars, some nuclear-armed states have relied on first-use postures for their nuclear weapons to coerce opponents who would otherwise be able to defeat them using conventional military forces. But limited wars that do not threaten the state's survival pose a difficult problem for nuclear-armed states because nuclear weapons are not ideal sources of strategic leverage in such conflicts. Threats to use nuclear weapons are difficult to make credible and raise the risk of a nuclear war. These challenges are even more acute in a limited

war because consequences of nuclear use are disproportionate to the kinds of stakes that limited wars are fought over, such as segments of disputed territory. Even states without a nuclear No First-Use pledge like China might therefore adopt force postures for their non-nuclear weapons to maximize their strategic leverage to coerce adversaries in limited war.

The rest of this chapter unfolds as follows. The first section defines the theory of strategic substitution as a theory of limited war, and the key concept of strategic leverage. The second section describes the dependent variable. It develops a general concept of a strategic weapon that can be applied beyond nuclear weapons and demonstrates that space, cyber and conventional missiles are similar enough to nuclear weapons to substitute for them in a limited war. It outlines the two options available for a state to use its non-nuclear strategic weapons to gain strategic leverage, brinkmanship and calibrated escalation force postures. The third section reviews the relevant international relations literature. The fourth section outlines the theory of strategic substitution. After briefly describing two alternative explanations, emulation of the United States and organization theory, the fifth and final section outlines the qualitative research design used in the empirical chapters of this dissertation.

I. Strategic Leverage in Limited Wars

The theory of strategic substitution outlined in this chapter explains how and why China selected one distinctive solution to the problem of maximizing strategic leverage in limited war. The theory has three key scope conditions. It applies only to a state that (1) faces a limited war as its primary conflict scenario, (2) has inferior conventional military forces compared to

their adversary in that scenario, and (3) a retaliatory nuclear posture. Among nuclear powers, China alone satisfies these three scope conditions. Therefore the theory is a specific to China, although it has implications for other nuclear-armed states. Before explaining why threats to use space, cyber and conventional missile weapons are viable substitutes for nuclear threats in a limited war, it is important to define what a limited war is and how states can use strategic leverage to achieve their objectives in a limited war.

Limited War

A limited war is defined by the political aims that states pursue in them, which are more modest than conquest of an adversary's territory or regime change. In limited wars, states fight over things that they can live without, such as segments of territory, weapons proliferation, or humanitarian principles. Limited wars can be defined in contrast to a total war, in which both parties seek the decisive defeat of one another. Clausewitz described three requirements for a state to decisively defeat an adversary in a total war: the destruction of its military; capture of the city that is the center of its social, professional and political activity; and the defeat of its more powerful allies.[1] States do not seek the decisive defeat of an adversary in a limited war either because their political aims do not require a decisive defeat, or their military forces are not capable of inflicting such a defeat.[2] Nuclear weapons give states the ability to decisively defeat their adversaries, but in doing so they would risk their own decisive defeat if their adversary has the ability to retaliate with nuclear weapons. In the nuclear age, Halperin defined

[1] Carl von Clausewitz, *On War*, ed. Michael Howard and Peter Paret (Princeton, N.J.: Princeton University Press, 1976), 596.
[2] Ibid., 606, 611–12. John J. Mearsheimer, *Conventional Deterrence* (Ithaca, N.Y.: Cornell University Press, 1983), 61.

limited wars as wars in which "the effort of each falls short of the attempt to use all of its power to destroy each other."[3] Limited wars in the nuclear age are therefore most likely to occur because a state's political aims do not require the decisive defeat of an adversary.

The limited goals states pursue in limited wars lead them to impose limits on the geographical scope and intensity of the conflict. For example, in humanitarian interventions in Kosovo in 1999 and Libya in 2011, NATO forces did not deploy ground troops. For the United States and China, the Korean War was fought only on the Korean Peninsula. Limited wars "fought within geographical limits" may be limited to a certain territory or exclude a certain territory that is treated as a sanctuary.[4] These limits are generally tacitly understood between the warring parties.[5] In limited wars, "major powers participate with only a fraction of their mobilizable resources."[6] Historically, a state's limited political aims "directly concerned with seeking a specific piece of territory" were pursued using a limited aims conventional military strategy in which "the attacker seeks to limit contact with the main body of the opposition's forces."[7] Mearsheimer observed that even if states had limited political aims, they rarely selected limited aims military strategies. Modern nation-states are biased towards decisive victories due to both domestic politics and a more strategic concern that an adversary would prolong the war.[8]

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[3] Morton H. Halperin, *Limited War in the Nuclear Age* (New York, N.Y: John Wiley & Sons, Inc, 1963), 2.
[4] Herman Kahn, *On Escalation: Metaphors and Scenarios* (New York, N.Y: Praeger, 1965), 298.
[5] Thomas C. Schelling, *Arms and Influence* (New Haven, C.T.: Yale University Press, 1966), 135. See also Bernard Brodie, *Escalation and the Nuclear Option* (Princeton, N.J.: Princeton University Press, 1966), 103–11.
[6] Fred Charles Iklé, *Every War Must End*, 2nd revised ed. (New York, N.Y: Columbia University Press, 2005), 27.
[7] Mearsheimer, *Conventional Deterrence*, 53.
[8] Ibid., 61.

Strategic Leverage

Strategic leverage is the bargaining leverage that gives a state the ability to change an adversary's calculations about initiating or continuing to fight a war with a threat of violence. States can use strategic leverage to deter or compel an adversary using threats of punishment and/or denial.[9] In limited wars, states want to maximize strategic leverage over an adversary because it offers the state a way to achieve their political aims using threats of violence rather than brute force victories on the battlefield. Coercion allows a state to achieve its aims more quickly and cheaply than brute force because the state can fight either a shorter war or not fight a war at all.[10] That leverage is "strategic" because it affects how an adversary pursues its political aims using a military strategy, rather than affecting its operations or tactics in a war.[11] For a state to succeed in using strategic leverage to achieve its limited war aims, it has to force an adversary to cooperate with it to avoid or end a war.

States gain strategic leverage in a limited war using threats to use brute force or threats of escalation.[12] A state can threaten to achieve its limited war aims by using brute force to win the war within the limits tacitly agreed on by both parties. This type of violent threat is often

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[9] States gain leverage by making threats to use their weapons to hurt an adversary, to punish them for non-compliance with the state's political demands. They can also use their weapons to diminish ("deny") an adversary's ability to fight, such that non-compliance with the state's political demands becomes more difficult. In a study focusing on the effects of using nuclear weapons rather than other weapons to change an adversary's calculations in a crisis or conflict, Betts uses a definition for "nuclear blackmail" that is similarly agnostic as to whether threats are deterrent or compellent in nature. See Richard K. Betts, *Nuclear Blackmail and Nuclear Balance* (Washington, D.C.: Brookings Institution Press, 1987), 6.

[10] Robert A. Pape, *Bombing to Win: Air Power and Coercion in War* (Ithaca, N.Y.: Cornell University Press, 1996), 13, 15; Schelling, *Arms and Influence.*

[11] See Allan R. Millet, Williamson Murray, and Kenneth H. Watman, "The Effectiveness of Military Organizations," *International Security* 11, no. 1 (Summer 1986): 42; Clausewitz, *On War*, 128.

[12] Glenn H. Snyder, *Deterrence and Defense: Towards a Theory of National Security* (Princeton, N.J.: Princeton University Press, 1966), 9.

referred to as "deterrence by denial" or "conventional deterrence,"[13] if it is used to back a deterrent threat. For example, a state can gain strategic leverage over an adversary in a territorial dispute because it has an amphibious landing capability to seize a disputed island if an adversary does not comply with a threat to give up its territorial claims. If a coercive threat backed by a brute force capability fails, the state simultaneously carries out its threat and achieves its political aim.

States can also gain strategic leverage using threats of a second type of violence, to escalate the conflict beyond the limits of the limited war. Kahn described three ways in which states could escalate a limited conflict: to increase the intensity of conflict on the battlefield, widen the geographical scope of the conflict, or by attacking an adversary's allies or homeland. For example, a state can threaten to launch a nuclear missile at an adversary's cities as punishment if it does not evacuate a disputed territory that it has occupied on the other side of the globe. Alternatively, it could use cruise missile strikes to destroy an adversary's ports, which would make it more difficult for the adversary to achieve a military victory in the disputed territory. The same act of violence beyond the battlefield may simultaneously threaten to punish an adversary and deny it a military victory.[14]

To gain strategic leverage over an adversary, a state can use three types of weaponry: conventional military forces, nuclear weapons, and a third option of "non-nuclear strategic weapons." Non-nuclear strategic weapons are space weapons, cyber weapons, and

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[13] Mearsheimer, *Conventional Deterrence*; Jonathan Shimshoni, *Israel and Conventional Deterrence* (Ithaca, N.Y.: Cornell University Press, 1988); Snyder, *Deterrence and Defense*, 9.
[14] Robert Jervis, *The Meaning of the Nuclear Revolution Statecraft and the Prospect of Armageddon* (Ithaca, N.Y.: Cornell University Press, 1989), 8–13.

conventional missile weapons. Scholars have pointed out that, in general, conventional ground, naval and air forces that are able to destroy an enemy's equivalent military forces are the best weaponry for threatening to use brute force violence, if an adversary ignores a coercive demand. Nuclear weapons are poor sources of brute force leverage because they not well-suited to taking and holding territory, and may inflict a lot of collateral damage if used to destroy adversary's military forces in the theater of conflict.[15] By contrast, nuclear weapons are particularly well-suited gaining strategic leverage through threats of escalation. Conventional air forces and navies can also be used to gain leverage through threats of escalation, if a state threatens strategic bombing or naval blockade of an adversary's homeland. Although non-nuclear strategic weapons share characteristics with both nuclear and conventional weapons, they are similar to nuclear weapons in ways that also make them well-suited to gaining strategic leverage in a limited war through threats of escalation.

II. Dependent Variable

The dependent variable of the theory of strategic substitution is China's force posture for each individual type of non-nuclear strategic weapon: its space force posture, its cyber force posture, and its conventional missile posture. A force posture is how a state plans to use its weapons in a conflict, together with the capabilities, command and control arrangements, and signals it sends to its adversary in order to realize those plans. Force postures have coercive effects in peacetime because they affect an adversary's calculations about taking actions that could trigger a crisis or conflict in the first place.[16] A force posture may also give a state strategic

[15] Snyder, *Deterrence and Defense*, 9.
[16] Vipin Narang, *Nuclear Strategy in the Modern Era* (Princeton, N.J.: Princeton University Press, 2014), 18–19.

leverage in a crisis or conflict even if it does not issue specific threats that link political demands to the use of its weapons. To establish these three types of weapons can substitute for nuclear weapons as sources for strategic leverage, I define these three types of weapons, develop a general concept of a strategic weapon, and outline a typology of coercive force postures for non-nuclear strategic weapons.

Defining Space, Cyber and Conventional Missile Weapons

While the definition of a conventional missile is relatively straightforward, defining a space or cyber weapon requires more explanation. I define a conventional missile as any cruise or ballistic missile that delivers a conventional explosive, rather than a nuclear warhead. I define a "cyber attack" as any action a state takes to disrupt or destroy the regular functions of another state's computer networks. "Cyber weapons" are the tools that states use to carry out those attacks.[17] A cyber attack does not include intruding into ("hacking" or "exploiting") another state's computer networks for the purpose of gathering intelligence, or to "prepare the battlefield" for a future attack. A cyber weapon may involve implanting malicious lines of computer code into an adversary's computer system to stop it from working, changing information on that system, erasing information, and "denial of service" attacks that involve flooding a website with too many requests for it to answer all of them, causing the site to crash. While cyber intrusions do not do violence to a target's computer networks, they may

[17] Using the common terms of computer network attack (CNA) and computer network exploitation (CNE), this dissertation is concerned only with the conditions under which states plan to conduct CNA. Many definitions of "cyber attack" include stealing information via cyber intrusions. I exclude data theft from my definition of a cyber attack. "Cyber Definitions," NATO Cooperative Cyber Defence Centre of Excellence, May 26, 2014, https://www.ccdcoe.org/cyber-definitions.

sometimes have a coercive effect on an adversary if they are mistaken for a prelude to an attack. Some cyber attacks require a state to intrude into an adversary's computer networks before attacking. States who are the targets of cyber intrusions cannot judge whether the purpose of that intrusion is to establish a "beachhead" for a future attack, or for intelligence gathering.[18]

A space attack is any action a state takes to disrupt or destroy another state's ability to use outer space. Space weapons include weapons that directly affect space assets such as jammers, missiles, lasers, microwaves, electromagnetic pulse weapons, or objects used to collide with an adversary's satellites or other assets in space. Space weapons also include weapons that affect data links between space and earth, such as jammers or cyber weapons used to interfere with communications between satellites and ground stations. Finally, space weapons can also be used to carry out kinetic or non-kinetic attacks from earth on an adversary's terrestrial space infrastructure, such as bombing a space launch facility or satellite tracking station.[19]

Defining a Strategic Weapon

Space, cyber and conventional missile weapons are "strategic" weapons because have many of the same characteristics that make nuclear weapons ideal for gaining strategic leverage through threats of escalation. Nuclear weapons have four characteristics that distinguish them from conventional weapons and make them ideal strategic weapons: range, destructiveness,

[18] Ben Buchanan, *The Cybersecurity Dilemma: Hacking, Trust and Fear Between Nations* (New York, N.Y: Oxford University Press, 2017).
[19] This is a relatively expansive definition, compared to some definitions of a "space weapon" defined in legal proposals to ban space weapons. See James Clay Moltz, *Crowded Orbits: Conflict and Cooperation in Space* (New York, N.Y: Columbia University Press, 2014), 125.

efficiency, and the difficulty of defending against a nuclear attack. I use these characteristics to develop a general concept of a strategic weapon. That concept can be used to identify other weapons that are well-suited to escalate a limited conflict to gain strategic leverage against an adversary. Those weapons may be used as substitutes for nuclear weapons in limited wars.

Nuclear threats can directly affect the choices of an enemy's decision-makers, independent of the war effort, because of their range, destructiveness, efficiency, and the difficulty of defense of nuclear weapons. First, nuclear weapons can be delivered quickly to any part of the globe.[20] Conventional armored divisions, aircraft and ships may take a long time to cover the distances to bring an adversary's homeland into striking range, especially if oceans or mountains stand between two adversaries. [21] Second, the most destructive nuclear weapons can cause unparalleled destruction on an adversary. Third, nuclear weapons are very efficient tools of destruction. A single nuclear weapon could destroy an adversary's city or military capabilities extremely quickly.[22] A state would need to deliver many more conventional munitions over a longer period of time to have the same effect on a target as a nuclear weapon.[23] Fourth, it is extremely difficult for a state to defend against an incoming nuclear attack because of the speed of delivery and rapid effects of a nuclear weapon, especially if it is delivered by a ballistic missile.[24] For this reason, nuclear weapons are offense-dominant weapons.[25] Missile defenses

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[20] Bernard Brodie, ed., *The Absolute Weapon: Atomic Power and World Order* (New York, N.Y: Harcourt, Brace and Company, 1946), 39.
[21] John J. Mearsheimer, *The Tragedy of Great Power Politics* (New York, N.Y: W. W. Norton and Company, 2001).
[22] Brodie, *The Absolute Weapon*, 24–27.
[23] For a discussion of these differences between conventional and nuclear weapons, see Shimshoni, *Israel and Conventional Deterrence*, 5–33.
[24] Brodie, *The Absolute Weapon*, 28–29.
[25] Charles L. Glaser, *Analyzing Strategic Nuclear Policy* (Princeton, N.J.: Princeton University Press, 1990), 363; Jervis, *The Meaning of the Nuclear Revolution*, ch.1; Stephen Van Evera, *Causes of War* (Ithaca, N.Y.: Cornell University Press, 1999).

are expensive and imperfect. Some strategists argued that anything short of perfect is insufficient for defending against a city-busting nuclear missile.[26] As states have no effective defenses against nuclear weapons, when two adversaries both possess a nuclear arsenal that could survive the other's attempt at a disarming first strike, they are mutually vulnerable to one another's nuclear weapons. By contrast, states have some hope of shooting down planes with air defenses, sinking ships with artillery along its coast, and stopping an invading army with fortifications.

Space, cyber and conventional missile weapons are also strategic weapons because they share the characteristics of range and difficulty of defense with nuclear weapons. To differing degrees, they also share the destructiveness and efficiency characteristics. Geography is not an impediment to the delivery of strategic space, cyber, conventional missile weapons. The speed with which a cyber weapon disrupts an adversary system, once the command is given to activate a "payload" of malicious code, is even shorter than the fifteen to thirty minutes of flight of an intercontinental ballistic missile. Anti-satellite (ASAT) weapons could destroy satellites in low earth orbit within 30 minutes. Space, cyber and conventional missile weapons are hard to defend against and have been characterized as offense-dominant. It is impossible to completely and confidently defend a computer system against a persistent, well-resourced hacker.[27] Missile defenses exist but are both expensive and imperfect. Satellites are almost

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[26] See Glaser, *Analyzing Strategic Nuclear Policy*, 32–35.

[27] There is some debate as to whether cyber weapons are offense-dominant in the existing literature. See David C. Gompert and Martin Libicki, "Cyber Warfare and Sino-American Crisis Instability," *Survival* 56, no. 4 (September 2014): 14–15; David C. Gompert and Phillip C. Saunders, *The Paradox of Power: Sino-American Strategic Restraint in an Age of Vulnerability* (Washington, D.C.: National Defense University Press, 2011), 7; Erik Gartzke, "The Myth of Cyberwar: Bringing War in Cyberspace Back Down to Earth," *International Security* 38, no. 2 (Fall 2013): 41–73, 27–29; Martin Libicki, *Cyberdeterrence and Cyberwar* (Santa Monica, C.A.: RAND Corporation, 2009), 32–33; Joseph S. Nye Jr., "Nuclear Lessons for Cyber Security?," *Strategic Studies Quarterly* 5, no. 4 (Winter 2011): 18–38; Ilai Saltzman, "Cyber Posturing and the Offense-Defense Balance," *Contemporary*

impossible to defend against a missile-based ASAT weapon, especially if they are situated in the orbits closest to earth.[28] States armed with space, cyber and conventional missile weapons are unlikely to be able to escape mutual vulnerability with a similarly-armed adversary.[29]

Space, cyber and conventional missile weapons can all have large-scale disruptive and destructive effects on an adversary's military or society, but these non-nuclear strategic weapons are not as destructive or efficient as nuclear weapons. A worst-case scenario cyber attack could very efficiently disrupt a society by disabling its critical infrastructure, but the attack would not directly cause loss-of-life. Furthermore, the disruption could be difficult to sustain. The operators of the victim computer systems may be able to remove the malware creating the disruption or fix the software vulnerability through which it was delivered. A conventional missile attack could cause loss-of-life, but not of the same magnitude as a nuclear missile attack because conventional warheads are not as efficient as nuclear weapons. A few ASAT weapons could very efficiently create enough space debris to destroy an orbit in outer space. Those attacks would disrupt militaries and even societies that rely on space for important functions such as communications and navigation, but once again, a worst-case scenario space attack may not directly cause loss-of-life.

Security Policy 34, no. 1 (2013): 40–63; Rebecca Slayton, "What Is the Cyber Offense-Defense Balance? Conceptions, Causes, and Assessment," *International Security* 41, no. 3 (January 1, 2017): 72–109.

[28] Ashton B. Carter, "Satellites and Anti-Satellites: The Limits of the Possible," *International Security* 10, no. 4 (1986): 81; Bruce M. DeBlois et al., "Space Weapons: Crossing the U.S. Rubicon," *International Security* 29, no. 2 (Fall 2004): 62, 83.

[29] The standards for "effective" defenses against these weapons could be lower than the standard of perfection demanded by some strategists for nuclear weapons because strategic space, cyber and conventional missile weapons are less destructive than nuclear weapons. Nevertheless, they are unlikely to allow a state to escape mutual vulnerability.

Strategic bombing campaigns that use conventional aircraft to attack an adversary's cities and naval blockade campaigns to strangle an adversary's economy do not fall within the definition of "strategic weapons" because they lack the characteristics of efficiency, range and difficulty of defending. These campaigns take time to inflict destruction and are therefore not efficient. Geography has an important impact on their success, including the distance to an adversary's territory, its access to oceans and vulnerability to maritime chokepoints. An adversary's ships and submarines can be sunk and its aircraft shot down to defend against those campaigns.[30] The characteristics of strategic weapons and these conventional campaigns are represented in the table below.

Characteristic	Nuclear Weapons	Space Weapons	Cyber Weapons	Conventional Missiles	*Strategic Bombing*	*Naval Blockade*
Range	X	X	X	X		
Destruction	X			X	*X*	*X*
Efficiency	X	X	X			
Difficulty of Defending	X	X	X	X		

Table 1: Characteristics of Strategic Weapons

Despite the similarities outlined above, there is an important difference between nuclear and non-nuclear strategic weapons: states are very unlikely to adopt a purely retaliatory posture for their strategic space, cyber or conventional missile weapons because those weapons are inextricably linked with conventional military operations. In addition to the "strategic" space, cyber and conventional missile weapons that share characteristics with nuclear weapons, states

[30] See Pape, *Bombing to Win*; Bruce A. Elleman and S.C.M Paine, "Conclusions: Naval Blockades and the Future of Seapower," in *Naval Blockades and Seapower: Strategies and Counter-Strategies, 1805-2005*, ed. Bruce A. Elleman and S.C.M Paine (New York, N.Y: Routledge, 2006), 250–66.

may also have "tactical" space, cyber and conventional missile weapons with shorter ranges and/or less intense effects. Examples include satellite jammers, cyber attacks used to send false information to a warship's automated navigation system, and cruise missiles used to destroy enemy positions. Further, satellites and computer networks are key enablers of modern combat and therefore irresistible targets for militaries to gain battlefield advantages over their adversaries using tactical space and cyber weapons. These systems collect and distribute large amounts of information, ranging from weather conditions to enemy positions, that allow militaries to fight more effectively.

At present, there is no evidence that any state has adopted a retaliatory posture for its strategic space, cyber or conventional missile weapons. This is likely because they would not be able to make a second-use posture for their strategic space, cyber and conventional missile weapons credible to an adversary. States cannot decouple their conventional military operations and postures for space, cyber and conventional weapons without severely undermining a conventional warfighting force. For a state to signal that it only intended to use strategic space, cyber or conventional missile weapons for retaliation, it would have to foreswear the use of tactical space, cyber and conventional missile weapons. Any use of tactical space, cyber or conventional missiles weapon could otherwise be taken as a prelude to the use of the same type of strategic weapon.[31] States faced a similar dilemma if they planned to use tactical nuclear weapons to defend their borders against an armored invasion. But states could more easily substitute tactical nuclear weapons with conventional weapons than they could substitute

[31] Cyber and space war games suggest that there is a chain reaction that links tactical weapons use to strategic weapons use, which influences decision-makers' willingness to use tactical space and cyber weapons. See Jacquelyn Schneider, "Cyber and Crisis Escalation: Insights from Wargaming" (Working Paper, United States Naval War College, March 2017), 17; DeBlois et al., "Space Weapons," 66.

tactical space, cyber and conventional missile weapons with conventional alternatives.[32] For example, trying to destroy a large number of adversary battlefield satellite communications terminals with an artillery shells would be a poor substitute for jamming a single satellite's data links.

A Typology of Non-Nuclear Strategic Force Postures

To use space, cyber or conventional missile weapons to maximize strategic leverage against an adversary, states can select different force postures that manipulate the risk that it will use its most damaging weapons. These force postures give a state leverage over its adversary even if both countries are mutually vulnerable to each other's space, cyber and conventional missile attacks.[33] By increasing the likelihood of the worst-case scenario in which both states use their most destructive weapons to attack each other, a state can make credible threats of escalation even if it is vulnerable to an adversary's retaliation. States can choose between two variants of a first-use coercive posture, brinkmanship and calibrated escalation. A brinkmanship posture manipulates that risk a lot by triggering rapid "explosive" escalation to the worst-case scenario that neither side can control. A calibrated escalation posture only manipulates that risk a little bit by initiating a process of escalation that both sides can control.[34] A state may, however, not select a force posture until it has tested its non-nuclear strategic weapons or deployed them to military units. In other words, states may decide to pursue a strategic weapons capability

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[32] Stephen Biddle, "Can Conventional Forces Substitute?" in *Battlefield Nuclear Weapons: Issues and Options*, ed. Stephen Biddle and Peter D. Feaver (Cambridge, M.A.: Center for Science and International Affairs, Harvard University, 1989), 67–93.
[33] Schelling, *Arms and Influence*, 99.
[34] Jervis, *The Meaning of the Nuclear Revolution*, 82–95; Robert Powell, "The Theoretical Foundations of Strategic Nuclear Deterrence," *Political Science Quarterly* 100, no. 1 (Spring 1985): 76.

without deciding which force posture to adopt.[35] If a state decides to pursue a coercive capability, it will develop and test weapons, research doctrine, and establish military units to test and experiment with those weapons, with an intent to adopt a force posture in the foreseeable future.[36]

The dependent variable can take three values: no posture, a brinkmanship posture, or a calibrated escalation posture. The four components of a state's force posture, its doctrine, capabilities, command and control arrangements, and transparency, can be used to determine which of these different postures a state has selected for its space, cyber or conventional missile weapons. The value of the dependent variable is "no posture" if a state either has no deployed strategic space, cyber or conventional missile weapons or does not posture them for coercion. It may nevertheless have tactical space, cyber or conventional missile weapons as part of its conventional military capabilities to fight wars.

A state with a brinkmanship posture tries to make its adversary as fearful as possible that the worst-case scenario will occur. A brinkmanship posture involves the use of either tactical weapons or strategic weapons on any scale in a crisis or at the outset of a conflict to initiate a process of uncontrolled escalation.[37] The state anticipates that the fear of uncontrolled

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[35] Narang, *Nuclear Strategy in the Modern Era*, 28.

[36] This definition includes the equivalent steps for non-nuclear weapons of both pursuing and acquiring a nuclear weapons capability in the nuclear proliferation literature. That literature distinguishes pursuit, the political decision to develop a weapons capability, and acquisition the successful testing of a nuclear weapon. See Sonali Singh and Christopher R. Way, "The Correlates of Nuclear Proliferation: A Quantitative Test," *Journal of Conflict Resolution* 48, no. 6 (December 2004): 866.

[37] Escalation may even spill over into the nuclear domain. For example, cyber weapons could threaten nuclear command and control networks, space-based surveillance could improve a state's ability to find and track an adversary's mobile missiles (at great expense) and support more effective missile defenses, while conventional missiles could be used to destroy a state's nuclear weapons without crossing the nuclear threshold. See Erik Gartzke and Jon R. Lindsay, "Thermonuclear Cyberwar," *Journal of Cybersecurity* 3, no. 1 (March 1, 2017): 37–

escalation will force its adversary to take the "last clear chance to avoid disaster," to use Thomas Schelling's expression, by acquiescing to the state's political demand not to initiate or continue fighting a limited war.[38] If an adversary ignores those state's demands, the state uses its weapons to trigger uncontrolled escalation. The metaphor commonly associated with a brinkmanship posture is descending a "slippery slope" to the worst-case scenario.

To make a brinkmanship posture credible, a state must signal to an adversary, using the four components of its force posture, that it may not be willing or able to stop space, cyber or conventional missile conflict from escalating. Both states may therefore use their strategic weapons on a massive scale, if the adversary ignores its political demand. Pakistan's "asymmetric escalation" nuclear posture after 1998 is a good example of a brinkmanship posture. Pakistan delegates authority to battlefield commanders to use tactical nuclear weapons early in a conventional war with India.[39]

A state with a calibrated escalation posture tries to make clear to an adversary that it wants to avoid the worst-case scenario, but it is prepared to make that scenario more likely to get what it wants. A calibrated escalation posture involves the limited first-use of a space, cyber or conventional missile weapon.[40] If the adversary refuses to acquiesce to the state's political demands, it carries out a tactical space, cyber and conventional missile attack, or a low-intensity, small-scale strategic attack. For example, it could use a laser beam to burn a small,

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48; Charles L. Glaser and Steve Fetter, "Should the United States Reject MAD? Damage Limitation and U.S. Nuclear Strategy toward China," *International Security* 41, no. 1 (July 1, 2016): 49–98; James M. Acton, *Silver Bullet? Asking the Right Questions About Conventional Prompt Global Strike* (Washington, D.C.: Carnegie Endowment for International Peace, 2013).

[38] Schelling, *Arms and Influence*, 118.

[39] Narang, *Nuclear Strategy in the Modern Era*, ch. 3.

[40] Kahn, *On Escalation: Metaphors and Scenarios*, 9–10.

permanent spot in the optical sensor of an imaging satellite or disrupt electricity services in an urban center for a couple of hours using a cyber attack, as Russia did in Ukraine in late 2015.[41] The state anticipates that an adversary will respond with a proportionate, retaliatory attack, or capitulate. The state calibrates the intensity of any further attacks to the intensity of an adversary's counter-attacks and how much it values the political issue at stake. Through a process of controlled coercive bargaining, the two states discover who values the political issue at stake more and is therefore willing to suffer more damage to prevail in the limited conflict. The metaphor commonly associated with this controlled approach to coercion and escalation is ascending rungs on a ladder.

A state uses the four components of its force posture to demonstrate to an adversary that it can control escalation by withholding its most destructive space, cyber or conventional missile weapons until late in a conflict. NATO's concept of a "flexible response" conventional and nuclear posture during the 1960s is an example of a calibrated escalation nuclear posture. That posture would have involved nuclear strikes of varying intensity, depending on the scale of a NATO-Warsaw Pact conflict.[42]

A space, cyber or conventional missile calibrated escalation posture may fail catastrophically in a conflict, as many strategists worried a nuclear calibrated escalation posture would fail if put to the test.[43] Low-intensity attacks using non-nuclear strategic weapons may provoke an

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[41] Kim Zetter, "Inside the Cunning, Unprecedented Hack of Ukraine's Power Grid," WIRED, March 3, 2016, https://www.wired.com/2016/03/inside-cunning-unprecedented-hack-ukraines-power-grid/.
[42] Francis J. Gavin, *Nuclear Statecraft: History and Strategy in America's Atomic Age* (Ithaca, N.Y.: Cornell University Press, 2012), ch. 2. Gavin argues that the Kennedy and Johnston administrations never fully committed to or implemented the strategy.
[43] See section on existing literature below.

adversary to retaliate with much more destructive attacks because it may not be possible for a state to persuade an adversary of one's restraint, especially once a conflict breaks out. Nevertheless, there are good conceptual reasons, outlined in the theory section below, to be more expect that escalation from tactical space, cyber or conventional missile attacks can be more easily controlled than escalation from tactical nuclear attacks.

III. Existing Theories of the Role of Strategic Weapons in Limited Wars

Existing international relations theory does not explain why and how China or any other nuclear-armed state gains strategic leverage in limited wars without using nuclear weapons. This dissertation begins to fill this gap in the literature by explaining why and how China has used non-nuclear strategic weapons to substitute for nuclear weapons to gain strategic leverage in limited wars. But there are no adequate theoretical explanations for why or how states use space, cyber and conventional missiles to gain strategic leverage in the existing literature to support this argument. The nuclear strategy literature examining the effectiveness of using nuclear threats for leverage also does not specifically address the limited war scenario. The nuclear literature does, however, identify the challenges that states face in using their nuclear weapons for coercive leverage. Those challenges offer insights into when and why states might substitute nuclear threats with threats to use non-nuclear strategic weapons to achieve their limited war aims.

Strategic Leverage from Non-Nuclear Weapons

There is very little existing literature explaining why or how states use their space, cyber and conventional missile weapons for compellence or deterrence. The existing literature treats space, cyber and conventional missiles as supporting capabilities for conventional military operations rather than as independent rungs on an escalation ladder. The possibility that states could use space weaponry to gain strategic leverage is not recognized. Space weapons are one tool states can use to disrupt an adversary's space-based support systems for conventional or nuclear operations.[44] Most scholarship treats conventional missiles as part of a state's overall conventional military capabilities.[45] But some scholars have acknowledged that conventional missile strikes could be a source of strategic leverage in their own right, as a "form of coercive strategic bombardment" similar to strategic bombing.[46]

Two debates in the existing cybersecurity literature are relevant to the question of why and how states can use cyber weapons for strategic leverage, but they do not provide an adequate

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[44] See, for example, Stephen Biddle and Ivan Oelrich, "Future Warfare in the Western Pacific: Chinese Antiaccess/Area Denial, U.S. AirSea Battle, and Command of the Commons in East Asia," *International Security* 41, no. 1 (July 1, 2016): 7–48; Carter, "Satellites and Anti-Satellites"; Ashton B. Carter, "Assessing Command System Vulnerability," in *Managing Nuclear Operations*, ed. Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket (Washington, D.C.: Brookings Institution Press, 1987), 555–610; Owen R. Coté Jr., "Assessing the Undersea Balance Between the U.S. and China," SSP Working Paper (Cambridge, M.A.: Security Studies Program, Massachusetts Institute of Technology, February 2011); Moltz, *Crowded Orbits: Conflict and Cooperation in Space*; Paul B. Stares, *The Militarization of Space: U.S. Policy, 1945-1984* (Ithaca, N.Y.: Cornell University Press, 1985).

[45] Mearsheimer, *Conventional Deterrence*; Evan Braden Montgomery, "Contested Primacy in the Western Pacific: China's Rise and the Future of U.S. Power Projection," *International Security* 38, no. 4 (Spring 2014): 115–49. Biddle and Oerlich note that China can use conventional missiles as part of a suite of capabilities to deny an adversary access to its littorals. Biddle and Oelrich, "Future Warfare in the Western Pacific," 14.

[46] Biddle and Oelrich, "Future Warfare in the Western Pacific," 14. See also Chase and Erickson, "The Conventional Missile Capabilities of China's Second Artillery Force,"; Joshua R. Itzkowitz Shifrinson and Miranda Priebe, "A Crude Threat: The Limits of an Iranian Missile Campaign against Saudi Arabian Oil," *International Security* 36, no. 1 (July 1, 2011): 199; Ray Takeyh, "The Iran-Iraq War: A Reassessment," *The Middle East Journal* 64, no. 3 (September 2, 2010): 380.

answer to that question. The first debate concerns whether cyber weapons can be used for coercion at all. Cyber coercion skeptics argue that the characteristics of cyber weapons make them poor coercive tools for three reasons. First, it is difficult for a state to demonstrate its cyber capabilities to an adversary.[47] Cyber weapons are tailored to their targets and frequently depend on an intrusion into another state's computer systems without its knowledge. A cyber weapon cannot be observed like a missile and would look different depending on the target system. The state cannot inform its adversary of what computer system it intends to attack and how much disruption it could cause without revealing how it was able to intrude into the adversary's network. With that knowledge, the target state could fix the vulnerability and cut off the attacker's access to the target computer system, effectively disarming the attacker. Second, attackers cannot accurately estimate the effects of their attacks because computer networks are so complex.[48] Policymakers will be reluctant to order cyber attacks or retaliatory strikes because they cannot anticipate the effects of the attack.[49] Third, it is difficult to attribute a cyber attack to a perpetrator that has tried to conceal its responsibility for an attack.[50] A decision-maker may not have confidence against whom to retaliate, given the variety of state and non-state actors capable of conducting cyber attacks. Rather than risk retaliating against the wrong state and escalating the conflict, decision-makers may choose not to retaliate at all.[51]

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[47] Gartzke, "The Myth of Cyberwar," 43; Brandon Valeriano and Ryan Maness, *Cyber War Versus Cyber Realities: Cyber Conflict in the International Relations System* (New York, N.Y: Oxford University Press, 2015), 58–60.
[48] Joseph S. Nye Jr., "Deterrence and Dissuasion in Cyberspace," *International Security* 41, no. 3 (Winter 2016): 44–71, 69.
[49] Libicki, *Cyberdeterrence and Cyberwar*, 398–99; Erica D. Borghard and Shawn W. Lonergan, "The Logic of Coercion in Cyberspace," *Security Studies* 26, no. 3 (2017): 452–81, 478; Valeriano and Maness, *Cyber War Versus Cyber Realities*, 63.
[50] Of course, states may claim responsibility for cyber attacks after the fact to coerce an adversary. Michael Pozansky and Evan Perkoski, "Rethinking Secrecy in Cyberspace: The Politics of Voluntary Attribution" (International Studies Association Annual Conference, San Francisco, C.A., 2018).
[51] Libicki, *Cyberdeterrence and Cyberwar*, 52–54.

Cyber coercion optimists argue that these obstacles are surmountable. First, states have been able to demonstrate their cyber attack abilities without indicating which specific computer networks they plan to attack. For example, U.S. intelligence officials have caught foreign hackers intruding into computer systems controlling the electricity grid and have concluded that U.S. critical infrastructure is vulnerable to foreign state attacks. Foreign countries have used the U.S.-Israeli Stuxnet operation to disrupt the Iranian Natanz nuclear facility in 2012 as an indicator of the sophistication of U.S. and Israeli cyber weapons.[52] States have also released cyber military strategy documents and publicized training exercises, which provide general insights into their capabilities and the goals of their cyber military capabilities.[53] Second, states have made significant investments in their cyber offensive capabilities and battle damage assessment techniques in the past decade to ensure the precision and effectiveness of cyber attacks.[54] As the former head of the U.S. National Security Agency's (NSA) hacking division remarked, "We put the time in ... to know [a network] better than the people who designed it and the people who are securing it."[55]

Third and finally, attributing cyber attacks is by no means impossible even if attackers do take steps to conceal their identity.[56] The United States has publicly attributed cyber intrusions in

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[52] Martin C. Libicki, *Brandishing Cyberattack Capabilities* (Santa Monica, C.A.: RAND Corporation, 2013).
[53] Borghard and Lonergan, "The Logic of Coercion in Cyberspace," 465.
[54] See, for example, Linsday's discussion of the careful development, planning, and testing of the Stuxnet attack. Jon R. Lindsay, "Stuxnet and the Limits of Cyber Warfare," *Security Studies* 22, no. 3 (2013): 365–404. A recent expert report making recommendations for U.S. cyber strategy also imply that the effects of cyber attacks can be accurately assessed ex ante. Defense Science Board, "Task Force on Cyber Deterrence" (Washington, D.C.: Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, February 2017), 7.
[55] Kim Zetter, "NSA Hacker Chief Explains How to Keep Him Out of Your System," WIRED, January 28, 2016, https://www.wired.com/2016/01/nsa-hacker-chief-explains-how-to-keep-him-out-of-your-system/.
[56] Thomas Rid and Ben Buchanan, "Attributing Cyber Attacks," *Journal of Strategic Studies* 38, no. 1–2 (2015): 4–37; Herbert Lin, "Attribution of Malicious Cyber Incidents: From Soup to Nuts," Aegis Paper Series (Hoover Institution, Stanford University, 2016); Nye, "Deterrence and Dissuasion in Cyberspace," 52, 69.

peacetime and the private cybersecurity sector has developed industry standards for identifying the "signatures" of certain state-based cyber espionage units.[57] Technical attribution of cyber attacks is therefore more of a cat-and-mouse game than an outright technological impossibility.[58] Further, the political context in which a cyber attack takes place, such as cyber attacks carried out on Ukrainian targets during the Russia-Ukraine conflict, can simplify the challenge of attribution.[59] The target of that attack, and attacks of certain types and sophistication, also rule out all but the most capable state actors. For example, the Chinese government is the only actor that had the motive and tools to borrow from China's "Great Firewall" internet filtering infrastructure to conduct a massive denial of service attack on the U.S. company GitHub, which hosted tools for averting Chinese internet filtering on its servers.[60]

Some scholars who argue that cyber coercion is possible nevertheless question whether states can manipulate the risk of "strategic" cyber attacks on an adversary's military and civilian critical infrastructure to gain strategic leverage, which is a key premise of both brinkmanship and calibrated escalation postures. Borghard and Lonergan argue that strategic cyber attacks are not costly enough in their own right to change an adversary's calculations.[61] They also question whether it is feasible to control cyber escalation, a key premise of a calibrated

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[57] Andrei Soldatov and Irina Borogan, *The Red Web: The Kremlin's War on the Internet* (New York, N.Y: Hachette, 2015), 322–23; Borghard and Lonergan, "The Logic of Coercion in Cyberspace," 458.
[58] Lin, "Attribution of Malicious Cyber Incidents: From Soup to Nuts," 44–46.
[59] Rid and Buchanan, "Attributing Cyber Attacks," 23. Chinese experts had no hesitation attributing Russian attacks on Ukraine to the Russian state, despite China's official claims that attribution in cyberspace is extremely difficult. See Ban Wentao, "Wukelan Weiji Zhong E-Wu Wangluo Zuozhan Xingdong Tedian [Characteristics of Russian and Ukrainian Actions in Cyberspace during the Ukraine Crisis]," *Waiguo Junshi Xueshu [Foreign Military Arts]* 11 (2015): 46–48.
[60] Bill Marczak et al., "China's Great Cannon," Research Brief (The Citizen Lab: University of Toronto, April 2015), https://citizenlab.org/wp-content/uploads/2009/10/ChinasGreatCannon.pdf.
[61] Borghard and Lonergan, "The Logic of Coercion in Cyberspace," 477–78.

escalation posture.[62] Borghard and Lonergan assume that cyber coercion must reach the same standard of destruction as nuclear or conventional weapons to be effective. But a state may not need to threaten a nuclear-equivalent level of damage if it is hoping to change its adversary's calculations about fighting a limited war over non-survival stakes. In fact, states may view the lower costs that they can threaten to impose on an adversary with cyber weapons and other non-nuclear strategic weapons as an advantage, compared to nuclear weapons.

The second debate in the cyber literature concerns what kinds of states gain the most leverage from cyber weapons. Some scholars argue that technologically and militarily "weaker" states can use cyber weapons more effectively for coercion and warfighting than stronger states, while others argue the inverse. In reality, both weak and strong states can gain strategic leverage or battlefield advantages from cyber attacks. Technologically advanced, liberal economies, which generally also have strong conventional military forces, may be particularly vulnerable to cyber attacks. The United States has unique difficulties in defending itself from cyber attacks because a large proportion of its critical infrastructure is privately-owned and companies tend to shirk responsibility for defending themselves.[63] Other scholars point out, however, that states need more than just a computer and a talented hacker to use cyber weapons to their advantage. Cyber weapons can be expensive and very complex, as Lindsay demonstrates by analyzing the Stuxnet attack on Iranian nuclear facilities.[64] Further, more valuable computer networks are likely to be better defended, making "nuisance" cyber attacks

[62] Ibid., 478.
[63] Defense Science Board, "Task Force on Cyber Deterrence," 7; Kello, "The Meaning of the Cyber Revolution," 29; Nye, "Deterrence and Dissuasion in Cyberspace," 57.
[64] Lindsay, "Stuxnet and the Limits of Cyber Warfare."

easy but truly disruptive cyber attacks hard and expensive.[65] Similarly, in their warfighting applications, cyber attacks may favor the state with superior military capabilities or joint warfighting capacity.[66] For example, if a state temporarily suppresses an adversary's air defenses using cyber attacks, the state only gains a military advantage from that attack if it can then fly fighter aircraft undetected into the adversary's airspace.[67]

Given the lack of literature examining space, cyber and conventional missile weapons as sources of strategic leverage independent of military operations, it is not surprising that there is also very little literature examining whether states can use those weapons as substitutes for nuclear threats. A nascent literature on "cross-domain deterrence" recognizes that rational states can select from the variety of technologies, including space, cyber and nuclear weapons, conventional missiles, and unmanned aerial vehicles, to use their comparative advantages to optimally deter an adversary.[68] But that literature does not identify which of those weapons could be used interchangeably with nuclear weapons as sources of strategic leverage. Nor does it explain why states might prefer to use those non-nuclear weapons to gain strategic leverage, rather than relying on their nuclear weapons, and in what circumstances.

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[65] Libicki, *Cyberdeterrence and Cyberwar*; Jon R. Lindsay, "Tipping the Scales: The Attribution Problem and the Feasibility of Deterrence against Cyberattack," *Journal of Cybersecurity* 1, no. 1 (2015): 53–67.
[66] Nadiya Kostyuk and Yuri M. Zhukov, "Invisible Digital Front: Can Cyber Attacks Shape Battlefield Events?" *Journal of Conflict Resolution*, November 10, 2017.
[67] Gartzke, "The Myth of Cyberwar."
[68] Erik Gartzke and Jon R. Lindsay, "Cross-Domain Deterrence: Strategy in an Era of Complexity," Working Paper, July 15, 2014, https://quote.ucsd.edu/deterrence/files/2014/12/EGLindsay_CDDOverview_20140715.pdf, 3.

Motivations for Strategic Substitution

The nuclear strategy literature offers insights into both why states might prefer to use non-nuclear threats to coerce an adversary, and in what circumstances. That literature identifies two challenges that states face in using nuclear threats to maximize strategic leverage: making those threats credible to a nuclear-armed adversary and the increased risk of nuclear escalation once nuclear threats are issued. There is consensus in the literature that threats to use nuclear weapons are credible and effective to deter threats to a state's survival from a conventional invasion or a nuclear attack.[69] But when a state's survival is not threatened, there is no scholarly consensus as to whether and when nuclear threats are credible and effective. In those circumstances, states have to accept a risk that their efforts at nuclear coercion for non-survival interests may either fail or trigger a nuclear war. To avoid these risks, states may look to non-nuclear strategic weapons to maximize their strategic leverage against an adversary to deter the outbreak or compel an end to a limited war.

The scholarly debate over the effectiveness of nuclear compellence illustrates the challenge states face in making nuclear threats credible in conflicts that do not threaten their survival. It is possible that making nuclear threats to pursue desirable but non-essential political goals are too costly to be credible. But it is equally possible nuclear superiority gives states strategic leverage to pursue non-survival political interests. Sechser and Fuhrmann argue that nuclear compellence is not credible and tends to fail for three reasons. First, nuclear weapons would destroy the very territory a state might seek to gain using compellent threats. Besides, states

[69] Jervis, *The Meaning of the Nuclear Revolution*; Narang, *Nuclear Strategy in the Modern Era.*

can often achieve the same aims using their conventional weapons. Second, nuclear compellence is costly for the coercer. An adversary could retaliate militarily, including with nuclear weapons, and the compeller may suffer international reputational costs for making nuclear threats. Third, compellers already live without the political aim they seek to achieve, while an adversary has an advantage in the balance of resolve because it possesses whatever is being fought over.[70] To support these arguments, Sechser and Fuhrmann conclude that there is only ambiguous evidence that nuclear weapons affected the outcome of the six historical cases they identify of seemingly successful nuclear compellence.

Scholars have pointed out that states can overcome the credibility challenges associated with nuclear coercion if they have superior nuclear capabilities compared to an adversary or if they deploy tactical nuclear weapons. But the empirical record as to whether nuclear superiority allows states to successfully compel adversaries is inconclusive and depends on how nuclear superiority is defined. Scholars have defined nuclear superiority in different ways, including simply having more nuclear weapons than an adversary,[71] having a significantly larger and more sophisticated arsenal,[72] and the complete absence of an adversary's nuclear capability.[73] Jervis points out that a state's superior nuclear capabilities are unlikely to improve the effectiveness of nuclear threats against a nuclear-armed adversary unless the inferior adversary believes that nuclear superiority both exists and matters.[74] States may also deploy tactical

[70] Todd S. Sechser and Matthew Fuhrmann, *Nuclear Weapons and Coercive Diplomacy* (New York, N.Y: Cambridge University Press, 2017), 46–50.
[71] Matthew Kroenig, "Nuclear Superiority and the Balance of Resolve: Explaining Nuclear Crisis Outcomes," *International Organization* 67 (Winter 2013): 141–71.
[72] Betts, *Nuclear Blackmail and Nuclear Balance*, 214; Francis J. Gavin, "Strategies of Inhibition: U.S. Grand Strategy, the Nuclear Revolution, and Nonproliferation," *International Security* 40, no. 1 (Summer 2015): 9–46.
[73] Pape, *Bombing to Win.*
[74] Robert Jervis, "Offense, Defense, and the Security Dilemma," in *International Politics*, ed. Robert Jervis and Robert J. Art, 3rd ed. (New York, N.Y: HarperCollins, 1992), 163.

nuclear weapons to make nuclear threats more credible against a nuclear-armed adversary. Strategists argued that these low-yield, limited-range nuclear weapons lowered the threshold for states to use nuclear weapons because they would inflict less destruction than a large-yield, inter-continental range strategic nuclear weapon. There is evidence to suggest that tactical nuclear weapons can help states to solve the credibility problem of making nuclear threats.[75]

Strategists have not, however found a compelling solution to address both the credibility and escalation challenges associated with nuclear coercion. Tactical nuclear weapons may allow states to make more credible nuclear threats, but they exacerbate risk of nuclear escalation. While some nuclear strategists argued that tactical nuclear weapons could be used to fight limited nuclear wars that would avoid the large-scale use of nuclear weapons on cities,[76] others pointed out that the limited use of tactical nuclear weapons actually increased the likelihood of states using their strategic nuclear weapons because they could easily trigger an escalating spiral of nuclear attacks.[77] Glaser summarized the political and technical reasons for this assessment: "Among the factors frequently seen as contributing to the poor prospects [of terminating a limited strategic nuclear war] are the problems of using limited nuclear attacks for wartime bargaining, the pressures to launch large counterforce and counter-control attacks to reduce the costs of an all-out war, problems with controlling forces during crises, and a lack of Soviet interest in limiting a strategic nuclear war."[78] The political factors that would make

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[75] See Narang, *Nuclear Strategy in the Modern Era.*

[76] See, for example, Kahn, *Escalation and the Nuclear Option*; Kerry M. Kartchner and Michael S. Gerson, "Escalation to Limited Nuclear War in the 21st Century," in *On Limited Nuclear War in the 21st Century*, ed. Jeffrey A. Larsen and Kerry M. Kartchner (Palo Alto, C.A.: Stanford University Press, 2014), 144–71.

[77] See, for example, Halperin, *Limited War in the Nuclear Age*, 59-63; Brodie, *Escalation and the Nuclear Option*, 12; Schelling, *Arms and Influence*, 109-111; Jervis, *The Meaning of the Nuclear Revolution.*

[78] Glaser, *Analyzing Strategic Nuclear Policy*, 42. On the difficulty of maintaining command and control of nuclear forces in a protracted nuclear conflict, see Ashton B. Carter, "Communications Technology and Vulnerabilities," in *Managing Nuclear Operations*, ed. Ashton B. Carter, John D. Steinbruner, and Charles A.

nuclear escalation difficult to control are likely to be more acute in a limited war. Halperin speculated that introducing nuclear weapons into a limited war would be seen as crossing a threshold by an adversary, and may prompt it to revise its assessments of the state's intentions, inducing the adversary to expand its war aims to ensure its survival.[79]

Scholars have pointed out the credibility and escalation challenges of nuclear coercion in their studies of past crises and wars in which states have threatened to use nuclear weapons against an adversary to maximize strategic leverage. Although this literature does not does not differentiate between total and limited wars, it identifies three aims that states have tried to achieve through threats of nuclear escalation in conflicts that did not immediately threaten their survival: to deter the outbreak of war, compel an end to a war, and deter the expansion of war. It might be possible for states to substitute nuclear coercion with threats to use non-nuclear strategic weapons to achieve these three aims in limited wars. States may even prefer to make threats to use space, cyber and conventional missile weapons to achieve these three aims to avoid the credibility and escalation challenges posed by making nuclear threats.

The first aim that states have pursued using nuclear threats in the past is to deter the outbreak of war. When two states find themselves in a crisis over a political issue, one state may threaten to use nuclear weapons to deter their adversary from starting a war or to prevail in the crisis. Those threats may prevent an adversary from resolving the political dispute by initiating a

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Zraket (Washington, D.C.: Brookings Institution Press, 1987), 224–25, 278–80; Carter, "Assessing Command System Vulnerability," 557–58. On the temptations for states to use damage-limiting strategic nuclear forces, see Glaser, *Analyzing Strategic Nuclear Policy*. See also Glaser and Fetter, "Should the United States Reject MAD?"; Halperin, *Limited War in the Nuclear Age*, 59–65.

[79] Halperin, *Limited War in the Nuclear Age*, 64.

limited conventional war that it can win or use to impose costs on the threatening state. Nuclear threats have been effective but dangerous tools in some historical crisis bargaining situations. During Cuban Missile Crisis, U.S. decision-makers increased the alert status of the U.S. military, including its nuclear forces, when they imposed a naval blockade on Cuba. They intended to coerce the Soviet Union not initiate a conflict between U.S. and Soviet forces at the picket line or in Europe. Diplomatic historians concluded that U.S. willingness to fight a nuclear war during the Cuban Missile Crisis influenced the decision of Soviet leaders to back down and remove their missiles from Cuba.[80] Nevertheless, scholars have both pointed out the extraordinary risk of nuclear war during the crisis.[81]

The second aim that states have pursued using nuclear threats in past conflicts is to facilitate bargaining to end the conflict, allowing the threatening state to win the war or at least end it in a draw. Once two states are fighting a limited war, a state may threaten to use nuclear weapons unless its adversary agrees to stop fighting and negotiate a post-war settlement. Nuclear threats could enable a stronger state to win the war without needing to spend the money and lives to win on the conventional battlefield. For example, after Chinese forces attacked Soviet forces along their disputed border in 1969, the Soviet Union counter-attacked and indicated that it could attack China with nuclear weapons. Soviet nuclear threats induced Chinese leaders to initiate talks with the Soviets to end the armed clashes along the border.[82] A weaker state might rely on nuclear threats to reverse its battlefield misfortunes. A weaker state can also use its

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[80] Gavin, *Nuclear Statecraft*, 70; Marc Trachtenberg, *History and Strategy* (Princeton, N.J.: Princeton University Press, 1991), 235–60.

[81] Martin J. Sherwin, "One Step from Nuclear War," *Prologue* 44, no. 2 (Fall 2012), https://www.archives.gov/publications/prologue/2012/fall/cuban-missiles.html.

[82] M. Taylor Fravel, *Strong Borders, Secure Nation: Cooperation and Conflict in China's Territorial Disputes* (Princeton, N.J.: Princeton University Press, 2008), 215–16.

nuclear weapons to "shield" itself from an adversary's nuclear threats, to enable it to use its conventional military power to change the political status quo.[83] For example, Pakistan's nuclear arsenal has restrained Indian retaliation for Pakistani sub-conventional attacks on Indian soil, but exacerbated the risk of nuclear war in South Asia.[84]

The third aim that states have pursued using nuclear threats in past conflicts is to keep a war limited. A state may threaten to use nuclear weapons to prevent its adversary from escalating a limited war. An adversary could expand the geographical scope of the war to attack the state on its homeland with conventional weapons, to try to win a limited war.[85] It may also increase the intensity of the conflict, including by using space, cyber, conventional missiles, chemical and biological weapons, for precisely the kind of limited war bargaining outlined in the previous paragraph. To deter any of these methods of expanding a limited war, the state may threaten to use nuclear weapons. For example, during the 1991 Gulf War, the United States issued ambiguous threats to use nuclear weapons against the Iraqi regime if Saddam Hussein ordered the use of chemical or biological weapons against advancing U.S. forces. U.S. officials revealed in memoirs, however, that those threats were bluffs.[86] It is not clear that nuclear threats can deter moderate expansions in the scope or intensity of a limited war, which do not reach the threshold at which a limited war becomes a total war.

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[83] Scholars identified the possibility that stable nuclear deterrence could embolden states to be more aggressive in conventional warfare, a situation known as the "stability-instability paradox." Glenn H. Snyder, "The Balance of Power and the Balance of Terror," in *The Balance of Power*, ed. Paul Seabury (San Francisco, C.A.: Chandler Books, 1965), 184–201.

[84] Vipin Narang, "Posturing for Peace? Pakistan's Nuclear Postures and South Asian Stability," *International Security* 34, no. 3 (Winter 2010): 43.

[85] For further discussion of escalation in the area or intensity of a conflict, see Kahn, *On Escalation*, 4–6; Iklé, *Every War Must End.*

[86] Scott D. Sagan, "The Commitment Trap: Why the United States Should Not Use Nuclear Threats to Deter Biological and Chemical Weapons Attacks," *International Security* 24, no. 4 (Spring 2000): 92–96.

In summary, the nuclear strategy literature indicates that if a state uses nuclear weapons to gain strategic leverage in a limited war, whether to deter the outbreak of war, compel an end to the war, or to deter an adversary from expanding that war, it must accept a risk of deterrence (or compellence) failure and a risk of nuclear war that could threaten its survival. These risks result from the challenges that states face in making nuclear threats credible and increasing the likelihood of nuclear escalation when making those threats. States that are unwilling to accept the risks of deterrence failure and nuclear war are likely to find non-nuclear sources of strategic leverage in a limited war more appealing.

IV. A Theory of Strategic Substitution

The theory of strategic substitution explains why states substitute space, cyber, and conventional missile weapons for nuclear weapons as a source of strategic leverage, and how they select a force posture for these weapons. Nuclear-armed states want to maximize their strategic leverage against an adversary without turning a limited war into a total war. Non-nuclear strategic force postures allow states to satisfy both of these objectives and avoid the credibility and escalation challenges associated with nuclear coercion. Decision-makers select force postures for space, cyber and conventional missile weapons based on the amount of damage the state would suffer from an adversary's retaliation for its use of those weapons. A state may adopt force postures for one, two, or all of these types of strategic weaponry at any one time.

States go through a two-step decision-making process for each type of non-nuclear strategic weapon. The first step is to decide whether to pursue a strategic space, cyber or conventional missile weapons capability. This decision is determined by the first independent variable, the state's need for strategic leverage. A state has a need for strategic leverage when its threat environment deteriorates and it cannot adequately respond to that change using its nuclear or conventional weapons. The second step is to decide which force posture to adopt, which is determined by the second independent variable, the expected cost of retaliation. Decision-makers estimate the expected cost of an adversary's in-kind retaliation if a state had to carry out its threat. That estimate helps decision-makers decide whether to adopt a brinkmanship posture, calibrated escalation posture, or no force posture.

The theory of strategic substitution assumes that China is a unitary rational actor that is able to accurately assess its and its adversary's strengths and weaknesses. As the empirical chapters demonstrate, at times China does not meet these assumptions. These assumptions do, however, allow me to determine when China's decisions are optimal given its security environment, and when Chinese decision-making is driven by domestic politics, mistakes, or other non-rational factors.[87] The theory also makes two assumptions informed by the nuclear strategy literature reviewed above. I assume that decision-makers are skeptical that they could control nuclear escalation, and that they are risk-averse in limited wars, at least with regards to their nuclear weapons. They are not willing to accept an elevated risk of nuclear war to make credible threats

[87] The utility of establishing a "rational baseline" for state behavior is recognized in the existing literature. See, for example, James D. Fearon, "Rationalist Explanations for War," *International Organization* 49, no. 3 (1995): 379–414.

to use nuclear weapons to achieve limited political aims. These assumptions are easily satisfied in China's case because of its strict No First-Use policy for its nuclear weapons.

The theory of strategic substitution assumes that states want to maximize leverage because they cannot accurately estimate how much leverage is necessary to change an adversary's calculations. In other words, they do not know how much damage they need to threaten to an adversary before it gives in to the state's political demands. Sometimes a state's efforts to maximize leverage will far exceed what is necessary to change an adversary's calculations and sometimes it will fall far short of that threshold.

The Need for Strategic Leverage

If a state has a need for strategic leverage that it cannot satisfy with nuclear weapons or conventional weapons, it is likely to pursue a coercive capability for its non-nuclear strategic weapons. A state's need for strategic leverage has three components: a change for the worse in its threat environment, a strategic credibility motivation, and a conventional inferiority motivation for establishing a non-nuclear strategic force posture. Changes for the worse in a state's threat environment drive variation in a state's need for strategic leverage over time because they prompt decision-makers to look for additional sources of strategic leverage. States respond to negative changes in their threat environment by pursuing a non-nuclear strategic weapons capability so that they can make more credible threats, compared nuclear weapons, given the non-survival stakes of a limited war. States may also pursue a non-nuclear strategic weapons capability when their threat environment deteriorates to compensate for their

conventional inferiority. Acquiring the capability to threaten space, cyber and conventional missile escalation may be the fastest and cheapest option they have to maximize their strategic leverage without raising the risk of a nuclear war.

Change for the Worse in Threat Environment

Changes for the worse in a state's threat environment drive variation in its need for strategic leverage over time because they reveal inadequacies in the state's existing sources of strategic leverage. These changes result from diplomatic or military crises and limited armed clashes with the adversary or adversaries the state would face in the limited war scenario. These threat events demonstrate that a state's existing sources strategic leverage from its nuclear, conventional, and non-nuclear strategic weapons is not sufficient to change an adversary's calculations. Crises and conflicts reveal important information about an adversary's resolve and the military capabilities it could bring to bear in the limited war scenario. That information exposes inadequacies in a state's existing sources of strategic leverage that it may not have been aware of, or may not have intended to address as a matter of priority, before the event.

The notion that a deteriorating threat environment leads states to increase their military capabilities, conventional or nuclear, is well-established in the existing international relations literature.[88] The contribution of the theory of strategic substitution is to explain the novel way states react to those changes given the scope conditions of a limited war scenario, conventional

[88] See, for example, M. Taylor Fravel, *Active Defense: China's Military Strategy Since 1949* (Princeton, N.J., 2019); Robert Jervis, *Perception and Misperception in International Politics* (Princeton, N.J.: Princeton University Press, 1976); Narang, *Nuclear Strategy in the Modern Era*; Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany between the World Wars* (Ithaca, N.Y.: Cornell University Press, 1984); Scott D. Sagan, "Why Do States Build Nuclear Weapons?: Three Models in Search of a Bomb," *International Security* 21, no. 3 (1996): 54–86.

inferiority, and a retaliatory nuclear posture. These scope conditions restrict a state's choices for responding to a worsening threat environment among its three sources of strategic leverage: nuclear, conventional, and non-nuclear strategic weapons.

Strategic Credibility

States can use non-nuclear strategic weapons to make more credible threats to escalate limited wars to maximize their strategic leverage than they are able to make with nuclear weapons. Non-nuclear strategic weapons threaten inflict a level of damage that is more proportionate to the political aims of a limited war. Threats to use nuclear weapons may not be credible in a limited war because the consequences of nuclear use would be overkill, given that the state's survival is not at stake. Threats to use nuclear weapons are even less credible against a nuclear-armed adversary because they could result in mutual overkill. For this reason, nuclear threats are a poor tool for maximizing a state's strategic leverage over an adversary in a limited war.

For a coercive threat to be credible, a state must have, at a minimum, both the resolve and the capabilities to carry out its threats.[89] A state has the resolve to carry out its coercive threat if the stakes are high enough for it to bear any costs associated with carrying out the threat. Carrying out a coercive threat to use a strategic weapon may be very costly because an adversary armed with the same strategic weapon is likely to retaliate. An adversary will try to determine whether the threatening state has a strong enough interest in the political issue at

[89] Scholars are divided on whether a state uses additional or other factors to determine the credibility of an adversary's threats and its intentions. See Daryl G. Press, *Calculating Credibility: How Leaders Assess Military Threats* (Ithaca, N.Y.: Cornell University Press, 2007); Keren Yarhi-Milo, "In the Eye of the Beholder: How Leaders and Intelligence Communities Assess the Intentions of Adversaries," *International Security* 38, no. 1 (Summer 2013): 7–51.

stake to withstand the cost of the adversary's retaliation. If the adversary perceives the state's interest to be strong enough, the adversary views the state's threat to use a strategic weapon as credible and may change its behavior.

Given the cost of nuclear retaliation, and the non-survival nature of limited war aims, using nuclear threats to pursue limited war aims is overkill. Nuclear threats are therefore unlikely to be credible and will not give the state the coercive leverage it needs to achieve its limited war aims. To underscore this point, states who have used nuclear weapons to gain strategic leverage in limited wars have taken steps to make a limited conventional war escalate rapidly into a total war, in which nuclear weapons use would not be overkill.[90] If a state can exist without a segment of territory or a political principle it cares about, it will have a hard time convincing an adversary that it is willing to accept nuclear attacks on its cities to deter an adversary from taking that territory or demolishing that principle. A nuclear-armed adversary could reasonably calculate that a state would be self-deterred from carrying out a nuclear strike and ignore the threatening state's political demand in a limited war. By ignoring the nuclear threat, the adversary could either call the threatening state's bluff or trigger a nuclear exchange.

While all states worry about the credibility of making nuclear threats for non-survival interests, the intensity of those concerns varies among states and may also vary within a state over time. As a result, the intensity of a state's strategic credibility motivation can also vary. As Betts

[90] This appears to be the U.S. modus operandi for using nuclear weapons to gain coercive leverage, both during the Cold War over the Soviet Union and today against both Russia and China. Barry R. Posen, *Inadvertent Escalation: Conventional War and Nuclear Risks* (Ithaca, N.Y.: Cornell University Press, 1991); Caitlin Talmadge, "Would China Go Nuclear? Assessing the Risk of Chinese Nuclear Escalation in a Conventional War with the United States," *International Security* 41, no. 4 (Spring 2017): 50–92.

concluded in his 1987 study of the effectiveness of nuclear threats, "if he [a decision-maker] were predisposed against nuclear risk, he could find points in the record to confirm his instinct, but no more easily than one with an incentive to try nuclear blackmail could find support."[91] The variation in nuclear postures across states belies variation in their assessments of the credibility of nuclear threats in limited wars. States that view nuclear threats credible sources of leverage in limited wars may select first-use postures to give themselves the flexibility to make nuclear threats in a future limited war contingency. Those states are more likely to deploy tactical nuclear weapons to enhance the credibility of those threats. The intensity of the same state's strategic credibility motivations may also vary over time, regardless of its nuclear posture. For example, the United States examined the possibility of adopting a No First-Use policy during the Obama Administration, suggesting skepticism about the credibility of making nuclear threats in conflicts that did not threaten U.S. survival.[92]

By contrast, non-nuclear strategic weapons allow states to make a threat that is sufficiently costly to change an adversary's calculations, but not so costly that it lacks credibility. Space, cyber and conventional missile attacks threaten a degree of damage that is more proportionate to a limited war aim. If a state had to carry out a threat to use a non-nuclear strategic weapon because its adversary ignored its demands, the worst-case scenario it would face following that initial attack may well be worth the political aim. The use of non-nuclear strategic weapons may well result in mutual kill, but at least it would not result in mutual overkill. Cyber, space, or conventional missile retaliation would not endanger the survival of the state. To demonstrate

[91] Betts, *Nuclear Blackmail and Nuclear Balance*, 218.
[92] David E. Sanger and William J. Broad, "Obama Unlikely to Vow No First-Use of Nuclear Weapons," *The New York Times*, September 5, 2016.

that non-nuclear strategic coercion is more proportionate to the stakes of a limited war, it is worth briefly examining what the worst-case scenario looks like if a threatening state had to carry out a coercive threat to use a strategic space, cyber or conventional missile weapon. The following three scenarios illustrate that using these weapons could result in damaging retaliation, but it would be nowhere near as damaging as a massive nuclear retaliatory strike.

A massive, coordinated strategic cyber attack could disrupt the delivery of electricity, transportation, air travel, sanitation, financial and telecommunications services, causing paralysis of a computer network-dependent society. It could also disrupt a state's ability to generate and project military power by targeting logistics networks, and the infrastructure supporting military bases, the defense industry and other industrial production facilities. These attacks could cause civilian injury or deaths as a second-order effect, for example if air traffic control networks were disrupted. But paralysis of even one major city's critical infrastructure would be difficult to sustain. Network operators could discover and remove the malware from these critical computer networks. "Patching" the vulnerabilities in the computer network used to conduct the attacks could force the attacker to use a completely new weapon, if indeed one was available, to sustain the disruption. Further, an adversary could choose to limit its connections to the internet to prevent the state from conducting follow-on attacks. In summary, cyber retaliation could cause large-scale disruption of the threatening state's society, but that disruption would be difficult to sustain and would not directly cause loss-of-life.

A large-scale attack on a state's space capabilities would involve kinetic and non-kinetic attacks on its satellites and other spacecraft in all orbits, as well as kinetic or non-kinetic attacks

to disable the state's terrestrial infrastructure to communicate with its fleet of satellites. Kinetic anti-satellite attacks increase the amount of debris in space, which remains in orbit indefinitely. Even limited missile ASAT attacks could render lower earth orbit (LEO) unusable to all states. The trajectory of debris in LEO is unpredictable and increases automatically after a certain threshold is reached, as existing pieces of debris collide to produce more debris.[93] If a state destroyed a number of satellites with ground-based anti-satellite missiles, or collided its spacecraft with an adversary's, it could create enough debris to make LEO (and other orbits that pass through LEO) unusable for any state. A state could also detonate a nuclear weapon in LEO, using the electromagnetic pulse from the blast to disable all satellites within line-of-sight and passing through the site of the explosion for months.[94] However, attacking satellites in orbit would not directly cause loss-of-life. Attacks on satellite ground stations could result in a small number of casualties, depending on the munitions used. The effects of disabling a state's access to space would be disruptive but not disabling for its society and military. Civilian societies would lose access to some communications links, location services, weather forecasts, time signatures for financial transfers, and scientific data. The loss of these services would hit technology-dependent militaries the hardest. States may also see reductions in the early warning they receive of missile attacks if the attacks affected satellites in higher orbits.

A large-scale conventional missile salvo could damage key governmental, military or civilian infrastructure such as buildings, ports and airfields. The effects of the attack would be more like a conventional strategic bombing campaign than a nuclear attack, although conventional missiles would deliver that effect more cheaply and quickly than an aircraft could deliver

[93] This is known as the Keppler syndrome. See Moltz, *Crowded Orbits*, 24–25.
[94] Ibid., 28–29.

munitions, and without the impediment of air defenses. A state would need to deliver more conventional munitions to equal the yield of a nuclear weapon. The most destructive conventional munition the United States possesses has a yield that is roughly double its lowest yield nuclear weapons, and could not be mounted on a missile.[95] The damage caused by an adversary's large-scale retaliatory strike using conventional missiles is also likely to be constrained by range for the foreseeable future to avoid any ambiguity as to the conventional or nuclear nature of the attack.[96] A large-scale, retaliatory conventional missile attack could, however, cause loss-of-life and damage to the threatening state's cities and infrastructure.

Despite their credibility advantages, there are two disadvantages to substituting nuclear threats with threats to use non-nuclear strategic weapons to gain strategic leverage in limited wars. First, using space, cyber and conventional missile weapons as sources of coercive leverage requires trade-offs with the incentives to keep these capabilities secret for warfighting, rather than demonstrate their capabilities to make coercive threats credible.[97] Second, there is a chance that an adversary may not retaliate in-kind for a space, cyber or conventional missile attack. Rather, it may respond with a conventional military offensive, a different non-nuclear strategic weapon, or even with a nuclear weapon. Nevertheless, the adversary's most prudent

[95] The largest conventional munition, the Massive Ordinance Penetrator, is a 30,000 ton bomb, while the lowest yield of a B-61 nuclear bomb is 0.3 kilotons.

[96] Although in theory there is no reason why a state could not pair a nuclear delivery system with a conventional warhead, to avoid an adversary mistaking a conventional attack for a nuclear attack, in the past the United States intended to develop different delivery systems for inter-continental conventional missiles. Until those systems come online, conventional missiles may have more limited ranges than ballistic missiles and may be less capable of penetrating sophisticated air and missile defenses. Chapter 5 illustrates that China has deployed dual-capable conventional and nuclear-tipped missiles of medium and intermediate range, but not tactical or intercontinental range.

[97] Shimshoni, *Israel and Conventional Deterrence*, 18; Brendan Rittenhouse Green and Austin Long, "Invisible Doomsday Machines: The Challenge of Clandestine Capabilities and Deterrence," *War on the Rocks* (blog), December 15, 2017, https://warontherocks.com/2017/12/invisible-doomsday-machines-challenge-clandestine-capabilities-deterrence/.

response to a space, cyber or conventional missile attack is to retaliate in-kind to avoid sending a signal that it has expanded its war aims. Retaliation using a different type of weapon could otherwise be interpreted as unjustified, disproportionate and opportunistic "horizontal escalation."[98]

Conventional Inferiority

States may also have a need for strategic leverage because they have an inferior conventional military compared to their adversary in a limited war. Non-nuclear strategic weapons can give a conventionally inferior state leverage to overcome its military weakness such that it would no longer have to accept defeat in a limited war. Further, non-nuclear strategic weapons are a faster, cheaper and easier option for gaining more strategic leverage than catching up with an adversary's conventional military power. Ideally, states would prefer to have both the conventional military power to win the conflict using brute force, as well as the strategic weapons to win the conflict "on the cheap" using threats of escalation to coerce their adversaries to capitulate rather than fight. If a state has to prioritize either gaining strategic leverage by threatening victory on the battlefield or escalating a limited war using a strategic weapon, it is likely to select the cheaper, easier, and faster option of pursuing a non-nuclear strategic weapons capability rather than building up its conventional military capabilities.

Of course, states can gain strategic leverage in a limited war to compensate for their conventional military inferiority using nuclear weapons, as well as space weapons, cyber

[98] It is difficult to establish the equivalence of attacks using different types of strategic weapons. As Schelling explained, there is a simplicity to thresholds of not using chemical or nuclear weapons at all that makes them easier for states to agree on as thresholds, compared, for example, to "a little bit of nuclear." Schelling, *Arms and Influence*, 131–35.

weapons, or conventional missiles. There are two reasons why a state might prefer the non-nuclear strategic weapons option. First, if a state already has concerns about the credibility of threatening to use nuclear weapons in a limited war, its conventional inferiority will amplify its need for strategic leverage. Second, the risk of nuclear war associated with nuclear coercion may lead states to pursue coercive space, cyber and conventional missiles rather than threaten to use their nuclear weapons first in a limited war. Even if a state is optimistic that it could credibility threaten to use nuclear weapons in a limited war, it may prefer to compensate for its conventional inferiority with non-nuclear weapons to avoid turning a limited war into a total, nuclear war. An adversary may view the use of nuclear threats to deter or win a limited war as a signal of the state's aggressive intentions beyond the limited conflict contingency.[99] Appearing too hostile or aggressive to an adversary could prompt it to build up its nuclear or conventional capabilities or even adjust its nuclear strategy in peacetime. An adversary could react to the state's nuclear threats during a war by revising its assessment of whether it is in fact fighting a limited war and whether it could trust the state to adhere to the terms of a negotiated settlement.[100]

Combining Threats and Motivations

A state has a need for strategic leverage when its threat environment changes for the worse and it has strategic credibility and/or conventional inferiority motivations to develop non-nuclear strategic force postures. Neither motivation is likely to affect a state's behavior on their own: they must be combined with a change for the worse in a state's threat environment to affect a

[99] For an analogous argument that developing "optional" U.S. nuclear capabilities for damage limitation increases Soviet perceptions of U.S. hostility, see Glaser, *Analyzing Strategic Nuclear Policy*, 71–80.
[100] Talmadge, "Would China Go Nuclear?" 63; Weisiger, *Logics of War*.

state's behavior. A deterioration in the state's threat environment highlights the inadequacy of the state's current sources of strategic leverage and prompts the state to look for more leverage. It cannot increase its strategic leverage using nuclear threats that lack credibility or could trigger a nuclear war. Nor can it increase its strategic leverage using conventional weapons that are too expensive and slow to develop. Unable to use nuclear or conventional weapons to maximize leverage, the state is left with a need for strategic leverage. It has only one option to satisfy that need: a coercive capability for a non-nuclear strategic weapon.

A worsening threat environment combined with the credibility motivation creates a weak need for strategic leverage that a state is *likely* satisfy with a non-nuclear strategic weapons capability. Conventionally stronger states could also rely on their conventional military power to gain leverage if they worry about the credibility of nuclear threats in limited wars. On the other hand, if both the strategic credibility and conventional inferiority motivations are present when a state's threat environment worsens, the state has a strong need for strategic leverage that is *very likely* to result in the pursuit of a non-nuclear strategic weapons capability. A change in threat environment combined with the conventional inferiority motivation on its own would create a very weak a need for strategic leverage. The state could rely on nuclear weapons as a source of strategic leverage as well. In that situation, it is *possible* that the state pursues a non-nuclear strategic weapons capability.

The theory of strategic substitution provides the following three testable hypotheses of the conditions under which a state pursues a non-nuclear strategic weapons capability:

(1) If a state assesses that nuclear threats are not credible in a limited war, it is *likely* to pursue a coercive capability for a non-nuclear strategic weapon to gain strategic leverage in response to a deterioration in its threat environment.

(2) If a conventionally inferior state assesses that nuclear threats are not credible in a limited war, it is *very likely* to pursue a coercive capability for a non-nuclear strategic weapon to gain strategic leverage in response to a deterioration in its threat environment.

(3) If a conventionally inferior state assesses that nuclear threats are credible in a limited war, it is *possible* that the state will pursue a coercive capability for a non-nuclear strategic weapon to gain strategic leverage in response to a deterioration in its threat environment.

The Expected Cost of Retaliation

Once a state has decided to pursue a coercive space, cyber or conventional missile weapons capability to satisfy its need for strategic leverage, the second step in its decision-making process is to determine which variant of a first-use posture, brinkmanship or calibrated escalation, to adopt for those weapons. States use the expected cost of retaliation to determine which force posture to select. Two factors determine the expected cost of retaliation: a state's exposure to attack, compared to its adversary, and the feasibility of controlling escalation in the domain.

Relative Exposure to Attack

The first factor a state considers when estimating its expected cost of retaliation is its exposure to attack. A state's exposure to attack using a strategic weapon determines how much damage or disruption it would suffer if it was attacked with that strategic weapon. If a state is less exposed to attack, compared to its adversary, it has less to fear from the worst-case scenario of space, cyber or conventional missile attacks outlined above than its adversary.

States that are relatively less exposed to attack have a low expected cost of retaliation and are likely to select a brinkmanship force posture. A brinkmanship posture tries to grease the slippery slope to the worst-case scenario. The threatening state fears mutual disaster less than its adversary if it is less exposed to attack, so it can credibly manipulate the risk of that worst-case scenario a lot. The adversary stands to lose much more from an unrestrained use of strategic weapons, so it is more likely to take "the last clear chance to avoid mutual disaster."[101]

A state may be less exposed to attack, relative to an adversary, for two reasons. First, its adversary may not have the weapons to retaliate in-kind.[102] For example, the United States launched cruise missile attacks on Afghanistan in retaliation for Al Qaida attacks on its embassies in Tanzania and Kenya in 1998. Afghanistan had no cruise missile capability of its own with which to retaliate. Second, the state may have fewer valuable targets for an adversary to retaliate against using that strategic weapon. This second situation is only likely to occur when a state is less dependent on the space or cyber domains than its adversary for its societal,

[101] Schelling, *Arms and Influence*, 100.
[102] Scholars who claim that states can use nuclear weapons to compel adversaries that do not have nuclear weapons to change their behavior make a similar argument. See, for example, Pape, *Bombing to Win*.

governmental and military functions. Some states can gain a significant amount of leverage from these asymmetries because their adversary will have more to lose from a cyber or space conflict. For example, when North Korean hackers destroyed data on the computer servers of Sony Pictures in 2014, the Obama Administration retaliated with economic sanctions rather than a retaliatory cyber attack. North Korea has a plethora of valuable U.S. networks to attack with cyber weapons, while the United States has far fewer, if any, valuable North Korean computer networks to attack in retaliation.[103] States facing an adversary armed with the same strategic weapon who cannot take advantage of a dependence asymmetry are roughly equally exposed to attack as their adversary.

Feasibility of Escalation Control

The second factor states consider in estimating the cost of retaliation, if they are roughly as exposed to attack as their adversary, is whether it is feasible to control escalation from small-scale space, cyber or conventional missile attack. A state that is roughly equally exposed to space, cyber or conventional missile attacks, compared to its adversary, shares an incentive with its adversary to avoid the worst-case scenarios outlined above. An adversary could reasonably expect the state to be self-deterred from carrying out a threat to use its weapons if doing so would result in rapid escalation to the worst-case scenario. That state can therefore only credibly manipulate the risk of the worst-case scenario a little.

[103] Some U.S. media reports suggested that the United States retaliated for the Sony attack by cutting off North Korean access to the internet, but the evidence to support this claim is weak. Nicole Perlroth and David E. Sanger, "North Korea Loses Its Link to the Internet," *The New York Times*, December 22, 2014. U.S. military officers have observed that the country's unparalleled dependence on these domains makes its space and cyber assets especially attractive targets to an adversary. Susan J. Helms, "Schriever Wargame 2010: Thoughts on Deterrence in the Non-Kinetic Domain," *High Frontier, Air Force Space Command* 7, no. 1 (November 2010): 15.

A state that is equally exposed to a space, cyber or conventional missile attack compared to its adversary faces a moderate expected cost of retaliation if it is feasible to control escalation using that weapon. It is likely to select a calibrated escalation posture. That way, the threatening state and its adversary have more opportunities to halt the spiral of retaliation and counter-retaliation before mutual disaster occurs. Both sides expect one or the other to capitulate before an unrestrained exchange of attacks occurs.

Calibrated escalation postures are only available to states if it is feasible to control escalation once a space, cyber or conventional missile weapon is used. Non-nuclear strategic weapons must fulfill three criteria for escalation control to be feasible, all of which they currently satisfy but have not always satisfied in the past.[104] First, weapons with low-intensity effects must exist to give states rungs on the lower end of the escalation ladder, such as tactical space, cyber and conventional missile weapons. The effects of space and cyber attacks may even be reversible or non-kinetic. Second, it must be possible for a state to confidently attribute any attack to the perpetrator. Third, both strategic weapons and their command and control arrangements must be able to survive a protracted conflict. For this third reason, states may be able to control space and cyber escalation at low levels of conflict intensity, but the difficulty of doing so may increase at higher levels of conflict intensity. Space, cyber and conventional missiles do not produce the ionospheric disruption and other blast effects that would make nuclear command and control difficult to sustain in a protracted conflict.[105] Nevertheless, it may be difficult to control escalation if states choose to attack each other's military command, control,

[104] In the measurement section below, I outline the turning points at which it became feasible to control space and cyber escalation, in the early 1990s and 2014, respectively.
[105] Carter, "Communications Technology and Vulnerabilities," 224–25, 278–80; Carter, "Assessing Command System Vulnerability," 557–58.

communications and intelligence networks as a conflict intensifies. Attacks on these networks could add to the fog of war and hamper communications between a state and its adversary to negotiate an end to a limited war.

If it is not feasible to control escalation, the state faces a high expected cost of retaliation and is unlikely to adopt a coercive force posture for that strategic weapon. In theory, state facing a high expected cost of retaliation would select a retaliatory posture for that strategic weapon. In practice, however, as outlined above, the importance of tactical space, cyber and conventional missile weapons to conventional warfighting operations makes it difficult for states to adopt retaliatory postures that are credible to their adversaries. Instead, states with a high expected cost of retaliation may take steps to dampen an adversary's incentives to use those non-nuclear strategic weapons for coercion. For example, it may try to reduce its reliance on the space and cyber domains, develop defenses to limit damage from an adversary's attacks, or take steps to improve the feasibility of controlling escalation.

The theory of strategic substitution provides the following three testable hypotheses of non-nuclear posture choice:

(4) States facing a low expected cost of retaliation for a space, cyber or conventional missile attack are likely to adopt a brinkmanship posture.

(5) States facing a moderate expected cost of retaliation for a space, cyber or conventional missile attack are likely to adopt a calibrated escalation posture.

(6) States facing a high expected cost of retaliation for a space, cyber or conventional missile attack are unlikely to adopt a force posture for that strategic weapon.

Alternative Explanations

Existing international relations theory suggests that states may not always make rational, strategic decisions as the theory of strategic substitution would expect. States may develop coercive postures for their space, cyber and conventional missile weapons because of the preferences of domestic organizations making decisions about those capabilities. They may also develop coercive postures for their space, cyber and conventional missile weapons because they uncritically copy the capabilities and doctrine of the United States military.

Organization Theory

The preferences of military organizations often explain why states develop certain military capabilities and doctrines. Large organizations behave in similar ways.[106] In general, most organizations, including militaries, want to increase their resources, influence, and autonomy. They also want to preserve their "organizational essence," the tasks they see as their core missions. This often means excluding other organizations from carrying out those missions, or avoiding new tasks that will divert the organization's attention and resources away from those

[106] James Q. Wilson, *Bureaucracy: What Government Agencies Do and Why They Do It* (New York, N.Y: Basic Books, 1989).

missions.[107] These insights explain why military organizations often do not adapt to changes in the state's security environment, do not integrate military strategy with the preferences of civilian decision-makers,[108] resist efforts at better integration across military services to fight joint operations,[109] and prefer offensive military doctrines that maximize their autonomy to conduct military operations and the predictability of their operational environment.[110] For example, before World War I, the French and German militaries pursued influence and resources through the offensive doctrines that contributed to the outbreak of war.[111] Scholars have also argued that the U.S. military's pursuit of autonomy, resources, and predictability of its operational environment contributed to its bloated nuclear arsenal and relentless pursuit of a disarming first-strike capability, despite the extraordinary difficulty of acquiring that capability against the Soviet Union.[112] Organization theory provides the following alternative hypothesis to explain how and why states select non-nuclear strategic force postures:

(1) Militaries will advocate for space, cyber and conventional missile postures that increase their resources, influence and autonomy.

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[107] Morton H. Halperin, Priscilla A. Clapp, and Arnold Kanter, *Bureaucratic Politics and Foreign Policy*, 2nd ed. (Washington, D.C.: Brookings Institution Press, 2006), 25–27.
[108] Posen, *The Sources of Military Doctrine*, 58–59.
[109] Lena S. Andrews, "One Fighting Machine: Joint Learning and Tactical Airpower Operations in World War II" (Ph.D. Dissertation, Political Science Department, Massachusetts Institute of Technology, 2018).
[110] Posen, *The Sources of Military Doctrine*, 58–59.
[111] Jack Snyder, *The Ideology of the Offensive: Military Decision-making and the Disasters of 1914* (Ithaca, N.Y.: Cornell University Press, 1984); Stephen Van Evera, "The Cult of the Offensive and the Origins of the First World War," *International Security* 9, no. 1 (Summer 1984): 58–107.
[112] Van Evera, *Causes of War*, 178; Scott D. Sagan, *Moving Targets: Nuclear Strategy and National Security* (Princeton, N.J.: Princeton University Press, 1990), 55; Glaser, *Analyzing Strategic Nuclear Policy*, 365–67.

(2) If the state has a retaliatory nuclear posture, the military units responsible for nuclear operations will advocate for first-use space, cyber and conventional missile postures to expand their influence, resources and autonomy.

Emulation Theory

States may also pursue space, cyber and conventional missile capabilities because they emulate the military innovations of the leading technological and military power in the international system, the United States. Scholars explain variation in the degree to which states emulate others' military innovations according to two factors: threat environment and the difficulty of adopting the innovation. Waltz stated that, to survive in anarchic international relations, states would emulate the dominant military power in the international system, leading to convergence in military strategies.[113] Resende-Santos argued that when states' security environments worsened, they emulated the leading military power in the system, "military emulation is the quickest and most dependable way to increase power and bolster security."[114] The literature on military diffusion argues that states will eventually adopt major military innovations, even if their optimal short-term response to a worsening threat environment may not necessarily be emulation. The resource-intensive nature of the innovation, and the degree of organizational disruption involved in adoption, determine the speed with which a state will adopt a military innovation. Where these factors form an obstacle to a state's immediate adoption of the innovation, it may try to counter the innovation through "low-cost alternatives or substitutions"

[113] Kenneth Waltz, *Theory of International Politics* (New York, N.Y: McGraw Hill, 1979), 127.
[114] João Resende-Santos, *Neorealism, States, and the Modern Mass Army* (Ithaca, N.Y.: Cornell University Press, 2007), 5.

which allow the state to "stall in the interim."[115] Emulation is perhaps more likely for space and cyber weapons because states have no experience of using those weapons in conflict and therefore fewer examples of different posture choices to choose from. Emulation theory provides the following alternative hypothesis to explain how and why states select non-nuclear strategic force postures:

If the United States establishes or amends its space, cyber and conventional missile force postures, other states will establish similar postures for their own space, cyber and conventional missile weapons.

V. Research Design

I use the comparative case study method to determine whether the theory of strategic substitution or alternative explanations better account for China's choices of space, cyber and conventional missile force postures. I prioritize the internal validity of the theory, its ability to explain China's puzzling strategic force posture choices, over the cross-national generalizability of the theory. I comprehensively examine the full universe of cases, China's three non-nuclear strategic postures for its space, cyber and missile weapons. China has made seven decisions to develop, adopt and change its space, cyber and conventional missile force postures since it began to prepare to fight limited wars in 1988. I exploit the different predictions of the theory of strategic substitution and the alternative explanations about the components of China's force posture, the timing of its force posture decisions, and the

[115] Michael C. Horowitz, *The Diffusion of Military Power: Causes and Consequences for International Politics* (Princeton, N.J.: Princeton University Press, 2010), 41.

mechanisms revealed by the decision-making process, to demonstrate that the theory of strategic substitution best accounts for China's post-Cold War strategic force postures.

The China Scope Condition

The theory of strategic substation is a China-specific theory because the strictness of China's retaliatory nuclear posture is distinctive among nuclear-armed states. Further, no other nuclear-armed state combines a retaliatory nuclear posture with conventional military inferiority in its primary conflict scenario. Beijing's decision to rely exclusively on non-nuclear sources of strategic leverage in a limited war is equally distinctive. These choices are a consequence of Beijing's unique view of nuclear weapons as tools for deterring nuclear attacks only, not for winning wars. Among all nuclear-armed states, China's behavior hews most closely to the central claim of the theory of the nuclear revolution: once a state has a nuclear arsenal that is able to survive an adversary's disarming first strike and carry out a retaliatory strike, it will find few applications for its nuclear weapons in international politics other than deterring existential threats.[116] Moreover, China's nuclear posture and views of nuclear weapons are remarkably consistent over time.

Despite the China scope condition, it is worth briefly outlining the implications of the theory of strategic substitution for understanding how other nuclear-armed states approach the problem of maximizing leverage in limited wars. Other nuclear-armed states may not foreswear the use of nuclear weapons in limited wars like China, but may nevertheless be

[116] Jervis, *The Meaning of the Nuclear Revolution.*

hesitant to use them when their survival is not at stake. Beijing's views of nuclear weapons may not be so unique in a limited war context. Other nuclear states might also have strategic credibility motivations for developing non-nuclear sources of strategic leverage in limited wars because they share China's skepticism about the utility of nuclear weapons for winning limited wars. Other nuclear-armed states may also be motivated to compensate for their conventional inferiority using space, cyber or conventional missile weapons in limited wars. But their need for strategic leverage may be less acute than China's.

There are a number of methodological advantages in using comparative case studies of China's non-nuclear force postures to establish the internal validity of the theory of strategic substitution. First, as a late modernizer, China is able to benefit from technological first-movers' experimentation with new types of strategic weapons. Its decisions to adopt coercive force postures are based on more information about the nature of those weapons and their possible coercive uses than first-movers.[117] Second, as a resource-constrained state up until at least 2010 (if not to the present), it had a strong incentive to invest its limited resources where they would give it the most coercive leverage per yuan spent, compared to a wealthy state.[118] Third, strong arguments can be made for the alternative explanations operating in China. In a study of changes to China's conventional military strategy, Fravel shows that domestic political dynamics affected the Chinese People's Liberation Army's (PLA) ability to update its conventional military strategy.[119] As a late military modernizer, emulation is an option for China in ways that it was not for many other nuclear-armed states that are also advanced

[117] Narang distinguishes between superpower and regional power nuclear postures for this reason. Narang, *Nuclear Strategy in the Modern Era*, 17–18.
[118] Fravel, *Active Defense: China's Military Strategy Since 1949*.
[119] Ibid.

economies. China has carefully studied conventional wars involving the United States or its allies over the past seven decades and adjusted its military strategy in response to those conflicts. China has not copied U.S. and Soviet/Russian choices of a first-use nuclear posture or either country's military strategy,[120] but it has emulated other states' behavior in arms control institutions.[121]

Although the PLA can be expected to seek resources, autonomy and control of the operational environment in the space, cyber and conventional missile domains, Fravel's findings about the conditions under which China has changed its conventional military strategy suggests two caveats in applying organization theory as an alternative explanation for China's non-nuclear strategic force postures. First, when the PLA has had the authority to determine conventional military strategy, its proposed changes to strategy were tightly integrated with the preferences of civilian leaders.[122] Chinese military and civilian leaders shared preferences for China's national military strategy because of their shared membership of the Communist Party. Second, in other states, civilian intervention into the formulation of military doctrine has led to more appropriate doctrines for the kinds of threats those states faced. By contrast, when Chinese civilian leaders intervened in military strategy formulation, they either refused to delegate authority to the PLA to make the changes required by China's security environment or imposed inappropriate strategies.[123]

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[120] Ibid.; M. Taylor Fravel and Evan S. Medeiros, "China's Search for Assured Retaliation: The Evolution of Chinese Nuclear Strategy and Force Posture," *International Security* 35, no. 2 (Fall 2010): 48–87; Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Strategy and U.S.-China Strategic Stability," *International Security* 40, no. 2 (Fall 2015): 7–50.
[121] Alastair Iain Johnston, *Social States: China in International Institutions, 1980-2000* (Princeton, N.J.: Princeton University Press, 2007).
[122] M. Taylor Fravel, "Shifts in Warfare and Party Unity," *International Security* 42, no. 3 (Winter 2017): 44–45.
[123] Ibid., 44, 55–66.

Observations

Across the three cases of space, cyber and conventional missile weapon force postures, China has made seven force posture decisions, which allow for both within-case and cross-case comparisons of posture choice. The unit of analysis for the study is a force posture decision, defined as any time at which Chinese leaders considered changes to a non-nuclear force posture, including decisions to develop force postures, adopt force postures, and reviews that led to adjustments in posture implementation. I also examine one point at which the theory of strategic substitution would have expected a cyber force posture decision and change in 2010, but no change occurred, and one point at which China's missile force posture changed around 2013 that the theory cannot explain. These observations are summarized in the table 2 on the following page.

Methods of Inference

I use two methods, congruence testing and process tracing, to analyze why and how China selected non-nuclear force postures.[124] Congruence testing examines the state's force posture and timing of its decisions to pursue a coercive strategic weapons capability to determine whether the observed values of the independent and dependent variables and changes in those values better support the observable implications of the theory or alternative explanations. There are three observable implications of the theory of strategic substitution for the timing of a state's decisions about its non-nuclear strategic weapons. First, a state is likely to pursue a

[124] James Mahoney, "Strategies of Causal Inference in Small-N Analysis," *Sociological Methods & Research* 28, no. 4 (2000): 387–424.

coercive capability for its non-nuclear strategic weapons when it satisfies all scope conditions of the theory: a retaliatory nuclear posture, a limited war primary conflict scenario, and its conventional military is inferior to its adversary in that limited war. Second, it is likely to pursue a non-nuclear strategic weapons capability following a crisis or conflict with involving its adversary that worsens its threat environment and creates a need for strategic leverage, the first independent variable. Third, changes in the expected cost of retaliation for a particular strategic weapon, the second independent variable, will lead to changes in a state's existing force posture.

Year	**Weapon**	**Posture**	**Threat**	**Motivations**	**Expected Cost of Retaliation**
1988	Missile	-	Shift to limited war	Strategic Credibility	Moderate
1995	Missile	*Brinkmanship*	Taiwan Crisis	Conventional Inferiority	Moderate
2001	Cyber	Brinkmanship	Embassy Bombing	Conventional Inferiority	Low
2002	Space	Calibrated Escalation	Embassy Bombing	Conventional Inferiority; Strategic Credibility	Moderate
1999	Missile	*Brinkmanship*	Embassy Bombing	Conventional Inferiority; Strategic Credibility	Moderate
2010	*Cyber*	*Brinkmanship*	-	*None*	*High*
2013	*Missile*	Calibrated Escalation	-	*None*	Moderate
2014	Space	Calibrated Escalation	-	Strategic Credibility	Moderate
2014	Cyber	Calibrated Escalation	-	None	Moderate

Note: Italicized cells are not explained by the theory of strategic substitution.

Table 2: China's Non-Nuclear Force Posture Decisions, 1988-Present

Different events would trigger decisions to establish or change force postures if they are driven by organizational interests or emulation. An observable implication of emulation theory is that force posture decisions are triggered by U.S. force posture decisions. One observable implication of organization theory is that, if decision-making about non-nuclear strategic weapons is dominated by the military, those decisions are likely to be made as soon as the appropriate space, cyber and conventional missile weapons become available by services looking to grow their missions. Another observable implication is that force posture decisions will occur if civilians delegate or retract the military's authority to make decisions about force posture.

The observable implications of the theory of strategic substitution for force posture choices are outlined above, according to the value of the expected cost of retaliation. The four components of the state's force posture, doctrine, capabilities, command and control arrangements, and transparency, should roughly correspond those of an ideal-type brinkmanship or calibrated escalation posture, which are outlined in detail in each of the empirical chapters. On the other hand, organization theory would expect states to adopt some components of a brinkmanship posture if the military makes force posture decisions, such as delegating authority to use weapons to the PLA to maximize autonomy over operations and minimal transparency of the posture to maximize operational surprise. Emulation theory would expect that the components of a state's force posture to correspond with those of the United States, which are outlined in detail in each of the empirical chapters.

Process tracing allows me to make the strongest causal claims about China's motivations for developing space, cyber and conventional missile postures and therefore perform the most thorough test of the theory.[125] The theory of strategic substitution, organization theory and emulation expect force posture decisions to follow different processes according to the different mechanisms connecting the explanatory and outcome variables. The theory of strategic substitution expects decision-makers to identify a non-nuclear strategic force posture as a possible solution to their need for leverage in a limited war, express doubts about the credibility of nuclear coercion and/or confidence in the credibility of space, cyber or conventional missile coercion, and evaluate the expected cost of retaliation before selecting a force posture. Decision-makers may also recognize that a non-nuclear strategic weapon can compensate for its conventional inferiority.

Decision-makers have different motivations for developing non-nuclear force postures if those decisions are driven by organizational interests or emulation. Organization theory expects military officers to advocate for brinkmanship postures, resist changes to posture that centralize authority to use weapons, and perhaps even disclose the organizational incentives driving their posture preferences. If civilians possess or are trying to assert authority over force posture decisions, military officers may criticize their decisions. If a state emulates the United States, its decision-makers are likely to justify their decisions to pursue non-nuclear strategic weapons and select force postures as keeping up with the United States in military technology.

[125] Andrew Bennett and Jeffrey T. Checkel, eds., *Process Tracing: From Metaphor to Analytic Tool* (New York, N.Y: Cambridge University Press, 2014).

To demonstrate the explanatory power of the theory of strategic substitution, I also examine China's nuclear posture for three reasons. First, China's retaliatory nuclear posture is one of the scope conditions of the theory of strategic substitution. Second, I examine China's nuclear posture decision-making after negative changes in its threat environment to measure the strategic credibility motivation. Decision-makers' assessments about the credibility of nuclear threats in limited wars are an important component of the first independent variable, the need for strategic leverage. Third, I examine China's nuclear posture decision-making when it faced both a total war and a limited war to demonstrate that China's consistent assessments that nuclear threats lack credibility only motivated it to pursue a non-nuclear strategic weapons capability once it faced a limited war primary conflict scenario. It is important to clarify, however, that I am measuring the strategic credibility motivation, not explaining China's choice of a retaliatory nuclear posture. China's choice of a retaliatory nuclear posture in the post-Cold War is overdetermined. It is best explained by a mix of strategic considerations such as credibility, China's vast geographical size and desire to avoid an arms race, as well as non-strategic considerations such as civilian control over nuclear strategy decision-making, leadership beliefs, and path dependence.[126]

[126] See Andrew S. Erickson, Michael S. Chase, and Christopher Yeaw, "Chinese Theater and Strategic Missile Force Modernization and Its Implications for the United States," *Journal of Strategic Studies* 32, no. 1 (2009): 67–114; Thomas J. Christensen, "The Meaning of the Nuclear Evolution: China's Strategic Modernization and US-China Security Relations," *Journal of Strategic Studies* 35, no. 4 (2012): 447–87; Fravel and Medeiros, "China's Search for Assured Retaliation"; Fravel, *Active Defense*; Avery Goldstein, *Deterrence and Security in the 21st Century: China, Britain, France, and the Enduring Legacy of the Nuclear Revolution* (Stanford, CA: Stanford University Press, 2000); Alastair Iain Johnston, "China's New 'Old Thinking': The Concept of Limited Deterrence," *International Security* 20, no. 3 (Winter 1995/96): 5–42; Wu Riqiang, "Certainty of Uncertainty: Nuclear Strategy with Chinese Characteristics," *Journal of Strategic Studies* 36, no. 4 (2013): 579–614.

Measurement

I measure the dependent variable, non-nuclear strategic force posture, using four indicators adapted from Narang's indicators of nuclear force posture.[127] At the beginning of each empirical chapter, I offer a description of an ideal-type brinkmanship and calibrated escalation posture for each strategic weapon. The main indicators of a brinkmanship posture are a doctrine envisaging the early use of tactical or strategic space, cyber and conventional missiles in a conflict, and tactical and strategic weapons that are not necessarily survivable or precise. The state may pre-delegate authority to use these weapons down the chain of military command. It will not be transparent about the features of its posture, to encourage an adversary to expect the worst-case scenario of how the state would use its weapons.

The main indicators of a calibrated escalation posture are a doctrine envisaging the early but limited use of tactical or strategic space, cyber and conventional missiles in a conflict, survivable strategic weapons and tactical weapons with precise effects, and the ability to assess the effectiveness of one's own attacks and attribute an adversary's attacks to it. The state will have strict command and control arrangements for strategic weapons to ensure that only top leaders can use them. It will also be transparent about these aspects of force posture to reassure an adversary that it would only use its most destructive capabilities as weapons of last resort. It may have a declaratory policy or engage in arms control or confidence building measures to

[127] Narang, *Nuclear Strategy in the Modern Era*, 4.

signal different thresholds for using tactical and strategic weapons to an adversary.[128] These indicators are summarized in the table below.

Indicator	**Brinkmanship**	**Calibrated Escalation**
Doctrine	Early, possibly large-scale use	Early limited use
Capabilities	Tactical weapons Strategic weapons	Accurate tactical weapons Survivable strategic weapons Battle damage assessment Attribution
Command and Control	Strict or delegated for all weapons	Strict for strategic weapons
Transparency	Opaque	Transparent

Table 3: Indicators of Brinkmanship and Calibrated Escalation Postures

To measure whether China had need for strategic leverage or not at any point in time, I examine Chinese decision-makers' reactions to deteriorations in its threat environment and look for evidence of the two motivations. First, I examine China's reaction to the end of the Cold War, when it began to satisfy all three scope conditions of the theory of strategic substitution. I examine China's reaction to two crises involving the United States and Taiwan: the 1995-6 Taiwan Straits Crisis; the series of cross-Strait and China-U.S. crises between 1999 and 2002, beginning with the U.S. bombing of the Chinese embassy in Belgrade in May 1999 and ending with Taiwanese President's Chen Shui-bian's suggestions for a referendum on independence in 2002. I also examine the U.S. Pivot to Asia policy announced in 2011, which was not a crisis or conflict involving China, the United States and/or Taiwan, but it nonetheless worsened China's threat environment by signaling that the United States would more actively counter

[128] For example, two states may clarify the application of the Geneva Conventions to non-nuclear strategic weapons, as non-governmental expert groups have tried to do with cyber attacks. See Michael N. Schmitt, ed., *Tallinn Manual 20 International Law Applicable Cyber Operations*, 2nd edition (New York, N.Y: Cambridge University Press, 2017).

China's rise. To measure strategic credibility motivations, I look for evidence that Chinese leaders viewed nuclear threats as lacking credibility, as well as evidence that space, cyber and conventional missile weapons offer more credible sources of strategic leverage, especially in the periods following these changes to its threat environment. To measure conventional inferiority motivations, I look for evidence that Chinese leaders recognized their conventional inferiority to confirm objective assessments of the military balance. Western scholars have assessed that China could not invade Taiwan and defeat U.S. forces in the East Asian theater today or at any point in the past.[129]

I measure the expected cost of retaliation according to its components of exposure to attack and feasibility of escalation control. I examine two factors to determine relative exposure to attack. First, I consider whether the adversary possesses the same kind of strategic weapon and whether treaties prohibit the state from developing that weapon.[130] If an adversary does not possess the same kind of strategic weapon, the state's relative exposure to attack is lower than its adversary's. Second, I consider whether there is a dependence asymmetry between the state and its adversary in the space and cyber domains. The state that depends less on space or computer networks for vital societal, governmental, or military functions is less exposed to attack than its adversary. Dependence asymmetries can be measured objectively, albeit crudely, by examining the proportion of a population that is connected to the internet and number of satellites a state has in orbit. I complement these crude, objective measures with an assessment

[129] See, for example, Eric Heginbotham et al., "The U.S.-China Military Scorecard" (Santa Monica, C.A.: RAND Corporation, 2015); Robert S. Ross, "Navigating the Taiwan Strait: Deterrence, Escalation Dominance, and U.S.-China Relations," *International Security* 27, no. 2 (Fall 2002): 48–85; You Ji, "The PLA and Diplomacy: Unraveling Myths about the Military Role in Foreign Policy Making," *Journal of Contemporary China* 23, no. 86 (2014): 236–54.

[130] Membership of treaties such as the Missile Technology Control Regime, Intermediate Nuclear Forces Treaty, and Outer Space Treaty may prevent a state from developing offensive space or conventional missile weapons.

of whether states have alternative means of carrying out military, governmental or societal functions if their space or cyber networks are degraded. For example, the United States possesses many satellites to support conventional military operations, but also has airborne alternatives for some of those functions.[131]

It is currently feasible to control escalation from the use of tactical space, cyber and conventional missile weapons. Escalation control has been feasible in cyberspace since approximately 2014, when the United States publicly demonstrated its ability to confidently attribute cyber intrusions to the Chinese military and the Sony cyber attack to North Korea.[132] Escalation control from the use of space weapons has been feasible since the early 1990s, when the United States successfully developed non-kinetic means, such as lasers and microwaves, to disable and destroy satellites.[133]

Sources

The dissertation follows the best practices for qualitative research on Chinese security policy.[134] It combines the extensive use of written Chinese-language sources with expert

[131] The 2010 U.S. National Space Strategy sought resilience for U.S. systems through "cost-effective space system protection, cross-domain solutions, hosting payloads on a mix of platforms in various orbits, drawing on distributed international and commercial partner capabilities, and developing and maturing responsive space capabilities." U.S. Department of Defense, "National Security Space Strategy: Unclassified Summary," January 2011, 11. See also Jaganath Sankaran, "Limits of the Chinese Antisatellite Threat to the United States," *Strategic Studies Quarterly* 8, no. 4 (Winter 2014): 19–46.

[132] The United States may have been able to attribute cyber attacks to their perpetrators before 2014, but there is no evidence that the United States or other countries factored that possibility into their choices of military cyber force posture before 2014. For a discussion of the evolution of U.S. attribution capabilities, see Lin, "Attribution of Malicious Cyber Incidents."

[133] Stares, *The Militarization of Space*, 214–21.

[134] See James Mulvenon and Andrew N.D. Yang, *A Poverty of Riches: New Challenges and Opportunities in PLA Research* (Santa Monica, C.A.: RAND Corporation, 2003).

interviews.[135] Written materials include Chinese newspapers, books and journal articles, including doctrinal writings, campaign manuals, analyses of foreign military capabilities, academic and technical analyses, military textbooks, biographies, chronologies and memoirs of decision-makers. Many of these written sources are only available within China and have not been examined in existing Western scholarship. Before relying on any written source, I evaluated the authoritativeness of its publisher and editor(s) or author(s).[136] To supplement these written sources and assist with their interpretation I also conducted more than 70 interviews with 50 Chinese experts on nuclear, space and cyber policy, as well as China's conventional military strategy and foreign policy, between 2015 and 2017. Those experts came from academia, government-affiliated research institutions, military educational and research institutions, defense industry research institutions, and weapons laboratories. I did not interview decision-makers in office or military officers with operational duties. To protect the anonymity of interviewees given the sensitivity of the subject, their names and affiliations are not provided where my empirical analysis relies on insights from interviews.

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[135] Thomas J. Christensen, Alastair Iain Johnston, and Robert S. Ross, "Conclusions and Future Directions," in *New Directions in the Study of China's Foreign Policy*, ed. Alastair Iain Johnston and Robert S. Ross (Stanford, CA: Stanford University Press, 2006), 393.

[136] I treat official government documents such as White Papers, and publications of the Party Central Documents Press, as the most authoritative statements of Chinese policy. Memoirs, chronologies and collected papers of key decision-makers are taken as the most authoritative evidence of the decision-making process. Official news reports from the *PLA Daily* and *People's Daily* are also treated as highly authoritative. Publications edited, published, or commissioned by the PLA's four general departments, are highly influential, although not authoritative. Less authoritative but still influential are edited research publications of the Academy of Military Sciences (AMS), China's premier research organization for doctrine reporting directly to the Central Military Commission, China's top military decision-making body, and the National Defense University (NDU), the top military teaching and research institutions. These edited publications include various editions of the *Science of Military Strategy* published by both institutions. Books authored by individuals, opinion articles in the *PLA Daily*, and academic research published in two AMS journals, *China Military Science* and *Foreign Military Arts*, or the *NDU Academic Journal*, are generally not authoritative but may be influential, depending on the identity of the author.

Conclusion

This chapter has outlined a theory of strategic substitution to answer the question of why and how China maximizes strategic leverage in limited wars without using nuclear weapons. The theory outlines two independent variables that explain why and how states develop space, cyber and conventional missile postures to gain strategic leverage in limited wars: the need for strategic leverage and the expected cost of retaliation. If decision-makers assess that nuclear threats lack credibility in limited wars, changes for the worse in a state's threat environment result in a need for strategic leverage. States satisfy that need for leverage by pursuing a coercive space, cyber or conventional missile capability. That need for strategic leverage is even stronger if a state faces an adversary with a stronger conventional military. States use the expected cost of in-kind retaliation, a function of its exposure to attack and the feasibility of controlling escalation, to select the force posture that will give them the most leverage over an adversary. In the following chapters I test this theory. First, I examine China's retaliatory nuclear posture to establish the scope conditions of the theory and measure the strategic credibility component of the need for strategic leverage variable. Second, I apply the theory of strategic substitution to China's specific force posture decisions and choices of its space, cyber and conventional missile postures to demonstrate that the theory explains China's strategic force posture choices better than the alternative explanations.

Chapter 2: China's Nuclear Force Posture I, Wars of Invasion

Introduction

Chinese leaders decided to develop nuclear weapons in 1955 and successfully tested a nuclear device on October 16, 1964. They selected a retaliatory nuclear force posture immediately after the test. The government issued a statement declaring that China "solemnly declares that China will never at any time or under any circumstances be the first to use nuclear weapons."[1] China fully realized its retaliatory nuclear force posture in 1984 and maintains that posture today. For the past five decades Chinese leaders have not viewed their nuclear weapons as a credible source of strategic leverage. China's nuclear forces have fulfilled two roles in its overall defense policy: to prevent other nuclear powers from using nuclear threats to coerce Beijing and to implement a nuclear counterattack if China suffers a nuclear attack from another country.

In this chapter and the next, I examine Chinese nuclear force posture decision-making to establish two of the scope conditions of the theory of strategic substitution, China's retaliatory nuclear posture and limited war scenario. This chapter examines China's retaliatory nuclear posture and its nuclear posture decision-making from 1952 until approximately 1984, when China faced a total war. The following chapter describes Chinese nuclear force posture and examines decision-making from 1984 onwards when it no longer faced a total war. The theory of strategic substitution explains China's strategic posture decision-making after 1988 only, once China satisfied all three scope conditions for the theory: a retaliatory nuclear posture, a

[1] "Statement of the People's Republic of China Government," *People's Daily*, October 16, 1964.

limited war scenario, and conventional military inferiority compared to its adversary in that scenario. Before 1984 China's nuclear and conventional weapons provided it with adequate strategic leverage to respond to any changes for the worse in its threat environment. It therefore had no need to pursue non-nuclear strategic weapons to maximize its strategic leverage. Chinese leaders did not view their nuclear weapons as a source of strategic leverage when they faced a total war against the Soviet Union or United States. Instead they viewed their conventional military power and a retaliatory nuclear posture as adequate to ensure the survival of the Chinese state against a conventional and nuclear attack respectively, thereby achieving their political aims in a total war.

The chapter makes four contributions to the overall argument of this dissertation. First, it establishes one of the three scope conditions of the theory of strategic substitution, China's retaliatory nuclear posture, from 1964 until the present. Second, it establishes that China did not have a need for strategic leverage, the first independent variable of the theory of strategic substitution, in a total war scenario. Nor did it have any non-nuclear strategic force postures, demonstrating the importance of the second scope condition, a limited war scenario. As later chapters show, China possessed the technology to pursue a conventional missile posture since the 1960s and it began to research the technology for anti-satellite weapons in 1966.

Third, the chapter demonstrates that Chinese leaders did not think they could gain strategic leverage from threatening to use nuclear weapons first against another nuclear-armed state because those threats would have lacked credibility. China could have used nuclear weapons for both deterrence and defense of a Soviet land invasion in the 1970s and early 1980s, but its

leaders rejected the nuclear option even when they faced the highest stakes in a total war. It is therefore less surprising that, as the following chapter demonstrates, China viewed nuclear threats as lacking strategic leverage when it faced a limited war with stakes. Fourth, this chapter indicates that the two assumptions of the theory of strategic substitution about Chinese leaders' views of nuclear weapons are empirically supported. Chinese leaders and strategists did not think it was feasible to control nuclear escalation. They also lacked the risk tolerance to make credible threats to use nuclear weapons first using tactical nuclear weapons that would increase the risk of nuclear war.

This chapter does not aim to explain which of the many factors put forward in the existing literature best explains China's choice of a retaliatory force posture. Scholars have argued that geography, threat environment, leadership beliefs, and domestic organizational factors all affected China's decisions.[2] But it is unlikely that any single factor can explain China's choice of a retaliatory posture. Instead, this chapter highlights that China's conventional military power, geography and doubts about the credibility of threatening to use nuclear weapons to gain strategic leverage against a nuclear-armed state factored into that choice. During the Cold War China could take advantage of its vast geography and population, together with its conventional military forces, to prevent an adversary from invading it. It did not need to threaten nuclear first-use to compensate for its inferior conventional military, compared to the two superpowers, because of its strategic depth. In the words of arms control expert Sun

[2] M. Taylor Fravel and Evan S. Medeiros, "China's Search for Assured Retaliation: The Evolution of Chinese Nuclear Strategy and Force Posture," *International Security* 35, no. 2 (Fall 2010): 48–87; M. Taylor Fravel, *Active Defense: China's Military Strategy Since 1949* (Princeton, N.J., 2019); Li Bin and Zhao Tong, eds., *Lijie Zhongguo He Siwei [Understanding Chinese Nuclear Philosophy]* (Beijing: Shehui Kexue Wenxian Chubanshe, 2016); Vipin Narang, *Nuclear Strategy in the Modern Era* (Princeton, N.J.: Princeton University Press, 2014), ch5; Wu Riqiang, "Certainty of Uncertainty: Nuclear Strategy with Chinese Characteristics," *Journal of Strategic Studies* 36, no. 4 (2013): 579–614.

Xiangli, the "No First-Use policy reflects Chinese decision-makers' sober acknowledgment of the special characteristics of nuclear weapons, it also reflects China's self-confidence in conventional combat, and its confidence of gaining strategic deterrence through a nuclear retaliatory capability."[3]

Existing scholarship has shown that two other factors have had an important influence on China's choice of a retaliatory nuclear posture: leadership beliefs and organizational factors. Chinese leaders' beliefs that nuclear weapons were not useful tools for warfighting influenced both their choice of a retaliatory nuclear posture in 1964 and the durability of that posture until the present.[4] Top civilian leaders never delegated the authority to decide nuclear posture to the PLA, which also explains the durability of China's retaliatory posture despite changes to its threat environment.[5]

This chapter begins with a description of China's second-use nuclear posture, from 1964 until the present. The second section outlines China's decision to develop nuclear weapons in 1955 to counter nuclear threats from its superpower adversaries and the establishment of its retaliatory nuclear force posture after 1964. The third section uses new evidence to examine China's decision not to use nuclear weapons for either battlefield advantages or strategic leverage when it faced the most serious threat to its survival, a Soviet armored invasion across its northern border in the 1970s and 1980s.

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[3] Sun Xiangli, *He Shidai de Zhanlue Xuanze - Zhongguo He Zhanlue Wenti Yanjiu [Strategy Choices in the Nuclear Era - Research on China's Nuclear Strategy]* (Mianyang: Zhongguo Gongcheng Wuli Yanjiu Yuan Zhanlue Yanjiu Zhongxin, 2013), 148.
[4] Fravel and Medeiros, "China's Search for Assured Retaliation"; Li and Zhao, *Lijie Zhongguo He Siwei*; Wu, "Certainty of Uncertainty."
[5] Fravel, *Active Defense*.

I. China's Retaliatory Nuclear Posture

There is a consensus among Western and Chinese scholars that China selected a retaliatory nuclear posture in 1964 and has retained that posture ever since. China's retaliatory nuclear posture became fully operational in 1985, when the Second Artillery, China's strategic missile forces, developed the capability to launch missiles independently of other PLA units.[6] The key features of China's retaliatory force posture are: its second-use doctrine, small arsenal of strategic weapons oriented towards surviving an enemy disarming first-strike, strict and centralized command and control arrangements, and transparency about how it would use its nuclear weapons in a conflict, in particular its No First-Use nuclear declaratory policy. If China planned to use its nuclear weapons for strategic leverage, its posture would look more like a brinkmanship or calibrated escalation posture. At a minimum, it would need a first-use doctrine. It would also need to have tactical nuclear weapons and delegate authority to use them to theater commanders to make first-use threats credible.[7]

Doctrine

China does not intend to use its nuclear weapons first to gain strategic leverage over an adversary in a conventional war. Its nuclear doctrine envisages the use of nuclear weapons for retaliation only, which implements the No First-Use policy. A 1975 Combined Combat

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[6] Deng Lizhong, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu [Research on the Combat Role of Second Artillery Nuclear Missile Forces under Informationized Conditions]" (Masters Thesis, PLA National Defense University, 2004), 20; Wu, "Certainty of Uncertainty," 28.

[7] See Narang's description of an "asymmetric escalation" posture for a description of an ideal-type first-use posture Narang, *Nuclear Strategy in the Modern Era.*

Campaign Regulation (*Hecheng Zhandou Gaize*) faithfully reflects that policy, "at any time, under any circumstances, we will absolutely not use nuclear weapons first, only when the enemy uses them first, will we, according to the order of the supreme command, then use this kind of weapon to resolutely counterattack."[8] China intends to use nuclear weapons only after absorbing a nuclear attack, to inflict unacceptable damage on an adversary and "gain mastery after the enemy has struck" (*houfa zhiren*).[9] The goals of nuclear weapons within China's defense policy are to deter a nuclear attack and deter nuclear coercion.[10] Some Chinese strategists describe the role of its nuclear weapons as "defensive deterrence,"[11] or deterrence-only weapons, in contrast to cyber, space, and conventional missile weapons that can also be used for combat campaigns and deterrence.[12]

The only campaign within the PLA's official doctrinal framework for the use of its nuclear weapons is a nuclear counter-attack campaign.[13] There is no evidence that China ever had a first-use campaign for its nuclear weapons. China's first operational doctrine for the use of its nuclear weapons appeared within the overall PLA doctrinal framework in 1984. That year the PLA issued a set of experimental (*shixing ben*) combat regulations for China's nuclear missile

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[8] Sang Zhongling and Xiao Kaishi, "Wo Jun Zhanyi Lilun de Yanjiu Ying Zengqiang 'He Guannian' [We Must Strengthen the 'Nuclear Concept' in Our Army's Campaign Theory]," in *Zhanyi Jiben Lilun Xintan [New Explorations of the Basic Theory of Campaigns]*, ed. Guofang Daxue Zhanlue Yanjiu Bu [National Defense University Strategy Research Department] (Beijing: Guofang Daxue Chubanshe, 1989), 806.
[9] Fravel, *Active Defense*; Aiping Zhang, *Zhang Aiping Junshi Wenxuan [Selected Military Works of Zhang Aiping]* (Beijing: Changzheng Chubanshe, 1994), 392.
[10] Shou Xiaosong, ed., *Zhanlue Xue [The Science of Military Strategy]* (Beijing: Junshi Kexue Yuan Chubanshe, 2013), 172.
[11] Ibid., 172.
[12] Ibid., 100.
[13] Xue Xinglin, *Zhanyi Lilun Xuexi Zhinan [Campaign Theory Study Guide]* (Beijing: Guofang Daxue Chubanshe, 2001), 384–93; Yu Jixun, *Di'er Paobing Zhanyi Xue [The Science of Second Artillery Campaigns]* (Beijing: Jiefangjun Chubanshe, 2004); Zhang Yuliang, *Zhanyi Xue [The Science of Military Campaigns]* (Beijing: Guofang Daxue Chubanshe, 2006).

force.[14] Combat regulations for nuclear missile and support units have been updated at least twice since 1984 as part of PLA-wide updates to its operational regulations.[15]

Descriptions of China's nuclear counterattack campaign demonstrate that its nuclear posture is intended to deter nuclear attacks only rather than gain strategic leverage in a conventional war. The objective of the campaign is for China's nuclear force to survive an enemy's disarming first nuclear strike and then carry out a retaliatory strike. The 2004 *Science of Second Artillery Campaigns*, a classified campaign manual for China's missile force, named the Second Artillery until 2016, described the campaign as follows: "according to the standpoint of our country's No First-Use principle, the Second Artillery can only carry out nuclear missile strikes against an adversary's important strategic targets after an adversary has carried out a nuclear strike against our country and according to the combat orders of the highest supreme command."[16] The intensity of counterattack campaigns may vary from those involving only one missile base to all of the missile force's five bases.[17] The ability to conduct campaigns of varying intensity does not, however, mean that China would engage in the kind of controlled coercive bargaining envisaged by a calibrated escalation posture. As one recent text explained, "it is necessary to ... control the scope of the nuclear counterattack, do not conduct equivalent

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[14] The regulations were called the "Second Artillery Missile Support Unit and Missile Launch Main Unit Combat Regulations."

[15] The most recent fifth generation of combat regulations were completed by 2009 and never implemented. Ren Jian, ed., *Zuozhan Tiaoling Gailun [An Introduction to Operations Regulations]* (Beijing: Junshi Kexue Yuan Chubanshe, 2016), 52.

[16] Yu, *Di'er Paobing Zhanyi Xue*, 298.

[17] Ibid., 145, 147. Both the 1997 and 2011 editions of the PLA's military terminology reference volume, the *Junyu*, also note that a nuclear missile assault may also include a single nuclear missile only, or a massive or large-scale assault. They do not clearly indicate whether these terms are included in the Second Artillery section because they are a part of Second Artillery campaigns, or enemy campaigns to which the Second Artillery would need to respond. Junshi Kexue Yuan [Academy of Military Science], *Zhongguo Renmin Jiefang Jun Junyu [PLA Military Terminology]* (Beijing: Junshi Kexue Yuan Chubanshe, 1997), 1021. Junshi Kexue Yuan [Academy of Military Science], *Zhongguo Renmin Jiefang Jun Junyu [PLA Military Terminology]* (Beijing: Junshi Kexue Yuan Chubanshe, 2011), 508.

nuclear strikes to an adversary, do not let oneself be led by the nose by an adversary, but play to one's strengths: you fight your way, I fight my way."[18] The Second Artillery would use strategic nuclear weapons on "strategic targets," which include civilian and soft military targets,[19] not enemy nuclear forces.

China's mobile nuclear missiles remain in garrison in peacetime and their warheads stored separately in a central storage facility.[20] If China anticipates a crisis involving a risk of nuclear attack, Second Artillery equipment inspection units would transport the warheads from the warhead storage facility in the center of China and mate them with missiles operated by a launch brigade. Road-mobile missiles would then be dispatched on deterrent patrols. An important mission for China's missile force is "close protection" of its nuclear missiles to ensure they would survive an enemy's attempt at a disarming first strike.[21] One text describes how on receipt of warning of an incoming attack, missile brigades would take up concealed positions and implement emissions control of electronic signals to prevent them from being identified and destroyed by an enemy first strike.[22]

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[18] Zhou Xinsheng, ed., *Junzhong Zhanlue Jiaocheng [Study Guide to Military Service Strategy]* (Beijing: Junshi Kexue Yuan Chubanshe, 2013), 206.
[19] Author's interviews, Beijing, 2016. Xue, *Zhanyi Lilun Xuexi Zhinan*, 384–93.
[20] Mark A. Stokes, "China's Nuclear Warhead Storage and Handling System" (Washington, D.C.: Project 2049 Institute, March 12, 2010). Ge Dongsheng, *Nanwang Lijian Suiyue [Memorable Years Sharpening the Sword]* (Beijing: Junshi Kexue Yuan Chubanshe, 2016), 190.
[21] Yu, *Di'er Paobing Zhanyi Xue*. Di'Er Paobing Siling Bu [Second Artillery Command], ed., *Di'Er Paobing Zhanyi Fa [Second Artillery Campaigns]* (Beijing: Lantian Chuban She, 1996), 22–29.
[22] Lu Lihua, ed., *Jundui Zhihui Lilun Xuexi Zhinan [A Guide to the Study of Military Command Theory]* (Beijing: Guofang Daxue Chubanshe, 2004), 289.

Capabilities

China's small nuclear arsenal relies on mobility and diversity to ensure its survival following an enemy disarming strike. Its arsenal is not well-suited for controlled coercive bargaining with either the United States or, previously, the Soviet Union, because it is an order of magnitude smaller than both countries' arsenals. China would run out of nuclear weapons long before both countries in any tit-for-tat nuclear exchange. The emphasis on hardening and mobility for survivability within China's nuclear force would also not be necessary if it planned to use them first and early in a conflict. China has no deployed tactical nuclear weapons. In theory, its medium and intermediate range forces could be used for limited nuclear strikes to gain strategic leverage and operational advantages against a distant adversary like the United States. China has, however developed the technology for missile defense,[23] short-range ballistic missiles,[24] and low-yield warheads[25] that it could deploy if it decided to adopt a first-use posture.

Chinese leaders emphasized that a small, survivable nuclear force is sufficient for China's deterrence requirements. In 1984, the Second Artillery adopted the principle of a lean but effective (*jinggan youxiao*) nuclear force as the guiding principle for force development.[26] A

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[23] See Li Bin, "What China's Missile Intercept Test Means" (Washington, D.C.: Carnegie Endowment for International Peace, February 4, 2013), http://carnegieendowment.org/2013/02/04/what-china-s-missile-intercept-test-means/io86.

[24] In 1993 the CIA concluded that China had almost certainly developed a tactical nuclear warhead and predicted the deployment of nuclear-tipped short-range ballistic missiles. Hans M. Kristensen and Robert S. Norris, "Chinese Nuclear Forces, 2015," *Bulletin of the Atomic Scientists* 71, no. 4 (2015): 80, 82. The CIA may have mistook China's first conventionally short-range ballistic missile units for nuclear-armed units. See Chapter 4.

[25] See below and Jonathan Ray, "Red China's 'Capitalist Bomb': Inside the Chinese Neutron Bomb Program," China Strategic Perspectives (Washington, D.C.: Institute for National Strategic Studies, National Defense University, January 2015).

[26] Fravel, *Active Defense*; Guowuyuan Xinwen, "2006 Nian Zhongguo de Guofang [China's National Defense in 2006]" (Beijing: Guowuyuan Xinwen Bangongshi, 2006). Shou, *Zhanlue Xue*, 173.

"lean" force must be no larger than necessary to carry out its goals. An "effective" force must be able to survive an enemy first strike, penetrate enemy missile defenses, and deliver a sufficient number of nuclear warheads to enemy territory to deter that enemy from threatening or attacking China with nuclear weapons. China aims to maintain a large enough arsenal to ensure that it can retaliate following a preemptive strike, but not so large as to waste its resources or trigger an arms race.[27] The qualitative and quantitative requirements for China's nuclear force structure have always been relative to that of its principal adversary: the United States until the mid 1960s, the Soviet Union from the mid 1960s until 1991, and the United States thereafter.[28]

China's development of nuclear warheads and delivery systems prioritized improvements in range, then survivability and penetrability. China tested a fission device on October 16, 1964 and a thermonuclear weapon on June 17, 1967. China's first ballistic missile capable of carrying a nuclear warhead was the DF-2 with a range of 1,450 kilometers.[29] It tested the intermediate range DF-3, with a range of 2,800 kilometers in December 1966, which brought U.S. bases in East Asia within range. An upgraded version, the DF-3A, was deployed in 1971 with a range of 3,000 kilometers.[30] The DF-4, initially deployed in 1980, has a range of at least 5,500 kilometers.[31] The DF-5 missile, with a range of at least 13,000 kilometers, was tested in May 1980 and deployed in 1981. It was the first Chinese missile capable of reaching the entire continental United States. An improved variant, the DF-5A, was deployed in the mid-1990s,

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[27] See Huo Xiaoyong, ed., *Junzhong Zhanlue Xue [The Science of Service Strategy]*, 2nd ed. (Beijing: Guofang Daxue Chubanshe, 2007), 294.
[28] Fravel and Medeiros, "China's Search for Assured Retaliation," 79.
[29] Ge, *Nanwang Lijian Suiyue*, 72.
[30] Kristensen and Norris, "Chinese Nuclear Forces, 2015," 78.
[31] Ibid., 78.

while a variant equipped with a multiple independently-targeted reentry vehicle (MIRV), the DF-5B, was deployed in 2015.[32]

Changes to China's force structure since the 1980s have emphasized the survivability of its nuclear weapons. China's arsenal remains limited in size, with only 40-60 inter-continental ballistic missiles (ICBMs), 10 of which are equipped with MIRVs, and a total delivery system inventory of approximately 163 missiles.[33] In the early 1980s, China began constructing a series of tunnels to allow its nuclear missile delivery systems to ride out a first nuclear strike, which it finally completed in 1995.[34] During the 1990s, China began to deploy mobile land-based missile delivery systems to ensure the survivability of its nuclear weapons. Its first road-mobile ballistic missile, the DF-21A, with a range of 2,150 kilometers, was deployed in 1991. The DF-31, with a range of at least 7,000 kilometers, was deployed in 2006, while the DF-31A variant, with a range of at least 11,000 kilometers, was deployed in 2007.[35] The DF-31AG, which has an off-road capability so that it does not need to launch from prepared launch sites vulnerable to enemy surveillance and attack, was revealed during military exercises in July 2017.[36] China will likely deploy an inter-continental range, MIRVed, road-mobile missile, the DF-41,[37] in the near future. In 2016 China unveiled the dual-capable nuclear-conventional, accurate, road-mobile intermediate-range DF-26 missile, with a range of 3,000-4,000

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[32] Ibid., 78.
[33] Hans M. Kristensen and Robert S. Norris, "Chinese Nuclear Forces, 2016," *Bulletin of the Atomic Scientists* 72, no. 4 (2016): 206.
[34] Wu, "Certainty of Uncertainty," 29–30.
[35] Kristensen and Norris, "Chinese Nuclear Forces, 2015," 78.
[36] Alex Lockie, "Watch China Debut an ICBM That Can Hit the US with Multiple Nuclear Warheads," *Business Insider*, August 1, 2017, http://www.businessinsider.com/china-df-31ag-icbm-rollout-parade-2017-7.
[37] Office of the Secretary of Defense, "Annual Report to Congress on the Military Power of the People's Republic of China" (Washington, D.C., 2017), 31.

kilometers at a military parade.[38] It is not clear whether any DF-26 missiles carrying nuclear warheads have been deployed.

China's nuclear forces take advantage of the country's vast size to improve the ability of the force to survive a disarming first strike. China has dispersed deployments of its nuclear weapons since 1975, hiding them in mountains and other topographical features, according to a principle of "caves, dispersal, mountains (*tong, san, shan*)."[39] Its nuclear missile units are commanded by five missile bases located in Shenyang in China's north, Anhui to the east, Yunnan to the south, and the interior provinces of Hunan, Henan and Gansu, although brigades are in different locations to these bases. Most of China's intercontinental ballistic missile brigades are located in these three interior bases to make it more difficult for an adversary to find and destroy them. All bases have both conventional and nuclear subordinate launch brigades.[40]

Although China's nuclear arsenal is primarily a land-based missile force, it has both ballistic missile submarines and nuclear-capable bombers that are not very survivable. China successfully tested a ballistic missile submarine capability paired with a submarine-launched ballistic missile (SLBM) in 1986. But the Xia class boat, armed with a JL-1 missile, never

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[38] Richard D. Fisher Jr, "DF-26 IRBM May Have ASM Variant, China Reveals at 3 September Parade," *IHS Jane's Defence Weekly*, September 3, 2015, http://www.janes.com/article/53994/df-26-irbm-may-have-asm-variant-china-reveals-at-3-september-parade.

[39] Li Shuiqing, *Cong Hong Xiaogui Dao Huojian Bing Siling: Li Shuiqing Huiyi Lu [From Little Red Monster to Rocket Force Commander: Memoirs of Li Shuiqing]* (Beijing: Jiefang Jun Chubanshe, 2009), 512.

[40] Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Strategy and U.S.-China Strategic Stability," *International Security* 40, no. 2 (Fall 2015): 7–50. A DF-26 brigade, which is believed to be conventional, was added to the missile forces' only exclusively nuclear base in 2014. Shi Yijie, "Wei Daying Xinxi Hua Zhanzheng Chashang Tengfei [Plugging into Rapid Advances in Capabilities for Winning Informationized Wars]," *Huojian Bingbao [Rocket Force Daily]*, December 2, 2014. The extent of and reasons for commingling Chinese conventional and nuclear missiles is outlined in Chapter 5.

conducted a deterrent patrol. China began to develop a second-generation ballistic missile submarine (SSBN), the Jin class, and a longer-range SLBM, the JL-2, in the 1970s. Although very noisy, and therefore not survivable against an adversary with strategic anti-submarine warfare capabilities, the U.S. Department of Defense called China's Jin class SSBN a "credible sea-based deterrent."[41] China tested an air-launched ballistic missile in 2017 and 2018, which is believed to be a variant of its DF-21 medium-range ballistic missile (MRBM), which would be carried by its non-stealthy H-6 bomber.[42]

Support capabilities for China's nuclear force are also optimized for its retaliatory campaign. The Second Artillery invested in multiple, redundant communications links between its headquarters near Beijing and its missile bases to ensure reliable communications following a nuclear attack. Currently, Second Artillery communications depend on fiber-optic cables installed no later than 2003, as well as wired, wireless, and satellite communications to ensure redundancy.[43] Its automated command and control system for missile force brigades allows for "skip-echelon" command and control arrangements. Leaders could directly command a launch battalion from headquarters in Beijing, which ensures command and control of the battalion even if its communications with intermediate links in the chain of command, the missile force base or brigade, are severed. Its central nuclear warhead storage facility is tunneled into a mountain in Shaanxi province.[44]

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[41] Office of the Secretary of Defense, "Annual Report to Congress on the Military Power of the People's Republic of China," 60.
[42] Ankit Panda, "Revealed: China's Nuclear-Capable Air-Launched Ballistic Missile," *The Diplomat*, April 10, 2018, https://thediplomat.com/2018/04/revealed-chinas-nuclear-capable-air-launched-ballistic-missile/.
[43] Yu, *Di'er Paobing Zhanyi Xue*, 349.
[44] Stokes, "China's Nuclear Warhead Storage and Handling System," 3.

China's existing intelligence, surveillance and reconnaissance (ISR) capabilities provide it with a short period of strategic warning of an incoming attack, which may give its missile units enough time to take cover or hide from an incoming attack. China's missile force has stated its intent to improve strategic warning capabilities since 2013,[45] The PLA has not yet deployed offshore or satellite-based radars to significantly increase the length of strategic warning it would receive of a nuclear attack.

Command and Control

Only China's top civilian and military leaders can authorize the alerting and use of China's nuclear arsenal.[46] The Communist Party Politburo Standing Committee, the top civilian decision-making body, and the Central Military Commission (CMC), the top military decision-making body, must both agree to alert or launch nuclear weapons. The CMC is chaired by the Communist Party General Secretary in his capacity as Commander-in-Chief. China's nuclear weapons are under stricter command and control arrangements than its non-nuclear strategic weapons, whose use could be authorized by the CMC alone.[47]

To ensure that Chinese leaders can exercise strict command and control over China's nuclear forces, its nuclear missile units are not integrated into the same chain of command as its

[45] State Council Information Office of the People's Republic of China, *China's Military Strategy* (Beijing: Renmin Chubanshe, 2015), section 4; Xiao Tianliang, ed., *Zhanlue Xue [The Science of Military Strategy]* (Beijing: Guofang Daxue Chubanshe, 2015), 368; Zhou, *Junzhong Zhanlue Jiaocheng [Study Guide to Military Service Strategy]*, 208.
[46] Shou, *Zhanlue Xue*, 228; Jiang Tiejun, ed., *Dang de Guofang He Jundui Gaige Sixiang Yanjiu [Research on Party Defense and Military Reform Thought]* (Beijing: Junshi Kexue Yuan Chubanshe, 2015), 79.
[47] Author's interview, Beijing, 2016.

conventional army, navy, and air force units. A direct line of command from the CMC to its nuclear missile units was established in 1967. The first set of regulations for nuclear missile units, the "Temporary Regulations on the Second Artillery's Basic Tasks and Command Relationships,"[48] were promulgated by the CMC on July 12, 1967 ("1967 Regulations"). The regulations state that the Second Artillery's "force development, deployments, maneuvers, and especially its combat [operations], must all be under the collective leadership of the CMC; extremely strictly, extremely precisely, obeying and carrying out the orders of the CMC."[49]

The CMC's direct command over Chinese missile units has not changed since 1967. To implement CMC command and control of China's nuclear missiles the 1967 Regulation established a three-tier chain of command. Command authority flows from the CMC to the Second Artillery, the missile combat base, and then to the missile regiment, "in order to make the leadership and organization of command easy." The CMC could also skip echelons, "at the necessary time the Second Artillery could bypass the immediate leadership to directly command the regiment."[50] In 2004, the chain of command was the same as that described in the 1967 Regulations, including the ability to skip echelons, except that the launch company was added as a fourth echelon at the bottom of the command and control hierarchy.[51] According to a 2004 Second Artillery campaign manual, command of nuclear brigades would bypass the command and control posts set up in wartime for each of the PLA's geographic Military Regions. By contrast, its conventional missile brigades could be commanded by Military Region wartime command and control posts, or directly commanded by the CMC, as described

[48] "Guanyu Di'er Paobing Jiben Renwu he Lingdao Guanxi de Zanxing Guiding."
[49] Wu Lie, *Zhenrong Suiyue [Memorable Years]* (Beijing: Zhongyang Wenxian Chubanshe, 1999), 357.
[50] Ibid.
[51] Yu, *Di'er Paobing Zhanyi Xue*, 161.

in Chapter 4.[52] These command and control arrangements are likely to endure after the 2015 PLA reforms, which elevated the Second Artillery to a full service and re-named it the PLA Rocket Force.[53]

It is unlikely that there is any degree of pre-delegation of China's nuclear forces beyond the Party and CMC Chairman, the Politburo, or the CMC, despite the risk that leadership decapitation may neutralize China's retaliatory capability. Recent Second Artillery texts indicate that, at most, nuclear missile unit commanders may, "under their stipulated responsibilities to direct military operations, within the limits of their authority, act promptly at their own discretion in an emergency, to ensure the realization of the CMC's strategic intention."[54] China appears to have focused instead on hardening and ensuring redundancy in its command and control infrastructure to ensure that launch orders can always, eventually, be executed. In the event that communications are disrupted, special teams may be dispatched from the central command to the bases, brigades or launch companies to personally deliver

[52] Yu, *Di'Er Paobing Zhanyi Xue*, 161.
[53] Ni Guanghui, "Cong Di'er Paobing Dao Huojianjun Bian Yu Bubian," *Renmin Ribao [People's Daily]*, January 10, 2016, http://military.people.com.cn/n1/2016/0110/c1011-28033340.html. The establishment of permanent Theater Commands to replace the Military Regions and the command posts they would establish in wartime, was intended to better facilitate joint operations. This reform does not affect the command and control arrangements for nuclear missile units.
[54] The text reads as follows: "zai guiding de yongbing zeren, qianxian fanwei nei jiduan xingshi, baozheng shixian Zhongyang Junwei de zhanlue yitu." Zhou, *Junzhong Zhanlue Jiaocheng*, 205.

launch orders.[55] China likely has some form of technical use-control mechanism to prevent unauthorized use,[56] which may be managed by the Second Artillery.[57]

Transparency

China has taken steps to make its retaliatory nuclear posture as credible as possible to an adversary. It has a clear and strict declaratory No First-Use policy. The PLA's nuclear capabilities, doctrine and command and control arrangements are optimized for retaliation. There is some ambiguity about the strictness of the posture due to debates within China in recent years about what to do if the United States used conventional weapons to degrade China's nuclear arsenal, examined in Chapter 3.[58] Chinese strategists are aware that foreign countries have doubts about the sincerity of China's NFU policy.[59] The Chinese Government denied the existence of any officially sanctioned debate over changing its NFU policy in the early 2000s, which indicates an awareness that debates over the policy undermine its credibility. Through 47 nuclear weapons tests between 1964 and 1996, as well as flight tests of its missile capabilities and one paired missile and warhead test in 1966, China has demonstrated that it

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[55] Yu, *Di'er Paobing Zhanyi Xue*, 349.

[56] Chinese nuclear scientists requested U.S. assistance with a Permissive Action Lock (PAL) use control device in the early 1990s. The request was denied, but China likely either developed its own encrypted devices or received assistance from Russia. Steve Coll, "The Man Inside China's Bomb Labs," *The Washington Post*, May 16, 2001, https://www.washingtonpost.com/archive/politics/2001/05/16/the-man-inside-chinas-bomb-labs/7d5a0209-fe13-4394-9ff5-6bbd16538f2e/?utm_term=.3f2e38f8f267.

[57] A "nuclear security and control system (*he anquan kongzhi xitong*) able to effectively prevent unauthorized launch and accidental launch" was a priority for Second Artillery force development in 2013. Zhou, *Junzhong Zhanlue Jiaocheng*, 209.

[58] Michael S. Chase, "China's Transition to a More Credible Nuclear Deterrent: Implications and Challenges for the United States," *Asia Policy* 16 (July 2013): 69–101; Cunningham and Fravel, "Assuring Assured Retaliation," 19–26.

[59] Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 19; Pan Zhenqiang, "Zhongguo Bu Shouxian Shiyong He Wuqi Wenti Yanjiu [Research on the Issue of China's No First Use of Nuclear Weapons]," in *Lijie Zhongguo He Siwei [Understanding Chinese Nuclear Philosophy]*, ed. Li Bin and Zhao Tong (Beijing: Shehui Kexue Wenxian Chubanshe, 2016), 28–52, 29.

has the warheads and delivery systems to conduct a nuclear counter-attack on an adversary. China is not transparent about the features of its deployed weapons or capabilities under development such as their precision, reliability, penetrability, numbers and locations.[60] This lack of transparency is likely to avoid giving an adversary information that could enhance the effectiveness of a disarming first strike in a future conflict.[61]

II. China's Nuclear Force Posture in the Era of Total Wars

The rest of this chapter examine China's decisions to establish and develop its nuclear force posture between 1952 and 1984. China developed nuclear weapons in the 1950s to prevent the United States from being able to threaten Beijing with nuclear attacks the way it had during the Korean War from 1950-1953. Despite a scare that the Soviet Union would attack China with nuclear weapons during the 1969 Sino-Soviet border clash, including attacks on its nuclear missile bases, Chinese leaders did not review their nuclear force posture in light of the new threat of a Soviet invasion until the internal chaos of China's Cultural Revolution ended in 1976. Rather than change its nuclear posture to gain strategic leverage over Moscow, in 1978 Chinese leaders doubled down on their efforts to acquire a survivable retaliatory nuclear force and ensure that their nuclear missile forces were launch-ready. They also canceled a tactical nuclear gravity bomb research program and initiated an enhanced radiation weapon (ERW) research program, which would have equipped China with a capability to attack advancing

[60] Wu Riqiang, "Zhongguo He Touming de Shijian Yu Silu ["The Theory and Practice of Nuclear Transparency in China]," in *Lijie Zhongguo He Siwei [Understanding Chinese Nuclear Thinking]*, ed. Li Bin and Zhao Tong (Beijing: Shehui Kexue Wenxian Chubanshe, 2015), 178.
[61] Lora Saalman, "China & the U.S. Nuclear Posture Review" (Washington, D.C.: Carnegie Endowment for International Peace, February 2011), 6–7, 17–18; Wu, "Zhongguo He Touming de Shijian Yu Silu," 178.

Soviet tank columns. Chinese leaders nevertheless chose not to develop and deploy tactical nuclear weapons, either for first-use or to acquire a proportionate retaliatory option in the event that the Soviet Union used tactical nuclear weapons first against China.

Unlike other nuclear-armed states that established first-use nuclear postures to compensate for their conventional military inferiority, China did not threaten to use its nuclear weapons first to gain strategic leverage. But China's choice of a retaliatory nuclear force posture in a total war scenario had a strategic rationale. Its conventional military disadvantage was offset by the size of its territory and population such that it did not need to compensate for its conventional inferiority using strategic weapons. Chinese leaders had concerns about the credibility of nuclear weapons and it was conventionally inferior to both adversaries it faced during that period, Washington and Moscow. Even though they had both motivations that lead states to develop non-nuclear strategic force postures in a limited war, according to the theory of strategic substitution, in a total war China did not have a need for strategic leverage. It therefore did not develop force postures for its non-nuclear strategic weapons when its threat environment deteriorated.

The Decision to Acquire Nuclear Weapons

Chinese leaders decided to develop nuclear weapons at an enlarged meeting of the Politburo in January 1955 to counter coercive nuclear threats from the United States, not to compensate for China's conventional military backwardness. After their experience with U.S. nuclear threats during the Korean War, Chinese leaders did not think conventional weapons were

sufficient to meet U.S. nuclear threats in future crises or conflicts over Taiwan, Indochina or Korea. PLA historian Xu Yan explained that "at that time, the greatest U.S. threat towards China was nuclear weapons" and Soviet assistance to China to modernize its conventional military forces "was not able to satisfy China's requirements to ensure its security."[62]

Chinese leaders first discussed the possibility of acquiring nuclear weapons in the midst of the Korean War. During a May 1952 meeting to formulate China's five year defense building plan, members of China's top military decision-making body, the CMC, discussed the requirements for China's defense if a large-scale war erupted. CMC members decided they needed more information before initiating a nuclear weapons program.[63] After consulting Chinese nuclear scientists on the requirements for China to acquire a nuclear weapons capability,[64] Chinese leaders repeatedly and unsuccessfully sought Soviet assistance with nuclear weapons.[65] China moved ahead with an indigenous nuclear weapons program after finding domestic uranium deposits, which removed the need to acquire uranium from abroad.[66]

In 1955, Chinese leaders clearly stated that its nuclear weapons were intended to deter nuclear threats not gain strategic leverage over the United States, foreshadowing their later choice of a

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[62] Xu Yan, *Xu Yan Jianggao Zixuan Ji [Xu Yan's Selected Lectures]* (Beijing: Guofang Daxue Chubanshe, 2014), 254.

[63] Peng Dehuai Zhuan Jizu [Peng Dehuai Biography Reporting Group], *Peng Dehuai Quan Zhuan [The Complete Biography of Peng Dehuai]*, vol. 3 (Beijing: Zhongguo Baike Chubanshe, 2009), 1073; Junshi Kexue Yuan Junshi Lishi Yanjiu Suo [Academy of Military Science Military History Research Institute], ed., *Jiefang Jun Junshi [History of the PLA]*, vol. 5 (Beijing: Jiefangiun Chubanshe, 2012), 145; Ge Nengquan, ed., *Qian Sanqiang Nianpu [Chronology of Qian Sanqiang]* (Jinan: Shandong Youyi Chubanshe, 2002), 94.

[64] Ge, *Qian Sanqiang Nianpu*, 95.

[65] Ibid., 95, 103, 105; Peng Dehuai Zhuan Jizu [Peng Dehuai Biography Reporting Group], *Peng Dehuai Quan Zhuan [The Complete Biography of Peng Dehuai]*, 3:1079; Shi Zhe, *Zai Lishi Juren de Shenbian: Shi Zhe Huiyilu [Together with Historical Giants: Memoirs of Shi Zhe]* (Beijing: Zhongyang Wenxian Chubanshe, 1991), 572.

[66] Li Jue, Li Yi, and Li Yingxiang, eds., *Dangdai Zhongguo de He Gongye [Contemporary China's Nuclear Industry]* (Beijing: Zhongguo Shehui Kexue Chubanshe, 1987), 12; Xu, *Xu Yan Jianggao Zixuan Ji*, 254.

second-use force posture. That year, Mao Zedong observed that "if you wish to oppose nuclear weapons, you must possess them yourself. Once you have them, you can destroy their insufferable arrogance."[67] The day before the January 1955 meeting, Premier Zhou Enlai also observed that "since the Korean War, the United States has continuously made overt nuclear threats." It threatened to use them on the battlefield as well as against Chinese strategic targets when the Korean War reached a stalemate. Colluding with Chiang Kai-shek, the U.S. stated that it "had the right to use nuclear weapons" to protect Jinmen Island, [68] a territory administered by Taiwan but also claimed by the mainland. When Zhou justified China's nuclear program to China's cabinet, the State Council, he cited his rejoinder to an ambassador's remark that China would be destroyed if the U.S. attacked it with hydrogen bombs: "the most damaging threat of nuclear weapons is to countries with concentrated industry and population."[69] Zhou implied that China could absorb a nuclear first strike.

Chinese leaders indicated that they would rely on their conventional military power, population and territorial size to defeat a conventional attack from the United States. At the January 1955 meeting, Mao declared that, "in warfare it is the people who determine victory or defeat, not one or two new types of weapons."[70] A year later he explained that China "we not only need more aircraft and artillery, we also need a nuclear bomb. In today's world, if we do not want to be bullied, we cannot not have this thing."[71] China rejected the Soviet example of using

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[67] Lu Qiming and Fan Ruiruo, *Zhang Aiping Yu Liangdan Yixing [Zhang Aiping and the Two Bombs and Satellite]* (Beijing: Jiefangjun Chubanshe, 2011), 18.
[68] Ibid., 16.
[69] Zhou Enlai, *Zhou Enlai Junshi Wenxuan (Di Si Juan) [Selected Military Works of Zhou Enlai (Vol. 4)]* (Beijing: Renmin Chubanshe, 1997), 358.
[70] Lu and Fan, *Zhang Aiping Yu Liangdan Yixing*, 18.
[71] Quoted by Zhang Aiping in Junshi Xueshu Zazhi She [Military Arts Magazine Publisher], ed., *Jushi Xueshu Lunwen Xuan [Selected Essays on Military Arts]*, vol. 1 (Beijing: Junshi Kexue Yuan Chubanshe, 1984), 227.

nuclear weapons as a substitute for investing in its conventional military power. Peng Dehuai, China's Defense Minister and architect of its conventional military strategy in the mid-1950s,[72] observed that Soviet military strategy was moving towards substituting nuclear weapons for conventional warfare. He recommended that China take a different approach in its war plans, and draw on China's strengths and experience in fighting conventional wars instead.[73]

When disastrous economic reforms during the Great Leap Forward forced Chinese leaders to make trade-offs in their allocation of defense resources, they decided to prioritize the missile and nuclear weapons programs over conventional modernization. But they still did not view nuclear weapons as a source of leverage to compensate for the PLA's conventional military backwardness. The question of priorities arose during a Politburo meeting at Beidaihe on August 8-9, 1961, at which some military officers and economic policymakers suggested canceling the nuclear and missile programs. After much discussion and an audit of the nuclear program,[74] Chinese leaders decided to prioritize resources for the nuclear program over conventional modernization. China's defense industry set the goal of testing a nuclear weapon in 1964 or 1965.[75]

Despite that outcome, in 1961 many top Party leaders, including PLA marshalls, acknowledged that China needed both nuclear and conventional capabilities.[76] At a meeting of the Defense Industry Committee on August 12, Zhou Enlai explained that China intended to use its

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[72] Fravel, *Active Defense*, ch2.
[73] Peng Dehuai Zhuan Jizu [Peng Dehuai Biography Reporting Group], *Peng Dehuai Quan Zhuan*, 3:1075.
[74] Lu and Fan, *Zhang Aiping Yu Liangdan Yixing*, 67.
[75] Zong Zhuang Bei Bu Zhengzhi Bu [Political Department of the General Armaments Department], *Zong Zhuangbei Bu Gaoji Jiangling [High-Level Leaders of the General Armaments Department]* (Beijing: Guofang Gongye Chubanshe, 2012), 93–94.
[76] Lu and Fan, *Zhang Aiping Yu Liangdan Yixing*, 67.

conventional weapons to fight wars and its nuclear weapons to deter nuclear threats, "once we have missiles and nuclear weapons, we can then prevent the use of missiles and nuclear weapons; if we don't have missiles, imperialism can use missiles. But to face combat, we still need conventional weapons." Zhou noted that both Cold War superpowers were also investing in both capabilities, while China had "recognized the importance of conventional weapons early."[77]

Establishing China's Nuclear Forces

China organized its nuclear forces after its first nuclear test in 1964 to deter nuclear threats and retaliate for a nuclear attack, rather than use them first for strategic leverage to compensate for its conventional military inferiority. Zhou Enlai established a nuclear missile force, the Second Artillery in 1966. From the very beginning, China's nuclear posture had all of the hallmarks of a retaliatory posture: a second-use doctrine, strict command and control arrangements, an emphasis on survivability of the force, and a clear No First-Use declaratory posture.

Zhou Enlai drafted a statement announcing China's No First-Use nuclear policy, which was immediately released after its first nuclear test in October 1964.[78] That policy guided the formulation of doctrine for the Second Artillery missile force, which was severely delayed by the outbreak of the Cultural Revolution in 1966.[79] The force began to carry out missions on

[77] Zhou, *Zhou Enlai Junshi Wenxuan (Di Si Juan)*, 421.
[78] Zhou, *Zhou Enlai Junshi Wenxuan (Di Si Juan)*, 486–89.
[79] Gao Tongsheng, *Dongfeng Qiwu: Zhongguo Zhanlue Daodan Budui Chuchuang Jishi [The First Dance of the East Wind: A Record of the Establishment of China's Strategic Missile Forces]* (Beijing: Guofang Gongye Chubanshe, 2016), 379; Lie Wu, *Zhenrong Suiyue [Memorable Years]* (Beijing: Zhongyang Wenxian Chubanshe, 1999), 357.

October 2, 1967 by order of the CMC.[80] Planning for Second Artillery operations did not really begin until it held a series of meetings to research nuclear operations and implement CMC principles for combat in 1978.[81] The CMC gave the Second Artillery its two guiding principles: active defense and striking after the enemy has struck, while its third principle, a lean and effective force structure, was suggested by the branch in 1978 but approved by Deng Xiaoping in the 1980s.[82]

A starting assumption for the development of the Second Artillery's operational doctrine was that China's nuclear weapons would play a different role in conflict to its conventional weapons. During a research meeting on October 17-29, 1978, the Second Artillery discussed the implementation of these principles in the force's strategic counterattack guiding thought, principles, guidance and missions. The meeting produced a document outlining "Guiding Principles for Second Artillery Combat" as well as an opinion on the issues the force faced in preparing for war.[83] The missile force's new commander, Li Shuiqing, recalled that "the question I thought about most was, finally, what role would the Second Artillery play in a future war to counter an invasion?" This was an entirely new question for the PLA: "Not only was it completely different from the army, with which I was very familiar, but it was also different from the other high technology services, the navy and air force."[84]

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[80] Gao, *Dongfeng Qiwu*, 380.
[81] For a detailed account of China's establishment of Second Artillery doctrine, see Fravel, *Active Defense.*
[82] Ibid; Li, *Cong Hong Xiaogui Dao Huojian Bing Siling*, 512–14.
[83] Li, *Cong Hong Xiaogui Dao Huojian Bing Siling*, 512.
[84] Ibid., 510–11.

Participants at one of the Second Artillery's meetings in 1978 identified distinctive features of missile force operations as combat occurring after a surprise nuclear attack and the dispersed deployment of the force. They began to set the force's combat objectives and posture requirements to implement a retaliatory strike, including centralized command, close protection of its missiles, and strategic planning of firepower actions.[85] The Second Artillery's initial base construction plans emphasized hardening and dispersion, and its initial training emphasized survivability, quick reaction capabilities, and the ability to conduct mobile combat.[86]

Chinese leaders organized their nuclear forces to ensure that they would have direct, strict control over the Second Artillery's activities. The CMC also strictly curtailed the ability of the Second Artillery to influence the strategy that guided its operations and the armaments under development. The Second Artillery, and the PLA more broadly, had little input into the formulation of China's retaliatory nuclear policy and force structure, and could only influence the missile force's service strategy.[87] Decisions as to what nuclear warheads and missiles should be developed to equip the force were made by a Party committee not a PLA committee, the Central Special Commission (CSC), which was established in 1962. China's civilian nuclear scientists and engineers had much greater input into nuclear force posture decisions than the Second Artillery.[88] The missile force's responsibilities were limited to political work, war preparedness and training, targeting "according to the CMC's intentions and enemy target situation," modeling combat plans, base construction and planning, procurement, storage and

[85] Ibid., 515–16.
[86] Wu, *Zhenrong Suiyue*, 359, 363–64.
[87] Fravel, *Active Defense*, ch.6.
[88] Author's interview, Beijing, 2016.

maintenance of its equipment. Its research and advisory tasks were scoped to researching missile unit combat (*zhandou shiyong*) and "making suggestions for the requirements for weapons system advancement and development."[89]

III. Tactical Nuclear Weapons in a Sino-Soviet War

In 1969, China's adversary in a total war shifted from the United States to the Soviet Union. China would have fared much worse in a conventional conflict with the Soviet Union, compared to the United States, because Moscow would have been able to deploy a massive and superior land army to the Far East more easily than the United States was able to project its conventional military power across the Pacific Ocean. Further, China's capital city, Beijing, was much more vulnerable to a land invasion from the north than a U.S. attack on its southeast coast, or through the Korean Peninsula or Vietnam. Despite the strong incentives for Beijing to use nuclear weapons first for strategic leverage and border defense against the Soviet Union to compensate for its conventional inferiority, Chinese leaders rejected the nuclear option. Discussions over whether to develop tactical nuclear weapons in the late 1970s and early 1980s demonstrate that Chinese leaders did not think that they could gain leverage over Moscow by threatening to use nuclear weapons first because it could retaliate with nuclear weapons.

[89] Wu, *Zhenrong Suiyue*, 357–58.

The Sino-Soviet Border Clash

China alerted its nuclear forces for the first and only time during a year of heightened tensions and border clashes with the Soviet Union in October 1969. There is very little information about whether and how Chinese leaders thought about using their nuclear weapons in that crisis. The alerting of the nuclear force may be explained by the chaotic elite political environment during the Cultural Revolution, during which the strict command and control of the CMC over China's nuclear force did not function as intended.

The 1969 crisis began when PLA forces attacked Soviet border guards deployed along the disputed Sino-Soviet border on Zhenbao Island in China's northwest in March 1969. A second clash occurred in mid-March. In response to the PLA's attacks, the Soviet Union increased forces deployed along the border, advanced 300 troops two kilometers into Chinese territory further west along the border on August 13 and made public threats to attack China with nuclear weapons in August 1969 to force China to the negotiating table. These Soviet actions made Chinese leaders worry that the Soviet Union would invade China and attack it with nuclear weapons.[90] In September, Chinese leaders dispersed throughout the country in case Moscow decided to attack Beijing with nuclear weapons.[91] However, according to PLA historian Xu Yan, Mao's chosen successor Marshall Lin Biao, who was in charge of the PLA and directing the affairs of the CMC in August 1969, did not actually think that the Soviet

[90] M. Taylor Fravel, *Strong Borders, Secure Nation: Cooperation and Conflict in China's Territorial Disputes* (Princeton, N.J.: Princeton University Press, 2008), 201–3, 213.
[91] Wu, "Certainty of Uncertainty," 22.

Union would attack China.[92] Speculatively, he may have used the Soviet war scare to his advantage to remove his domestic political opponents from the capital.

Talks to defuse tensions between Premiers Zhou Enlai and Alexey Kosygin began in Beijing in September 1969. But Chinese leaders doubted the sincerity of Kosygin's assurances to Zhou that the Soviet Union did not intend to attack China.[93] Marshall Lin, who was directing the affairs of the CMC at the time, issued an order on October 17, 1969 that placed all of China's military forces on alert. This "No. 1 Order," also placed China's newly-established nuclear missile force on alert.[94] At the time of the crisis, China had one DF-2 missile unit deployed to its northwest, which "was the only unit capable of carrying out a strategic nuclear counterattack combat mission deployed to the 'three norths' region during the serious situation of massing millions of troops along the Sino-Soviet border."[95] In October the Politburo also ordered the evacuation of China's northern cities, including Beijing, and ordered the military to disperse in October. The order remained in force until 1970. Xu Yan explained that "the Politburo gave an order to the entire country and military to urgently prepare for war, it was not until spring of the second year [of the crisis] that people recognized that this was only a false alarm."[96] Xu commented that "some documents and books have reached an agreement that Lin Biao's order was not precise,"[97] implying that Lin Biao did not issue the No. 1 Order and the dispersal order out of a genuine fear of a Soviet attack.

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[92] Xu, *Xu Yan Jianggao Zixuan Ji*, 275.
[93] Ibid., 276.
[94] Wu, "Certainty of Uncertainty," 22. For an unverified account of how this order came to include alerting the missile force, see John Wilson Lewis and Xue Litai, *Imagined Enemies: China Prepares for Uncertain War* (Palo Alto, C,A.: Stanford University Press, 2006), 63–72.
[95] Ge, *Nanwang Lijian Suiyue*, 73.
[96] Xu, *Xu Yan Jianggao Zixuan Ji*, 275.
[97] Ibid., 276.

It is not clear whether Lin Biao or any other Chinese leader considered using China's nuclear weapons to gain strategic leverage during the crisis. Wu Riqiang and Xu Yan both note that China's nuclear force was too weak and limited in range at the time to strike Soviet cities.[98] Wu argues that at the time neither Soviet nor Chinese leaders believed that China had the ability to strike the Soviet Union with nuclear weapons.[99] Regardless, the incident had a lasting impact on the Second Artillery's fears about the survivability of China's nuclear force. Second Artillery research texts from 2004 quoted in the following chapter cite a top-secret report by the Academy of Military Science reproduced for training in 1982 entitled "Analysis of Soviet Surprise Nuclear Attacks on our Missile Bases."[100]

Developing a Secure Second Strike

Although the 1969 Sino-Soviet border conflict marked a change for the worse in China's threat environment, China still chose not to use its nuclear weapons first for strategic leverage to overcome its conventional military inferiority. During the 1970s and 1980s China would not have been able to defend its homeland from a Soviet invasion. Beijing was vulnerable to a Soviet offensive across the northern border.[101] The political chaos of the Cultural Revolution prevented Chinese leaders from quickly re-evaluating China's nuclear force posture in light of this change in threat environment. When they did re-evaluate China's nuclear posture after the Cultural Revolution, they concentrated on developing a survivable retaliatory nuclear force.

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[98] Wu, "Certainty of Uncertainty," 22; Xu, *Xu Yan Jianggao Zixuan Ji*, 274.
[99] Wu, "Certainty of Uncertainty," 21–25.
[100] Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 46.
[101] Fravel, *Active Defense*, chap. 4.

Chinese leaders also decided not to develop and deploy tactical nuclear weapons for first- or second-use in a total war with the Soviet Union.

China's development of ICBMs and progress towards an operational launch capability for its nuclear weapons floundered during the Cultural Revolution. The disruptions ceased after 1976 as elite politics in China returned to normal under the leadership of Deng Xiaoping. Zhang Aiping, who had been purged during the political chaos between 1966 and 1976, returned to a leadership position in the defense industry in March 1977.[102] Zhang immediately set into motion plans for China to acquire the "Three Grasps": an ICBM, a submarine-launched ballistic missile, and a communications satellite.[103] In July 1977, Zhang briefed Deng Xiaoping on the Three Grasps plan. On September 18, 1978 the CMC and Deng Xiaoping approved his request to achieve the Three Grasps before 1980.[104]

Despite the CMC's decision to prioritize the Three Grasps, it decided to re-orient Chinese defense spending from strategic to conventional weapons in December 1977. The CMC and State Council directed that defense spending must "emphasize the shift toward solving conventional weapons and equipment by accelerating the pace of research and development on new types of [conventional] systems."[105] Zhang Aiping disagreed with this re-prioritization. In 1982 he wrote that China needed to first focus on developing a survivable strategic nuclear

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[102] Lu and Fan, *Zhang Aiping Yu Liangdan Yixing*, 353.
[103] Ibid., 365–66.
[104] Ibid., 367; Song Renqiong, *Song Renqiong Huiyi Lu [Memoirs of Song Renqiong]* (Beijing: Jiefangjun Chubanshe, 2007), 403.
[105] Xie Gang, *Dangdai Zhongguo de Guofang Keji Shiye [The Defense Industry of Contemporary China]*, vol. 1 (Beijing: Dangdai Zhongguo Chubanshe, 1992), 148. quoted in Evan A. Feigenbaum, *China's Techno-Warriors: National Security and Strategic Competition from the Nuclear to the Information Age* (Stanford, CA: Stanford University Press, 2003), 80.

force, "after we have succeeded in this aspect, we can, at the suitable time, gradually turn our focus towards the aspect of seizing conventional weapons."[106] Zhang judged that China's capabilities gap with its adversaries was greater for its nuclear than conventional weapons.

Researching Tactical Nuclear Weapons

At the same time as China moved ahead with the Three Grasps, to complete the development of its first-generation strategic nuclear delivery systems, its leaders examined whether China needed to develop tactical nuclear weapons. Chinese leaders decided to research an enhanced radiation weapon (ERW), a battlefield nuclear warhead, in 1978. But they also canceled a project to develop a tactical nuclear bomb that would be delivered by aircraft to the battlefield. The neutron bomb research and development effort continued until its successful completion in 1988, but was never deployed.

Chinese leaders could have used tactical nuclear weapons in two ways: for proportionate retaliation against Soviet first-use of tactical nuclear weapons, or to threaten the first-use of tactical nuclear weapons on Soviet ground forces if they tried to invade China across its northern borders. The first-use of tactical nuclear weapons would have given the PLA leverage for two different reasons if the Soviet Union invaded China. First, they could have manipulated the risk of nuclear escalation, which could have resulted in China and the Soviet Union using strategic nuclear weapons on each other's cities. Second, they could have forced Soviet ground

[106] Junshi Xueshu Zazhi She [Military Arts Magazine Publisher], *Jushi Xueshu Lunwen Xuan [Selected Essays on Military Arts]*, 1984, 1:229.

forces to disperse as they invaded China, rather than to concentrate in the manner required to break through Chinese defenses.[107]

Chinese strategists rejected these options and instead opted for conventional, positional defenses of China's homeland against a Soviet conventional invasion. Strategists judged that using tactical nuclear weapons could quickly escalate to the use of strategic nuclear weapons against China. They also dismissed the notion that the Soviet Union would use tactical nuclear weapons first as it attacked China. China therefore did not need to develop tactical nuclear weapons for first-use or for a proportionate retaliation.

The Gravity Bomb Program

China initiated a program to develop an aircraft-delivered tactical nuclear bomb around 1971 when defense planning had become an instrument of domestic political struggles during the Cultural Revolution. The program was canceled in 1978 because the technology was problematic, and the capability unsuited to China's military strategy. Nuclear scientist Zhu Guangya recalled that Lin Biao and other members of his political faction intervened with the 1971-1975 Fourth Five Year Plan for national defense production: "they required strategic weapons and space technology 'to catch up in the first three years, and surpass in the last two years' the world's most advanced standards." Zhou Enlai, who had carefully directed China's missile and nuclear programs up to that point, "proceeded to stop these unrealistic requirements many times." But Lin Biao criticized Zhou and continued with his "grand plan."[108] The tactical

[107] Liu Huaqiu, *China and the Neutron Bomb* (Stanford, CA: Center for International Security and Arms Control, Stanford University, 1988).
[108] Du Xiangwan, ed., *Zhanlue Kexue Jia Zhu Guangya [Strategist and Scientist Zhu Guangya]* (Mianyang: Yuanzi Neng Chubanshe, 2009), 327–28.

nuclear gravity bomb was part of that grand plan. One of Lin Biao's political allies, Air Force commander Wu Faxian, advocated the program in 1969.[109] Zhu explained, "In 1969, the Air Force suggested researching and developing a type of nuclear bomb to be launched from a ground strike aircraft. Because the program was initiated before it was completely proven, there were a number of problems with the research and development."[110] Zhu attributed China's pursuit of the gravity bomb to Cultural Revolution politics, "It was a product of the 'Cultural Revolution' period, the requirement to research the use of fighter aircraft to carry nuclear bombs, this general idea, was a task to be achieved under the line [direction] of Lin Biao and Wu Faxian."[111]

Work on the air-dropped tactical weapon commenced in 1975 but was canceled in 1979. In 1977, leaders who shared Zhou Enlai's views of the role of China's nuclear weapons were returned to power. Marshall Nie Rongzhen, who had overseen China's strategic weapons development plans since 1958 until the Cultural Revolution, strongly opposed the gravity bomb program once he learned about it after 1976. By that time "plenty of funds" had been invested in the project.[112] At a CMC meeting that likely took place on April 11-2, 1977,[113] Nie likely raised his objections to the program. Zhu recounted that, "In April 1977, when the CMC Vice-Chairman Ye Jianying heard the 2nd Machine Building Ministry's report, Marshall Nie gave his opinion on the project. Wu Faxian raised the topic, and the Premier [Hua Guofeng] silenced him. The same year in July, Marshall Nie once again wrote on a report, 'this research

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[109] Sun, *He Shidai de Zhanlue Xuanze - Zhongguo He Zhanlue Wenti Yanjiu*, 30.
[110] Du, *Zhanlue Kexue Jia Zhu Guangya*, 327.
[111] Nie Li, *Shangao Shuichang: Huiyi Fuqin Nie Rongzhen [High Mountains, Long River: Remembering My Father, Nie Rongzhen]* (Shanghai: Shanghai Wenyi Chubanshe, 2006), 307.
[112] Ibid., 307.
[113] Liu Jixian, *Ye Jianying Nianpu [Chronology of Ye Jianying]*, vol. 2 (Beijing: Zhongyang Wenxian Chubanshe, 2007), 1124.

and development program of work is best deliberated on.' Vice-Chairman Ye agreed with Marshall Nie's opinion and requested that the General Staff Department do more research."[114]

In February 1978, Nie Rongzhen persuaded the other CMC members to cancel the gravity bomb program because it was inconsistent with China's approach to nuclear weapons development and was not necessary for China's future wars. According to Zhu Guangya, "Marshall Nie once again mentioned that China needed to have a cautious policy in its nuclear weapons development direction. Marshall Nie described the strategic guideline of our military, analyzed the possible combat style of nuclear weapons in a future war, clarified active defense as the strategic starting point, and gave the opinion that [we] should not develop this type of nuclear weapon model." [115] Nie's arguments persuaded the CMC members present to eventually cancel the project, "Nie's words had a logical basis, his attitude was clear-cut... These comrades all agreed with and supported Marshall Nie's opinion."[116] Nie also persuaded the Central Special Commission's members, including Deng Xiaoping and Ye Jianying, to cancel the program in 1979. He not only pointed to the shortcomings of the delivery system, but also that "weapons type development must be viewed from the perspective of our strategic thought and high-level policy."[117] Zhu recounted that "In March 1979, at another meeting, the CSC officially approved canceling the research and development of and *equipping* [units] with this weapons model."[118]

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[114] Du, *Zhanlue Kexue Jia Zhu Guangya*, 328.
[115] Ibid.
[116] Ibid.
[117] Nie, *Shangao Shuichang*, 307.
[118] "1979 nian san yue, Zhongyang Zhuanwei de ling yici huiyi zhengshi pizhun tingzhi yanzhi, zhuangbei zheyi wuqi xinghao." Du, *Zhanlue Kexue Jia Zhu Guangya*, 328 (emphasis added).

The Neutron Bomb Program

China's leaders also considered whether to develop a tactical nuclear weapons capability in light of U.S. and Soviet developments of enhanced radiation weapons. Also known as a neutron bomb, an ERW is a tactical nuclear weapon that is particularly effective against an enemy's tanks as they advanced on a battlefield. At the same time that Chinese leaders canceled the gravity bomb program in 1978, they also approved a research and development plan for a neutron bomb. The main proponent of the plan was nuclear scientist Zhu Guangya. ERW tests were carried out six times between 1982 and 1988. The first four tests, on October 5, 1982, May 4 and October 6, 1983, and October 3, 1984 all failed. The fifth test, on December 19, 1984, was successful.[119] China conducted a final test on September 29, 1988.[120]

Scientist Zhu Guangya argued that China would need its own neutron bomb if it was to going to be able to fight a war with a Soviet Union equipped with ERW warheads in the future. If the United States produced and armed its forces in Europe with neutron bombs, he argued, it would reverse the conventional advantage the Soviet Union held on the Central Front because of its greater number of tanks. As a result, "the ERW could fundamentally change the style of warfare (*zhanzheng de fangshi*), this would be extremely unfavorable for the Soviet Union."[121] In a later speech, Zhu declared that the "ERW could sooner or later become a new nuclear weapon in the hands of nuclear great powers." This development trend for nuclear weapons

[119] Xu Luxi et al., *Deng Jiaxian Zhuan [Biography of Deng Jiaxian]* (Hefei: Anhui Renmin Chubanshe, 1998), 137–40.
[120] Vipin Gupta, "Locating Nuclear Explosions at the Chinese Test Site near Lop Nor," *Science & Global Security* 5, no. 2 (1995): 208.
[121] Xi Qixin, ed., *Zhu Guangya Zhuan [Biography of Zhu Guangya]* (Beijing: Renmin Chubanshe, 2015), 485.

"set off a clear signal for the field of nuclear weapons research: China must research and develop the neutron bomb."[122]

Zhu drafted a report recommending that China initiate an ERW research and development program in 1977. The "Report on the Issue of the Neutron Bomb" outlined the trends in the development of the two superpowers' arsenals. It "introduced the U.S. situation of researching the ERW, analyzed world nuclear weapons development trends, and raised the strategic idea that our country should research and develop the ERW, and plans for first steps."[123] After receiving feedback on the report from fellow nuclear scientists Deng Jiaxian and Yu Min on September 9, Zhu sent the report to Zhang Aiping on September 13, 1977. Zhang gave the report to CMC Chairman Hua Guofeng and Ye Jianying. The CMC approved the report four days later, on September 17, 1977.[124] In February 1978, Zhu received the CSC's complete approval for the direction of the "Three Year Nuclear Testing Plan Report Outline," which may have included approval to research the neutron bomb.

Although the United States ceased production of the ERW in April 1978 due to pressure from both Western Europe and the Soviet Union, Zhu continued to push for the program. He judged that "the U.S. announcement that it was delaying production of the ERW was only a temporary stop-gap measure. China must make some precautions."[125] At an ERW research meeting sometime during or after 1980, Deng Jiaxian, director of China's Nuclear Weapons Research Institute, explained the strategic significance and rationale of China's second generation

[122] Ibid., 486.
[123] Ibid., 486–87.
[124] Ibid., 486–87.
[125] Ibid., 484.

nuclear weapons: "If one says that nuclear weapons, the hydrogen bomb are offensive weapons of large-scale destructiveness (*cuican xing*), the new generation of nuclear weapons are a type of effective strategic, defensive weapons, they are 'weapons that strangle weapons' (*e'sha wuqi de wuqi*), they have even more importance and value for safeguarding national defense." He continued, "these 'weapons that strangle weapons,' we must finish making them. What foreigners can achieve, we can definitely achieve."[126] It is not clear what Deng Jiaxian meant by "weapons that strangle weapons," but he could have been referring to strangling Soviet tanks or other nuclear weapons.

Leadership Discussions of Tactical Nuclear Weapons

In 1978, top leader Deng Xiaoping likely decided that China would not use nuclear weapons first to gain strategic leverage or to better defend its borders and did not need tactical nuclear weapons for proportionate retaliation. Chinese leaders discussed the possibility of developing tactical nuclear weapons at a February 14, 1978, meeting of the CSC. Missile designer Qian Xuesen, Ma Jie, and nuclear scientist Zhu Guangya reported on nuclear weapons and satellite research, production and testing plans.[127] During the meeting, chaired by Hua Guofeng, it was agreed that "it was necessary to have more discussion of the military and political advantages and disadvantages of tactical nuclear weapons."[128] Nevertheless, "Deng Xiaoping indicated, we'll see [about] tactical nuclear weapons but nevertheless make the neutron bomb."[129] At the meeting, Zhu Guangya reported on the development trends in tactical and strategic nuclear

[126] Ibid., 488.
[127] Zhang Xianmin, ed., *Qian Xuesen Nianpu [Chronology of Qian Xuesen]*, vol. 1 (Beijing: Zhongyang Wenxian Chubanshe, 2015), 410.
[128] Ibid., 1:410.
[129] Qian Xuesen's chronology gives the following description of Deng's instructions, "Deng Xiaoping zhichu, zhanshu he wuqi wo kan haishi gao zhongzi dan." Ibid., 1:410.

weapons and "gave detailed analysis of the advantages and disadvantages of developing tactical nuclear weapons."[130] In his report, Zhu listed the capabilities and types of weapons for strategic and tactical nuclear forces, noting that "possessing missiles, aircraft and artillery with an operational and tactical nuclear attack capability can all become a part of a tactical nuclear weapons capability."[131]

By August, Deng Xiaoping had likely decided to continue Mao and Zhou's approach to nuclear force posture, which relied on a small retaliatory force to deter nuclear coercion and attacks but would not use nuclear weapons first to gain strategic leverage. Zhu Guangya recalled that 1978 and 1979 discussions of China's national military strategy, the strategic guideline, and Deng's views, had a strong influence on China's nuclear weapons development strategy going forward. The guideline and Deng's views sharply distinguished China's approach to nuclear weapons from that of the Soviet Union and United States. China would only produce small numbers of weapons and focus on improving their quality in the next generation, in accordance with its resource constraints.[132] Sun Xiangli explained that the ERW was never deployed "because the new generation of leaders at the decision-making level carried on the fundamental development principle of a defensive nuclear strategy."[133]

Deng expressed his views on the role of China's nuclear force posture facing a total war of invasion from the Soviet Union in a meeting on August 1-2, 1978. The 7th Ministry of Machine Building, which was responsible for developing missiles, requested the meeting to receive

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[130] Xi, *Zhu Guangya Zhuan*, 474–75.
[131] Ibid., 475.
[132] Du, *Zhanlue Kexue Jia Zhu Guangya*, 317–18.
[133] Sun, *He Shidai de Zhanlue Xuanze - Zhongguo He Zhanlue Wenti Yanjiu*, 31.

Deng's guidance on nuclear missile development. A number of then- and future defense leaders were present at the meeting, among them Zhang Aiping, missile designer Qian Xuesen and Liu Huaqing.[134]

Deng instructed China's nuclear weapons complex to develop survivable, second-generation of strategic nuclear weapons. He did not mention tactical nuclear weapons. The Ministry head, Song Renqiong, recalled that, "On strategic weapons development guidelines, he pointed out: ICBMs are the main part, 'land-based' are the main part. It is necessary to concentrate capabilities on producing the 'DF-5,' miniaturization, and mobility. The most advanced technology [must be] used to fight mobile warfare [road-mobile ICBMs]. Weapons must be newer, the principle is small but high-quality (*shao er jing*)."[135] Song remarked that Deng encouraged the Three Grasps program, "which also had important guiding meaning for later work."[136] As one book on China's nuclear program explained, "high yields and miniaturization were the core of China's second-generation nuclear weapons development."[137]

A Conventional Strategy to Defeat a Soviet Invasion

China's decision to cancel the tactical gravity bomb but proceed with ERW research occurred as leaders were belatedly updating the PLA's conventional military strategy to counter a Soviet invasion, following the deterioration in threat environment in 1969 due to the border conflict.

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[134] Song, *Song Renqiong Huiyi Lu*, 402.
[135] Ibid., 402–3.
[136] Ibid., 407.
[137] Xi, *Zhu Guangya Zhuan*, 487, quoting Song Jian, ed., *"Liangdan Yixing Yuanxun" [The Founding Fathers of "One Bomb and Two Satellites].*

In 1980, they decided not to use nuclear weapons for strategic leverage to deter a Soviet conventional invasion.

The PLA made two changes to the strategic guideline in 1977 and 1980 respectively. In 1977, Chinese leaders made a minor adjustment to Mao's 1964 Strategic Guideline of "luring the enemy in deep," which planned to conduct mobile and guerrilla warfare to defeat a Soviet invasion. But the 1980 strategic guideline of "active defense" was a major change. Chinese leaders adopted a positional warfare and combined arms approach to defeating a Soviet invasion, ratifying an approach that was already gradually being adopted within the PLA.[138] Nuclear weapons played no role in plans to defend China from a Soviet invasion under the 1980 strategic guideline. It is equally unlikely that tactical nuclear weapons could have played a role under the previous strategic guideline of luring the enemy in deep, which involved ceding territory and conducting guerrilla warfare.

Influential PLA strategists indicated that the Soviet Union was unlikely to use tactical nuclear weapons if it invaded China, which removed the incentive for China to develop tactical nuclear weapons for proportionate retaliation. According to veteran PLA strategist Su Yu, Moscow could not gain strategic leverage over Beijing under conditions of mutual nuclear vulnerability. Implicit in Su's assessment was a judgment that Beijing's nuclear weapons also were not a credible source of strategic leverage over a nuclear-armed adversary like the Soviet Union. Su had expressed many of these views as early as 1955. Like Ye Jianying, whose views from 1961 are quoted above, Su believed that the superpowers would use nuclear weapons for a strategic

[138] Fravel, *Active Defense*, chap. 4.

bombing campaign at the outset of a war to destroy cities and industrial centers.[139] In a 1979 speech, broadly considered the basis of China's 1980 strategic guideline,[140] Su Yu explained:

> "whether an adversary could finally use nuclear weapons, and hydrogen bombs at the beginning of a war, this is a question we can directly research. The enemy would launch a war of invasion in order to pillage; if it uses nuclear weapons from the beginning, turning cities, mines and factories into rubble, greatly destroying the labor force, has it not lost the object of pillage? From the perspective of military affairs, if it turns our cities into rubble, even if it stands in a leading position, it cannot use those cities as a forward base to depend on to continue attacking. In addition, we also have nuclear weapons, if you attack we attack, there is the danger that all will suffer great losses, so it [the Soviet Union] cannot but have some hesitation. As for tactical nuclear weapons, although currently the enemy divisions and above are commonly armed with nuclear weapons, it would also have a lot of doubts about using them in the beginning, because once they are used, it is very hard for any limits to exist, so tactical scale [nuclear weapons use] could develop into strategic scale."[141]

Other top PLA strategists agreed with Su Yu's assessment. The President of AMS in 1980, Song Shilun, remarked in a speech to AMS senior personnel that, "in the past 10 years in military exercises targeting our country, the Soviet Union has envisaged using tactical nuclear

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[139] M. Taylor Fravel, "Shifts in Warfare and Party Unity," *International Security* 42, no. 3 (Winter 2017): 55.
[140] Ibid., 68–69, 71.
[141] Junshi Xueshu Zazhishe [Military Arts Magazine Publisher], *Jushi Xueshu Lunwen Xuan*, 4.

weapons to attack us. If the enemy uses them, we will of course use them." But Song also pointed out that China had fewer targets for the Soviet Union to attack with nuclear weapons because its population was less urbanized, which reduced the leverage that the Soviet Union could gain over China from its massive nuclear arsenal. Soviet nuclear weapons use was therefore not a given.[142] He also noted that Soviet military strategy emphasized conventional warfare since Brezhnev had taken power. "When Khrushchev took power, he had blind faith in the omnipotence of nuclear weapons." But this "singular nuclear strategy thinking was opposed by many marshalls and generals, they quietly made changes to recognize the role of conventional weapons and warfare."[143] Some PLA researchers dissented, however, and argued that the Soviet army would use nuclear weapons first as it invaded China to create a "nuclear corridor"[144] and warned that the PLA would be dangerously unprepared for such an attack.[145]

The PLA's decision to shift to positional defenses under the 1980 strategic guideline probably rested on the assumption that the Soviet Union would not use nuclear weapons as it advanced into Chinese territory. PLA positional defenses would otherwise be ideal, concentrated targets for the Soviet army to attack with tactical nuclear weapons. Su Yu did, however, think that

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[142] Junshi Kexue Yuan Jundui Jianshe Yanjiu Bu [Academy of Military Science Force Building Research Department], ed., *Song Shilun Junshi Wenxuan [Selected Military Works of Song Shilun]* (Beijing: Junshi Kexue Yuan Chubanshe, 2007), 198.

[143] Ibid., 350.

[144] Xu Baoshan, "Yao Zhunbei Zai Weilai Zhanzheng Chuqi Da Hezhan [We Must Prepare to Fight a Nuclear War in the First Stage of Any Future War]," *Jiefangjun Bao [PLA Daily]*, September 16, 1979; Zhou Shizhong, "Kangji Sulian Shouci Tuji de Jige Wenti [Several Questions on Resisting the First Soviet Surprise Attack]," in *Jushi Xueshu Lunwen Xuan [Selected Essays on Military Arts]*, ed. Junshi Xueshu Zazhi She [Military Arts Magazine Publisher], vol. 2 (Beijing: Junshi Kexue Yuan Chubanshe, 1984), 238–44. Both of these sources are quoted in Alastair Iain Johnston, "China's New 'Old Thinking': The Concept of Limited Deterrence," *International Security* 20, no. 3 (Winter 1995/96): 5–42.

[145] Researcher Xu Baoshan argued that nuclear weapons were becoming more usable, were central to Soviet strategy, would be useful as the Soviet army advanced through mountain passes into China's north. Despite its conventional superiority, the Soviets could be tempted to use tactical nuclear weapons once it encountered difficulties holding Chinese territory. Xu, "Yao Zhunbei Zai Weilai Zhanzheng Chuqi Da Hezhan" quoted in Johnston, "China's New 'Old Thinking."

nuclear weapons were most likely to be used late in a war, "contrary to what one might expect, when warfare develops to a certain threshold, especially in the last phase of the war, in order for the adversary to hold onto territory, to protect it while retreating, to hold onto and save a losing battle, it is very likely that it would use nuclear weapons."[146]

It is difficult to find evidence that Chinese leaders wanted to use tactical nuclear weapons first to counter a Soviet invasion. In 1980, the head of the Los Alamos National Laboratory reported that Zhang Aiping told him China needed "to bowl neutron bombs over the Soviet border," while retreating southward and consolidating defenses in the cities,[147] but there is no evidence of Zhang holding this view in Chinese sources. In any case, by 1982, Zhang was focused on ensuring that China developed a survivable second generation of strategic weapons because "our strategic weapons are not the same as our adversary's. If we don't have strategic nuclear weapons, when our adversary attacks us, we won't have any leeway to strike back. As such, considering strategy, in the next few years we should concentrate our efforts on seizing strategic weapons research work."[148] Zhang wanted China to develop solid-fueled missiles of medium, long and intercontinental ranges, road-mobile missiles, prioritizing missiles that were "miniaturized, flexible, convenient to use" over large models.[149] He likely made these recommendations to Deng Xiaoping and the CMC, who approved them in early 1983.[150]

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[146] Junshi Xueshu Zazhi She [Military Arts Magazine Publisher], *Jushi Xueshu Lunwen Xuan*, 2:4.
[147] This quote is drawn from an interview with the director. Dan Stober and Ian Hoffman, A Convenient Spy: Wen Ho Lee and the Politics of Nuclear Espionage (New York: Simon & Schuster, 2002) 53-4, quoted in Ray, "Red China's 'Capitalist Bomb'," 22.
[148] Junshi Xueshu Zazhi She [Military Arts Magazine Publisher], *Jushi Xueshu Lunwen Xuan*, 1:229.
[149] Zong Zhuang Bei Bu Zhengzhi Bu [Political Department of the General Armaments Department], *Zong Zhuangbei Bu Gaoji Jiangling*, 55.
[150] Other opinions Zhang expressed in the same discussion with the editor of *Military Arts*, such as prioritizing land forces development and self-reliance in weapons development, were submitted in a set of policy recommendations to Deng and the CMC. Policy recommendations submitted to Deng and the CMC included strategic missile force building. The details of the recommendations about nuclear force development are not

In 1983, Deng Xiaoping also confirmed that China's nuclear arsenal was symbolic and therefore small, which the force sub-optimal for gaining strategic leverage over the Soviet Union. He explained that "we still need to develop a bit, but how to develop will still be limited. Our money needs to be spent on industry, agriculture, education and scientific affairs. From a long-term perspective, China's possession of nuclear weapons is symbolic... if China expends too much effort in this aspect, it could restrict itself."[151] A year later Deng downgraded his assessment of the severity of the Soviet threat. After 1984, the PLA stopped preparing for a total war. They began to prepare for local wars in the late 1980s, as documented in the next chapter.

Explaining China's Tactical Nuclear Weapons Decisions

In interviews conducted in 2017, Chinese strategists explained that China did not deploy tactical nuclear weapons in the 1980s because China could not gain strategic leverage from using nuclear weapons first against a nuclear-armed adversary. Doing so would invite nuclear retaliation that could escalate to strategic nuclear war and destroy China.[152] Strategists believed, like Su Yu, that tactical nuclear weapons use would escalate to the use of strategic nuclear weapons. They pointed to the U.S.-Soviet Intermediate Nuclear Forces Treaty as recognition of this nuclear escalation chain in Europe. Liu Huaqiu, a nuclear scientist who worked on the ERW project, wrote in 1988 that precision-guided conventional munitions were a better option for attacking Soviet tanks as they "have proved enormously more effective against tanks than

mentioned in Zhang's biography, however, so sources cannot confirm whether Zhang made those precise recommendations to Deng and the CMC. Ibid., 55.

[151] Huo, *Junzhong Zhanlue Xue*, 294.

[152] Author's interview, Beijing, 2017.

unguided munitions and do not run the risk of escalation to a nuclear war."[153] Strategists cited two other disadvantages of deploying tactical nuclear weapons: they could pull China into an arms race and China would have to use those nuclear weapons on its own territory.

Strategists also noted that it would be impractical to use tactical nuclear weapons for proportionate retaliation. According to one expert, it would be impractical to maintain a No First-Use policy while possessing a tactical nuclear weapons capability. Tactical units would not know if China had already been attacked using nuclear weapons and that those units therefore could use nuclear weapons in retaliation. The expert implied that China could end up using nuclear weapons first despite its No First-Use policy if it had tactical nuclear weapons and would have needed to change that longstanding policy.[154]

It is puzzling that China continued to test the ERW after the PLA adopted the 1980 strategic guideline, which clearly indicated that nuclear weapons would be irrelevant in China's future total wars. It is possible that neutron bomb research continued after 1980 because scientists used the same tests to advance both China's second-generation nuclear warhead development and the ERW. In the early 1980s, Chinese nuclear scientists worked on the initiation and boosting principles essential for both the neutron bomb and hydrogen bomb warhead modernization. In November 1985, Deng Jiaxian, the head of China's nuclear weapons laboratory, reportedly wrote that "our institute successfully detonated principles tests for *second-generation nuclear weapons and* the neutron bomb."[155] After the successful "principles"

[153] Liu, *China and the Neutron Bomb*, 37.
[154] Author's interview, Beijing, 2017.
[155] Ray, "Red China's 'Capitalist Bomb'," 25 (emphasis in original).

test in December 1984, resources for miniaturization and the neutron bomb would have competed. Writing in 1988, Liu Huaqiu also suggested that China complete its development of the ERW because "the neutron bomb has potential application as a future space weapon."[156] China may have tested a weaponized neutron bomb in 1988 for this reason. China began to research space weapons technology in response to Regan's Strategic Defense Initiative for space-based missile defense.[157]

Conclusion

This chapter demonstrates that China satisfies one of the three scope conditions of the theory of strategic substitution, a retaliatory nuclear force posture. It also demonstrates that, in the absence of the other two scope conditions, a limited war scenario facing an adversary with a conventionally superior military, China could gain strategic leverage from its conventional and nuclear weapons and did not need to acquire non-nuclear strategic weapons. Even when China had the strongest incentives to compensate for its conventional military inferiority compared to an invading Soviet army, it did not establish a first-use nuclear posture or develop a tactical nuclear weapons capability. Chinese leaders did not think it was possible to gain strategic leverage through threats to use nuclear weapons first against a nuclear-armed adversary. Those threats would not be credible given the risk that using tactical nuclear weapons created of a highly destructive nuclear war. Instead, Chinese leaders relied on the strategic depth afforded

[156] Liu, *China and the Neutron Bomb*, 37.

[157] In 1986, Deng Jiaxian, the director of China's Academy of Engineering Physics, wrote on a draft report for the document that guided China's nuclear testing program for the next decade that the draft should be revised and linked to "high technology" including SDI's proposed "Free Electron Laser" and "Excimer" before being submitted to the leadership. See Deng Zhiping, Peng Jie, and Ge Kangtong, *Deng Jiaxian* (Guiyang: Guizhou Renminbi Chuban She, 2004), 117–18.

by its large territory and population to defeat an invading Soviet army. In short, for China, nuclear threats lacked strategic credibility and its leaders were unwilling to use them to compensate for its conventional military inferiority. As the next chapter demonstrates, once China faced a limited war these two factors gave it a need for strategic leverage whenever its threat environment deteriorated. Only then did Chinese leaders establish force postures for their non-nuclear weapons.

Chapter 3: China's Nuclear Force Posture II, Limited Wars

Introduction

China maintained its retaliatory nuclear posture after its main conflict scenario shifted from a total war of a superpower invasion during the Cold War to limited wars on its periphery in the post-Cold War era. The threat China faced of a Soviet invasion declined as the Cold War drew to a close, which dramatically improved its China's security situation. China began preparing for limited wars beginning in 1988. Once it faced a limited war scenario in which it would field an inferior conventional military, while maintaining a retaliatory nuclear posture, it satisfied all three scope conditions of the theory of strategic substitution. Beijing's main limited war contingency focused on a local war over Taiwanese independence in the mid-1990s as Taiwanese leaders became more active in pursuing the island's independent legal status. In that contingency, the PLA's conventional military power was inferior to Taiwan and the United States. China's limited aims in a Taiwan conflict, and the local geographical scope of that conflict, meant that Beijing could not use its vast territory and population to exhaust an adversary in a conventional war, as it had planned to when facing a total war of invasion. But threats to use nuclear weapons against Taiwan or the United States lacked strategic credibility. China therefore had a need for strategic leverage whenever its threat environment changed for the worse in the post-Cold War era.

Chinese leaders and strategists concluded that they could not make credible nuclear threats in a Taiwan conflict on two occasions in the post-Cold War era. As the Cold War drew to a close,

Chinese leaders examined whether they needed to change China's retaliatory nuclear posture to prepare for limited wars on its periphery. A decade later, the U.S. bombed the Chinese embassy in Belgrade in May 1999 during the Kosovo intervention, beginning a series of events that worsened China's threat environment. Those events triggered a debate as to whether China needed to relax its No First-Use posture to maximize its strategic leverage in a Taiwan conflict. On both occasions Chinese nuclear strategists and leaders reasoned that nuclear threats against a nuclear-armed adversary lacked strategic credibility. In addition, China had much more credible options to maximize its strategic leverage: its conventional missiles, and space and cyber weapons.

This chapter advances the overall argument of this dissertation in a number of ways. First, it establishes the limited war scenario and conventional inferiority scope conditions of the theory, beginning in 1988. Second, it establishes that China's need for strategic leverage varied as its threat environment changed for the worse and shows that Chinese strategists ruled out using nuclear weapons to respond to those changes. Third, this chapter provides evidence that nuclear strategists viewed non-nuclear strategic weapons as more credible sources of strategic leverage in a limited war. In doing so, this chapter also contributes to the empirical literature on Chinese nuclear posture decision-making. It builds on Alastair Iain Johnston's account of a debate within China about the merits of shifting to a limited warfighting nuclear posture in the early 1990s. It also provides the most complete account to date on a debate among Chinese analysts in the early 2000s over changes to its No First-Use policy.

This chapter proceeds as follows. The first section outlines the discussion among Chinese strategists and leaders about the role of its nuclear weapons in limited war scenarios at the end of the Cold War. The second section outlines the evolution of China's nuclear posture during the 1990s and describes the Taiwan conflict scenario that China focused on after the 1995-6 Taiwan Straits crisis. The third section outlines the debate over China's No First-Use policy among Chinese strategists in the early 2000s after the Belgrade embassy incident worsened China's threat environment. The fourth section briefly outlines the current debates about China's nuclear posture among its strategists.

I. China's Nuclear Posture for Limited Wars

From approximately 1988 onwards, China satisfied all scope conditions of the theory of strategic substitution, a limited war scenario, conventional military inferiority in that scenario, and a retaliatory nuclear posture. As the theory of strategic substitution would expect, once all of these conditions were satisfied by 1988, China considered how it could maximize its strategic leverage using its nuclear, conventional, and non-nuclear strategic weapons. Its strategists explored three different options for China's nuclear posture in a future limited war. The first option was that nuclear weapons were useless in limited wars, a view, inspired by the trend towards nuclear disarmament among the superpowers. The second option was to use nuclear weapons to fight limited nuclear wars, either to maximize strategic leverage in a conventional conflict or to retaliate proportionately for a Soviet or U.S. tactical nuclear attack. Third, China could maintain a retaliatory posture for its nuclear weapons, using a small strategic arsenal to deter both tactical and strategic nuclear attacks, and use its conventional

missiles, to maximize strategic leverage to win local wars. By 1992 Chinese leaders chose the third option, as expected by the theory of strategic substitution.

Nuclear Posture in a Local Conventional War

The PLA examined how China could fight and win "local wars" on its periphery, especially its territorial disputes, after 1985. In the early 1980s, Deng Xiaoping assessed that China no longer faced a threat of a Soviet invasion and began to re-allocate resources from defense to the civilian economy. In 1985 announced a "Strategic Transformation" to reduce the size of the PLA and re-allocate resources from defense to economic development. The gradual improvement in China's threat environment during the 1980s led to a period of unprecedented experimentation within the PLA with ideas for China's future military strategy. For the first time since the People's Republic was established, the PLA did not need to plan for an imminent invasion. The Central Military Commission (CMC) made a minor change to China's national military strategy, the strategic guideline, in December 1988. It applied China's 1980 strategy of active defense to a new type of war, "local wars and armed conflicts," without specifying a primary adversary in those conflicts.[1]

In this context, PLA officers, civilian scientists and engineers and, likely, the CMC, debated the role of China's nuclear weapons in its future limited wars. In 1990, the Commander of the Second Artillery, China's nuclear missile force, Li Xuge and Political Commissar Liu Anyuan observed that the missile force needed to research "how to completely display the role of the

[1] M. Taylor Fravel, *Active Defense: China's Military Strategy Since 1949* (Princeton, N.J., 2019), ch 5.

strategic missile force in preventing local wars and emergencies."[2] Strategists decided that China would need to fight a local conventional war under conditions of nuclear deterrence and put forward three options for the role of nuclear weapons. They were influenced by their observations that the Soviet Union and United States were intending to fight a conventional war and avoid using nuclear weapons. In a 1986 speech at a PLA meeting to discuss campaign theory, Zhang Zhen, then Commandant of the National Defense University (NDU), argued that "in order to struggle against global hegemony, they [the superpowers] are currently preparing for nuclear war, as well as preparing for conventional war,"[3] but they were emphasizing "conventional war under nuclear conditions." The 1987 *Science of Military Strategy*, authored by the Academy of Military Science (AMS) evaluated that nuclear war was becoming less likely between the United States and Soviet Union because both possessed second strike capabilities and nuclear weapons use would destroy the spoils of conquest in Europe. Besides, conventional weapons were becoming increasingly lethal.[4]

Option 1: Useless Weapons

PLA strategists acknowledged that global nuclear disarmament could succeed, which would dramatically reduce China's need for nuclear weapons. China's missile force paid particularly close attention to the implications of global disarmament trends for China's nuclear force.

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[2] Li Xuge and Liu Anyuan, "Yunyong Mao Zedong Jianjun Sixiang Zhidao Zhanlue Daodan Budui Jianshe [Employing Mao Zedong's Thought on Military Development to Guide the Development of the Strategic Missile Force]," in *Quanjun Mao Zedong Junshi Sixiang Xueshu Taolun Wen Jing Xuan [Selected Essays from the All-Army Academic Meeting on Mao Zedong's Military Thought]*, ed. Hu Minggao and Li Dalun, vol. 2 (Beijing: Junshi Kexue Yuan Chubanshe, 1992), 562. These sources are cited in Alastair Iain Johnston, "China's New 'Old Thinking': The Concept of Limited Deterrence," *International Security* 20, no. 3 (Winter 1995/6): 5–42.

[3] Zhang Zhen, "Guanyu Wo Jun Zhanyi Lilun Fazhan de Jige Wenti [Some Issues with Our Army's Campaign Theory Development]," *Guofang Daxue Xuebao [National Defense University Journal]*, no. 2 (1986): 3.

[4] Junshi Kexue Yuan [Academy of Military Science], ed., *Zhanlue Xue [Science of Military Strategy]* (Beijing: Junshi Kexue Yuan Chubanshe, 1988), 70–71.

Second Artillery Commander Li Xuge and Political Commissar Liu Anyuan wrote in 1990 that the strategic missile force needed to research "whether, under the situation of disarmament, it is still necessary to push forward the development of strategic nuclear weapons."[5]

Nevertheless, Chinese strategists within and outside the Second Artillery were skeptical of the disarmament trend and envisaged an important role for China's nuclear weapons in an era of limited wars. Missile designer Qian Xuesen, criticized the naivety of a report submitted by Second Artillery officers to the CMC in 1988. That report was optimistic about nuclear disarmament.[6] Qian warned that Western reports heralding the "post-nuclear era" were "deceiving people, it's all false." He instead recommended a limited role for nuclear weapons, "even if nuclear weapons were useless, would you ask the United States and Soviets if it is okay to destroy all of their nuclear weapons? It is not at all the case that nuclear weapons are now useless, their utility is now in deterrence."[7] At the time Qian was Vice-Chairman of the Science and Technology Committee, which functioned as a think tank on cutting edge technology for the defense industry's governing body, the Commission for Science,

[5] Li and Liu, "Yunyong Mao Zedong Jianjun Sixiang Zhidao Zhanlue Daodan Budui Jianshe," 562.
[6] The name and content of the report are unknown.
[7] Mi Zhenyu, ed., *Qian Xuesen Xiandai Junshi Kexue Sixiang [Qian Xuesen's Thinking on the Modernization of Military Science]* (Beijing: Kexue Chubanshe, 2011), 76. PLA officers who advocated for a limited warfighting nuclear force similarly acknowledged and dismissed the argument that nuclear weapons could become obsolete if disarmament succeeded. See Yang Xuhua and Cai Renzhao, *Weishe Lun [Deterrence Theory]* (Beijing: Guofang Daxue Chubanshe [NDU Press], 1990), 243–45; Zhang Jingxi, "Lun Wo Jun Zhanyi Lilun Tixi Zhong de He Zhanyi Lilun [On Nuclear Campaign Theory in Our Military's Campaign Theory System]," in *Zhanyi Jiben Lilun Xintan [New Explorations of the Basic Theory of Campaigns]*, ed. Guofang Daxue Zhanlue Yanjiu Bu [National Defense University Strategy Research Department] (Beijing: Guofang Daxue Chubanshe, 1989), 839; Sang Zhongling and Xiao Kaishi, "Wo Jun Zhanyi Lilun de Yanjiu Ying Zengqiang 'He Guannian' [We Must Strengthen the 'Nuclear Concept' in Our Army's Campaign Theory]," in *Zhanyi Jiben Lilun Xintan [New Explorations of the Basic Theory of Campaigns]*, ed. Guofang Daxue Zhanlue Yanjiu Bu [National Defense University Strategy Research Department] (Beijing: Guofang Daxue Chubanshe, 1989), 804–5; Peng Guangqian and Wang Guangxu, eds., *Junshi Zhanlue Jianlun [A Brief Discussion of Military Strategy]* (Beijing: Jiefang Jun Chubanshe, 1989), 81. These sources are cited in Johnston, "China's New 'Old Thinking.'"

Technology and Industry (COSTIND).[8] Writing in 1989, Second Artillery Deputy Commander Yang Hua also expressed skepticism about disarmament and pointed out that the two superpowers were "actively researching and developing new and high-level strategic nuclear weapons." He recommended that China continue to develop its strategic nuclear force to keep up with global trends in high technology.[9]

Option 2: Limited Nuclear Warfighting

A second option for the role of China's nuclear force in a limited conventional war was to adopt a "limited nuclear deterrence" (*youxian he weishe*) posture, which would enable China to fight a limited nuclear war as well as a large-scale nuclear war. An adversary could conduct a limited strike on China, which required China to be able to retaliate proportionately. China could even use its nuclear weapons first. This option assumed that nuclear weapons could be a source of strategic leverage in a limited war, even if China's adversary was armed with nuclear weapons. It also assumed that it was feasible to control nuclear escalation. Both of these assumptions departed from the assumptions that underpinned China's choice of a retaliatory posture during the Cold War.

In a 1995 article, Alastair Iain Johnston documented the case for a limited nuclear deterrence posture put forward by authors from the Second Artillery, NDU, AMS and the General Staff Department (GSD) between approximately 1987 and 1993. He identified the goal of that

[8] Eric Hagt, "The General Armaments Department's Science and Technology Committee," in *Forging China's Military Might: A New Framework for Assessing Innovation*, ed. Tai Ming Cheung (Baltimore, M.D.: Johns Hopkins University Press, 2014), 66.
[9] Nie Li and Huai Guomo, eds., *Huigu Yu Zhanwang: Xin Zhongguo de Guofang Keji Gongye [Remembering and Looking Forward: New China's National Defense Science and Technology Industry]* (Beijing: Guofang Gongye Chubanshe, 1989), 159.

posture as giving China "sufficient counterforce and countervalue tactical, theater and strategic nuclear forces to deter the escalation of conventional or nuclear war. If deterrence fails this capability should be sufficient to control escalation and to compel the enemy to back down."[10] In 1995, China did not have the diverse and sophisticated nuclear weapons and support capabilities to implement this posture, such as tactical nuclear weapons, nuclear attack warning systems, and a robust command and control network that would endure in a protracted conflict.[11] This section examines some but not all of the sources Johnston consulted for that article. Those sources often seemed to assume that China's future conflict scenario would be a total war rather than a local war, which suggests that PLA strategic thinking in the late 1980s was still adapting to the change in China's conflict scenario.[12]

If nuclear weapons could be used as a credible source of strategic leverage against a nuclear-armed adversary, China had to be capable of fighting a limited nuclear war to deter an adversary from using nuclear weapons to coerce China. Many authors argued that China's nuclear forces needed be able to prevent nuclear threats and "the escalation of nuclear warfare."[13] According to two NDU researchers, "Our nuclear force structure should have many levels, it should be able to attack both enemy strategic targets and enemy targets within the scope of campaigns. The scope of our nuclear capabilities must reach the extent of ...stopping the enemy from invading us, even if a military conflict occurs, [it] will not dare to lightly

[10] Johnston, "China's New 'Old Thinking,'" 5.
[11] Ibid., 6.
[12] See, for example, Sang and Xiao, "Wo Jun Zhanyi Lilun de Yanjiu Ying Zengqiang 'He Guannian'."
[13] Liu Tieqing, Rong Jiaxin, and Chang Jinan, "Zhanlue Daodan Budui Zhanyi Lilun Tixi Chuyi [Our Views on the Structure of the Campaign Theory of the Strategic Missile Forces]," in *Zhanyi Jiben Lilun Xintan [New Explorations of the Basic Theory of Campaigns]*, ed. Guofang Daxue Zhanlue Yanjiu Bu [National Defense University Strategy Research Department] (Beijing: Guofang Daxue Chubanshe, 1989), 326.

escalate the war into a nuclear war."[14] Authors from the Second Artillery Command College recommended a force that would be "suitable for both the requirements of a big nuclear war, as well as satisfies the requirements for fighting a local nuclear war and conventional war."[15] One author highlighted that proportionate retaliation could prevent escalation: "if prevention [of a nuclear attack] is ineffective, then it is necessary to use equivalent nuclear counterattacks as a necessary response. So-called equivalent counterattacks do not initiate escalation."[16]

Limited deterrence advocates did not acknowledge that, if the PLA were equipped to fight a limited nuclear war, it would have an optimal force posture for using nuclear weapons first to gain strategic leverage. Nor did those authors advocate a first-use nuclear doctrine.[17] Some noted that China's No First-Use policy placed it in a passive position.[18] China would need to react quickly once it was attacked with nuclear weapons to ensure an adversary did not gain the strategic initiative.[19] Some authors implied that China's nuclear counterattack campaign could be triggered by the threat of nuclear use as well as an actual nuclear attack.[20]

Many advocates of limited deterrence nevertheless acknowledged that conventional weapons were the principal means of China's national defense. In the words of one author, "conventional

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[14] Yang and Cai, *Weishe Lun*, 408.
[15] Liu, Rong, and Chang, "Zhanlue Daodan Budui Zhanyi Lilun Tixi Chuyi," 328.
[16] Xu Guangyu, *He Zhanlue Zongheng [The Ins and Outs of Nuclear Strategy]* (Beijing: Guofang Daxue Chubanshe, 1987), 368.
[17] These authors could have been politically constrained from openly challenging China's No First-Use policy.
[18] Liu, Rong, and Chang, "Zhanlue Daodan Budui Zhanyi Lilun Tixi Chuyi," 328.
[19] Sang and Xiao, "Wo Jun Zhanyi Lilun de Yanjiu Ying Zengqiang 'He Guannian'," 806–7.
[20] Ibid., 804; Xiancun Wang, "Mao Zedong Renmin Zhanzheng Sixiang Zai Zhanlue Daodan Budui Zuozhan Zhong de Yunyong," in *Quanjun Mao Zedong Junshi Sixiang Xueshu Taolun Wen Jing Xuan [Selected Essays from the All-Army Academic Meeting on Mao Zedong's Military Thought]*, ed. Hu Minggao and Li Dalun, vol. 2 (Beijing: Junshi Kexue Yuan Chubanshe, 1992), 595.

capabilities are our country's principal armed capabilities."[21] Another NDU scholar argued that, "in warfare we must make preparations with two hands (*liangshou zhunbei*), that is, it is necessary to prepare to use modernized limited nuclear deterrence capabilities, to deal with enemy nuclear war, it is also necessary to employ modernized conventional capabilities to contest enemy conventional war."[22] He implied that China's nuclear weapons would not be used to counter enemy conventional threats.

There was, however, always the possibility that a conventional war could escalate into a nuclear war. For this reason, conventional and nuclear campaign planning needed to be better coordinated.[23] Officers from the PLA Chemical Defense Department complained that China had a strategic-level "contempt" for nuclear weapons that led to a lack of nuclear consciousness in the military. Only about 30 per cent of China's combat principles had nuclear content, compared to 77 per cent of Soviet campaign principles, and the nuclear content of Chinese regulations was shallow. That strategic-level contempt "leads to the separation of nuclear technology, and nuclear campaigns and tactics."[24]

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[21] Su Qianming, "Shilun Changgui Liliang Yu Zhanlue He Weishe Liliang Xiang Jiehe [Preliminary Discussion of the Linkages between Conventional Power and Strategic Nuclear Deterrence Power]," in *Quanjun Mao Zedong Junshi Sixiang Xueshu Taolun Wen Jing Xuan [Selected Essays from the All-Army Academic Meeting on Mao Zedong's Military Thought]*, ed. Hu Minggao and Li Dalun, vol. 2 (Beijing: Junshi Kexue Yuan Chubanshe, 1992), 566.

[22] Xu, *He Zhanlue Zongheng*, 369.

[23] Su, "Shilun Changgui Liliang Yu Zhanlue He Weishe Liliang Xiang Jiehe," 563; Wang, "Mao Zedong Renmin Zhanzheng Sixiang Zai Zhanlue Daodan Budui Zuozhan Zhong de Yunyong," 597–98.

[24] Importantly, however, these authors assumed that in future China would fight a war to counter an invasion against the Soviet Union or United States. As these authors assumed China's future conventional scenario was a war of invasion, their views may not have been very influential because they were already outdated at the time of publication. Sang and Xiao, "Wo Jun Zhanyi Lilun de Yanjiu Ying Zengqiang 'He Guannian'," 804, 811–12.

To equip China with the capabilities to fight a limited nuclear war, some advocates of limited deterrence indicated that China needed tactical nuclear weapons and command and control systems that would be reliable in a protracted conflict.[25] NDU author Xu argued that, "in order to maintain (*baochi*) an equivalent limited deterrence capability, tactical nuclear weapons are also necessary."[26] The other NDU researchers observed that new types of tactical nuclear weapons "objectively increase the flexibility and discrimination of nuclear weapons," which eliminated the differences between nuclear and conventional weapons. More "conventional" nuclear weapons made it more likely nuclear weapons would be used in local wars.[27] The Chemical Defense Department officers argued that, "Although we currently do not have campaign or tactical nuclear weapons, that does not mean in future we will not be able to be so armed; further, our air force nuclear bombs and Second Artillery nuclear bombs can also be used on adversary's deep rear in a campaign."[28] Most authors noted that China did not need quantitative parity with the superpowers in the size of its arsenal, but should keep up qualitatively.[29] They also argued for capabilities improvements that would make China's strategic arsenal more survivable.[30] They did not, however, recommend delegated command and control arrangements that would make threats to use tactical nuclear weapons more credible.

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[25] Ibid., 809.
[26] Xu, *He Zhanlue Zongheng*, 368.
[27] Yang and Cai, *Weishe Lun*, 242–43.
[28] Sang and Xiao, "Wo Jun Zhanyi Lilun de Yanjiu Ying Zengqiang 'he Guannian'," 806.
[29] Zhang, "Lun Wo Jun Zhanyi Lilun Tixi Zhong de He Zhanyi Lilun," 842; Peng and Wang, *Junshi Zhanlue Jianlun*, 87; Su, "Shilun Changgui Liliang Yu Zhanlue He Weishe Liliang Xiang Jiehe," 567.
[30] Those improvements included: quick reaction to ensure China's nuclear forces could hide in time to ride out an attack and adversaries cannot take tactical advantage of battlefield nuclear weapons use, a strategic triad, base hardening and protection, and mobile combat bases for road-mobile nuclear missiles. Zhang, "Lun Wo Jun Zhanyi Lilun Tixi Zhong de He Zhanyi Lilun," 329–30, 809, 843–44; Wang, "Mao Zedong Renmin Zhanzheng Sixiang Zai Zhanlue Daodan Budui Zuozhan Zhong de Yunyong," 595; Yang and Cai, *Weishe Lun*, 411.

China's leaders did not adopt a limited deterrence nuclear force posture, but it is likely that they considered the option of a limited nuclear warfighting posture.[31] Some Chinese experts claim that this debate reflected the individual opinions of PLA officers and had little influence on actual Chinese nuclear policy. Others, however, cite this debate as an example of enduring Second Artillery advocacy of nuclear warfighting capabilities.[32]

Option 3: Deterrence not Strategic Leverage

A third option for China's future nuclear posture in limited conventional wars was to maintain a retaliatory posture to deter nuclear coercion and attacks. Proponents of this option argued that a state could not credibly threaten to use nuclear weapons to gain strategic leverage over a nuclear-armed adversary in a limited war or a total war. The cost of nuclear retaliation was too severe to justify the first-use of nuclear weapons for any objective a state would pursue in a limited war. The most prominent advocates of continuing China's retaliatory nuclear posture were scientists and engineers, who had more influence over nuclear strategy formulation than the PLA.[33] This option created a problem for China: it would need to look elsewhere to gain strategic leverage in a limited war.

Advocates of continuity in China's retaliatory nuclear posture did not think that nuclear weapons were a credible source of strategic leverage in a limited war because they were too destructive. In 1988, missile designer and defense industry adviser Qian Xuesen described the role of nuclear weapons in future limited wars, "it is possible that large wars will not be fought,

[31] M. Taylor Fravel and Evan S. Medeiros, "China's Search for Assured Retaliation: The Evolution of Chinese Nuclear Strategy and Force Posture," *International Security* 35, no. 2 (Fall 2010): 78.
[32] Author's interviews, Beijing, 2014, 2016.
[33] Author's interview, Beijing, 2016.

but it is not possible to eliminate nuclear deterrence."[34] In remarks at a meeting on operations theory organized by the GSD in September 1986, Qian explained that "current world peace is peace under every type of nuclear deterrence. It is not that people do not want to fight, but they do not dare to fight, because the destructiveness of nuclear weapons is too great."[35] He observed that the Soviet Union and United States did not dare to fight a nuclear war but maintained their arsenals, so "we also cannot not have a strategic nuclear capability." A strategic nuclear capability would "prevent superpower nuclear threats."[36]

Proponents of using nuclear weapons to deter nuclear attacks rather than conventional wars argued that China had more credible, non-nuclear alternatives to maximize its strategic leverage in its future wars. Qian approved of using conventional missiles to prevent others from landing on islands in the South China Sea as a substitute for naval aviation, "this is not fighting a large nuclear war. If they [adversaries] do not dare to return [to the islands], then this is deterrence."[37] Two AMS authors also observed that conventional missile capabilities could be used to deter the outbreak and escalation of warfare.[38] Missile base commander Ge Dongsheng explained that conventional and nuclear missiles played different roles in China's national defense. Equipped with both, the "Second Artillery is like a tiger with wings (*ruhu deyi*), conventional missiles would play an irreplaceable role in our country's strategic armed forces."[39]

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[34] Mi, *Qian Xuesen Xiandai Junshi Kexue Sixiang*, 77.
[35] Ibid., 77.
[36] Ibid., 55.
[37] Ibid., 78.
[38] Peng and Wang, *Junshi Zhanlue Jianlun*, 79, 86, 89.
[39] Ge Dongsheng, *Nanwang Lijian Suiyue [Memorable Years Sharpening the Sword]* (Beijing: Junshi Kexue Yuan Chubanshe, 2016), 130.

Advocates of maintaining China's retaliatory nuclear posture argued that China could deter a nuclear first strike of any scale with a small arsenal of survivable strategic weapons. These strategists did not think tactical nuclear weapons or a larger arsenal gave the superpowers a bargaining advantage over China. In 1986, Qian remarked that "we must have a certain number, or what is called a minimum nuclear counterattack capability (*zuidi xiandu de fanji liliang*). Of course, these strategic nuclear weapons cannot be eliminated by an adversary, their ability to survive must be high, their reaction quick, their penetration capability must be strong."[40] A dynamic, effective balance of terror could be maintained against an adversary with a much larger nuclear force if China had a strategic force of about 100 weapons, "achieving a lot with little effort" (*banliang bo qianjin*).[41]

It did not matter to those strategists whether the nuclear threshold was crossed with tactical or strategic nuclear weapons. In the words of Zhu Guangya, the head of COSTIND's Science and Technology Committee, "even the role of tactical nuclear weapons is also mainly political. ... whether the differences between tactical nuclear weapons and strategic nuclear weapons are many or few, [the differences between them] are arbitrary, regardless of whether they are intercontinental range or short-range nuclear weapons, there is no great difference in the effects after they are used."[42] Zhu Guangya's views are striking given that he was one of the strongest proponents of China developing the neutron bomb just over a decade earlier. Two NDU authors who were proponents of limited deterrence for proportionate retaliation made the contradictory

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[40] Mi, *Qian Xuesen Xiandai Junshi Kexue Sixiang*, 55.
[41] According to Qian, "you just need to have about a hundred, that is unavoidable, add some here on this side, then on that side, and that is unbearable." Ibid., 55–56.
[42] Yuanze Neng Chuban She Bianji Weiyuan Hui [Editorial Committee of the Nuclear Energy Press], *Zhu Guangya Yuanshuai Bashi Huadan Wenji [Collected Works for the Eightieth Birthday of Academician Zhu Guangya]* (Mianyang: Yuanzi Neng Chubanshe, 2004), 300.

argument that "using a large-scale (*da weili*) weapon to force a country to submit, requires the condition that you cannot suffer from an adversary's retaliation."[43]

To ensure that China could deter U.S. or Soviet nuclear coercion and attacks, China needed to modernize its arsenal. Although Deng Xiaoping and Zhang Aiping recognized the need for a survivable second-generation nuclear force in the early 1980s, the urgency of arsenal modernization increased in the late 1980s as the Regan Administration pursued of missile defense. Chinese strategists saw missile defense as a threat to their nuclear retaliatory capability. In a 1986 CMC meeting, Defense Minister Zhang Aiping stated that, "in the situation of this kind of balance of terror, in order to contest superiority in future wars, and avoid suffering the destructiveness of an attack, they [the superpowers] have switched from researching and developing large-scale nuclear offensive capabilities to researching and developing strategic defenses, intending to develop in the non-nuclear area to gain superiority."[44] Zhu Guangya organized China's nuclear, missile, and space complexes to research missile defense technology in response to Regan's Strategic Defense Initiative (SDI).[45] Second Artillery Commander Li Xuge also "deeply analyzed the effect of the U.S.'s Star Wars plan on the world situation" during a spring 1987 training work meeting. He instructed the missile force to increase the range of China's DF-5 ICBM and accelerate the construction of bases to which that ICBM would be deployed.[46]

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[43] Yang and Cai, *Weishe Lun*, 27.
[44] Zhang Aiping, *Zhang Aiping Junshi Wenxuan [Selected Military Works of Zhang Aiping]* (Beijing: Changzheng Chubanshe, 1994), 573.
[45] Xi Qixin, ed., *Zhu Guangya Zhuan [Biography of Zhu Guangya]* (Beijing: Renmin Chubanshe, 2015), 508–11.
[46] Ge, *Nanwang Lijian Suiyue*, 165.

Leadership Decisions

In 1992, Chinese leaders decided that they would not use nuclear weapons to gain strategic leverage in a limited conventional war scenario. Three events suggest that Chinese leaders decided on the role of nuclear weapons in a limited war that year. First, top Party leader and General Secretary of the Communist Party, Jiang Zemin, affirmed China's retaliatory nuclear doctrine when inspecting the Second Artillery. Second, the Politburo approved a development plan for China's second generation of nuclear weapons, which prioritized the survivability of the force through road-mobile missiles carrying miniaturized warheads. Third, the CMC made a sudden decision to downgrade the military rank of missile bases that did not operate intercontinental-range missiles or had too few personnel. They also did not allocate sufficient resources for the Second Artillery to complete deployment of the DF-5 ICBM.

Affirming Doctrine

In 1992, top leader Jiang Zemin reaffirmed China's retaliatory nuclear posture using the same language as Mao Zedong, which was a strong signal of continuity in nuclear doctrine. He indicated that nuclear weapons were useful, but not for limited warfighting, "we develop strategic nuclear weapons, not in order to attack, but in order to defend." He quoted Mao's remarks about nuclear strategy, "If people don't attack us, we won't attack them, but if people attack us, we must attack them." Jiang explained that China's offensive nuclear capability

fulfilled a defensive role: "after we had this type of capability, it was a kind of very large deterrent against countries with nuclear weapons. It made them not dare to act carelessly."[47]

The 1991 Gulf War likely had an important impact on Chinese leaders' decision to maintain a retaliatory nuclear posture, given that the United States barely used its nuclear weapons to gain strategic leverage against Iraq in that conflict. The conflict was extremely influential on the PLA's assessments of the kinds of conventional wars China would need to fight in the future. It led to a major change in the strategic guideline, China's national military strategy in 1993, to "local wars under conditions of high technology."[48] A 1993 report on the Gulf War distinguished between superpowers' use of nuclear weapons to gain strategic leverage and non-superpower nuclear postures, which deterred superpower nuclear coercion: "superpowers see their nuclear weapons as great power symbols and the principal bargaining chip for gaining strategic superiority, other countries also think of using limited nuclear deterrence to protect themselves."[49] The report recommended that China should still be prepared for its adversary to use nuclear weapons and strengthen its deterrent despite global trends towards disarmament and arms control.[50] When the PLA finally updated its operational regulations to implement the

[47] Quoted in Deng Lizhong, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu [Research on the Combat Role of Second Artillery Nuclear Missile Forces under Informationized Conditions]" (Masters Thesis, PLA National Defense University, 2004), 28.
[48] See M. Taylor Fravel, "Shifts in Warfare and Party Unity," *International Security* 42, no. 3 (Winter 2017): 37–83.
[49] Zong Canmou Bu Junxun Bu [General Staff Department Training Department] and Zong Zhengzhi Bu Xuanchuan Bu [General Political Department Propaganda Department], *Gao Jishu Zai Junshi Lingyu de Yingyong Ji Dui Zuozhan de Yingxiang [The Role of High Technology in the Military Domain and Its Influence on Warfare]* (Beijing: Bayi Chuban She, 1993), 244.
[50] Ibid., 245.

1993 strategic guideline, in 1999, it issued a Training Outline for Second Artillery Campaigns, which codified operational doctrine for a counterattack campaign only.[51]

Despite Jiang's remarks affirming the retaliatory role of nuclear weapons in China's national defense in the post-Cold War era, the view that nuclear weapons were useless in limited wars endured among some Chinese leaders into the 1990s. The remarks of PLA, missile force, and defense industry leaders suggest that nuclear skeptics were encouraged by the modest role nuclear weapons played in the 1991 Gulf War. CMC Vice-Chairman at the time, Admiral Liu Huaqing, wrote in his memoir that "I always participated in upholding the plan of researching our nuclear weapons equipment building in the new era. ... After the Gulf War, a sort of false appearance pervaded the world: nuclear weapons do not have as much of a role as before, they may even be useless. This view does not reflect reality."[52] According to the Deputy Commander of the Second Artillery from 1999-2002, Ge Dongsheng, some in the PLA "believed that today we were fighting conventional local wars, nuclear weapons are hard to put to use on the battlefield."[53] In a speech to the COSTIND Science and Technology Committee on February 29, 1992, Qian Xuesen argued that China needed to invest more in its nuclear capabilities to deter nuclear attacks, "of course, we don't need to do so on a large scale, but if you don't have this people want to coerce (*weishe*) you and bully you. We absolutely do not grasp this thing to scare and coerce (*weishe*) people."[54] Nuclear skeptics may have

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[51] Xue Xinglin, *Zhanyi Lilun Xuexi Zhinan [Campaign Theory Study Guide]* (Beijing: Guofang Daxue Chubanshe, 2001), 386–93.
[52] Liu Huaqing, *Liu Huaqing Huiyi Lu [Memoir of Liu Huaqing]* (Beijing: Jiefangjun Chubanshe, 2004), 681.
[53] Ge, *Nanwang Lijian Suiyue*, 190.
[54] Gu Jihuan, Li Ming, and Tu Yuanji, eds., *Qian Xuesen Wenji [Collected Works of Qian Xuesen]*, vol. 6 (Beijing: Guofang Gongye Chubanshe, 2012), 262.

influenced subsequent CMC decisions to cut Second Artillery funding and downgrade of some of its bases within the PLA rank system.

Capabilities Development

The Politburo did not approve a plan to develop China's second generation of strategic nuclear weapons until 1992, despite the fact that Chinese nuclear scientists approached the CMC with a plan to develop second-generation nuclear weapons in 1989, if not earlier. A decision among Chinese leaders to affirm its retaliatory nuclear posture that year would explain the timing of the plan's approval. The political upheavals associated with the violent end to the pro-democracy movement on June 4, 1989, coupled with a restructuring of the Chinese Academy of Engineering Physics (CAEP) in 1990, likely contributed to the delay as well.[55]

China's nuclear weapons laboratory and missile research institutes were starved of funding from 1985 until at least 1992. Deng Xiaoping allocated resources away from PLA modernization until the civilian economy had further developed in a policy known as "military patience." Ge Dongsheng, who was a Second Artillery missile base commander at that time, recalled, "in order to implement the policy that 'the military must be patient' some of the big military research programs stopped or were canceled, severely influencing the process of weapons development, making a large number of scientific researchers lose their jobs or move to private industry."[56] Zhang Aiping tried but failed to secure adequate funding for strategic weapons programs in the late 1980s. He even gave a specialist report entreating the CMC not

[55] Wang Gantang and Sun Hancheng, eds., *He Shiji Fengyun Lu: Zhongguo He Kexue Jia Shihua [Recording the High Position of the Nuclear Century: Chinese Nuclear Scientists' Accounts of History]* (Beijing: Kexue Chuban She, 2006), 114–15.
[56] Ge, *Nanwang Lijian Suiyue*, 123.

to neglect high technology weapons in mid-December 1985.[57] In 1989 the CAEP held a meeting about China's nuclear weapons development strategy.[58] On April 28, 1989, Zhu Guangya and other nuclear scientists reported to the CMC on the state of China's nuclear weapons and a tentative plan under the 8th Five Year Plan. They received guidance from CMC Vice-Chairmen Yang Shangkun and Liu Huaqing, but no plan was approved.[59]

In 1992, CAEP held a second meeting about China's nuclear weapons development strategy and sent the Politburo a report outlining "A Concept for a Nuclear Weapons Development Plan." Scientists reported that the Politburo "made an important decision" after receiving the report, "clarifying the direction of accelerating research and development in nuclear weapons affairs."[60] The meeting and its outcome addressed the atrophying of China's nuclear weapons research and development complex, and ensured its second-generation warheads could be tested before a comprehensive nuclear test ban treaty came into effect.[61] On December 15, 1992, Zhu Guangya gave a report to Jiang Zemin and others on "A Tentative Plan for Nuclear Weapons Development."[62] The same day, CMC Vice-Chairman Liu Huaqing heard reports from relevant departments on the nuclear weapons development plan.[63]

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[57] Zong Zhuangbei Bu Zhengzhi Bu [Political Department of the General Armaments Department], *Zong Zhuangbei Bu Gaoji Jiangling [High-Level Leaders of the General Armaments Department]* (Beijing: Guofang Gongye Chubanshe, 2012), 59.
[58] Yuanze Neng Chuban She Bianji Weiyuan Hui [Editorial Committee of the Nuclear Energy Press], *Zhu Guangya Yuanshuai Bashi Huadan Wenji]*, 80.
[59] Du Xiangwan, ed., *Zhanlue Kexue Jia Zhu Guangya [Strategist and Scientist Zhu Guangya]* (Mianyang: Yuanzi Neng Chubanshe, 2009), 413.
[60] Yuanze Neng Chuban She Bianji Weiyuan Hui [Editorial Committee of the Nuclear Energy Press], *Zhu Guangya Yuanshuai Bashi Huadan Wenji*, 80.
[61] Ibid.
[62] Du, *Zhanlue Kexue Jia Zhu Guangya*, 417.
[63] Jiang Weimin, ed., *Liu Huaqing Nianpu [Chronology of Liu Huaqing]*, vol. 2 (Beijing: Jiefangiun Chubanshe, 2016), 1007.

China made little progress towards a second-generation retaliatory force between 1982 and 1991. At the end of 1982 Zhang Aiping argued that China needed to develop solid-fueled missiles, a mobile launch capability on land, and nuclear weapons that were "miniaturized, flexible and convenient to use."[64] A decade later Second Artillery leaders were still calling for the same capabilities. In 1989, the Second Artillery Deputy Commander Yang Hua wrote that China's future nuclear armaments research needed to improve in three areas: survivability, accuracy, and penetrability. He also called for China to "strengthen research into missiles that were miniaturized, solid-fueled, and highly automated and mobile, strengthening concealment technology and both nuclear and non-nuclear hardening technology, and improving the survivability of missiles before and during flight."[65] In 1991, the Second Artillery Commander, Li Xuge, and Political Commissar, Liu Anyuan, again. gave an identical list of priorities for the force.[66] Li and Liu also raised the question of, "how to increase the combat power of the strategic missile forces on the basis of their current funds and materials" given China's "situation in which our nation cannot obtain more funds to use on defense building."[67]

Missile Force Adjustments

A third indicator that Chinese leaders decided to maintain a retaliatory nuclear force in 1992 was a CMC decision to downgrade missile force bases that did not have intercontinental-range missiles. The CMC probably decided to downgrade bases some time in May 1992 to re-allocate resources to economic development and conventional military modernization. [68] Base

[64] Zong Zhuangbei Bu Zhengzhi Bu [Political Department of the General Armaments Department], *Zong Zhuangbei Bu Gaoji Jiangling*, 55.
[65] See also Li and Liu, "Yunyong Mao Zedong Jianjun Sixiang Zhidao Zhanlue Daodan Budui Jianshe," 560–61.
[66] Ibid., 560–61.
[67] Ibid., 562.
[68] CMC Vice- Chairman Liu Huaqing heard reports from COSTIND and the GSD Equipment Department on a nuclear weapons development plan on May 12, 1992. He also heard a report from Second Artillery commander

commanders were informed of the decision at a "top secret and sudden" meeting during the Second Artillery's Party Committee meeting in 1992.[69] Second Artillery bases would not retain their full corps grade (*zhengjun ji*) if they had too few personnel or their missiles were less than long- or ICBM-range.[70]

Chinese leaders did not allocate adequate funds for the missile force to deploy a true ICBM capability after 1992. Former Deputy Commander of the Second Artillery, Ge Dongsheng, describes the criticism that some leaders directed at the missile force after 1993: "where do you need to target with 10,000-kilometer range missiles? Is this possible and necessary? Can our deterrent force even make use of such force? If ten missiles are a deterrent, then so is one, why on earth make so many?" According to Ge, some leaders "even wanted to halt construction on the first phase of ICBM base construction"[71] and "did not approve of large ICBMs maintaining year-round war preparedness to launch."[72] Second Artillery Commander Li Xuge actively sought funds from China's cabinet, the State Council, to complete the construction of silo bases for China's first intercontinental-range ICBM, the DF-5. He also suggested to the CMC that China extend the DF-5's range to ensure it had a truly intercontinental-range nuclear delivery system. When the CMC would not provide sufficient funds, Li reached an agreement with the Aerospace Ministry, which produced the missiles, to fund the testing and certification of an extended range missile from the Second Artillery's budget.[73]

Li Xuge and convened a meeting between the relevant leaders of the GSD, COSTIND, the Second Artillery and the military trade office to research the Second Artillery's development plan on May 20, 1992. Jiang, *Liu Huaqing Nianpu*, 2:978–79.

[69] Ge, *Nanwang Lijian Suiyue*, p. 151.

[70] Ibid., p. 150-152.

[71] Ibid., 173.

[72] Ibid., 190.

[73] Ibid., 174.

Ge Dongsheng claimed that a mis-reading of the 1993 strategic guideline, which set the PLA's goal of fighting a local war under high-technology conditions, fueled the view that nuclear weapons were not important for China's national defense. Under that guideline, he clarified that China's nuclear weapons played two important roles. First, other states might try to use their nuclear weapons to gain strategic leverage over China, "there is still an extremely small number of madmen, who have threatened socialist countries, especially new China, to initiate nuclear war, intending to use their nuclear superiority as a final bargaining chip to win a war." Nuclear weapons could, however, keep the peace, "Western politicians also cannot but dread the enormous destructive role and lethality of nuclear weapons, recognizing that 'there is no winner in nuclear war,' maintaining a policy of using nuclear weapons 'using nuclear to prevent nuclear,' producing what has emerged in the world as a mutual peace within the haze of "nuclear terror."[74] Second, in the post-Cold War era, China needed nuclear weapons to serve as a backstop to prevent a conventional war from escalating into a nuclear war, "local war, general war and even nuclear war do not have lines of separation between them that must be crossed, they can all turn into each other."[75] These two roles assume that nuclear weapons cannot be used to gain strategic leverage against a nuclear-armed adversary because the cost of nuclear retaliation would be too high.

II. The Evolution of China's Nuclear Force Posture in the 1990s

During the 1990s, political, military and defense industry leaders affirmed that China would use non-nuclear strategic weapons, not nuclear weapons, as sources of strategic leverage in a

[74] Ibid., 190-1.
[75] Ibid., 191.

limited war. Although PLA leaders viewed a limited war scenario over Taiwan in the early 1990s as a possibility, they were not focused on the Taiwan scenario as China's single most important contingency until a crisis broke out in cross-Strait relations in 1995. During that crisis, which worsened China's threat environment, Chinese leaders did not consider using nuclear weapons as a source of leverage. Instead they used their conventional missiles and military exercises to deter further Taiwanese moves towards independence and encourage the United States to restrain Taipei. The crisis tested China's approach to maximizing strategic leverage in a limited conflict scenario against the superior conventional military power of Taiwan and the United States using non-nuclear weapons. After that deterioration in China's threat environment, its leaders and strategists did not even consider changing their view that nuclear weapons lacked strategic credibility in a limited war.

The Taiwan Scenario

Taiwan emerged as China's primary conflict scenario in the 1990s as Taiwanese leaders began to advocate for formal recognition of the de facto independence of Taiwan from the mainland. The Chinese civil war ended in 1949 with the establishment of the Republic of China in Taiwan and the People's Republic of China on the mainland. Both governments claiming to be the rightful government of both the Taiwan island and the mainland. While Taiwan and the People's Republic were de facto independent states since 1949, they were formally one state. Both Taipei and Beijing adhered to that view until some Taiwanese political leaders began to advocate for Taiwan to become a formally independent state in the 1990s. The Communist

Party viewed the reunification of Taiwan with China as the final step in completing the revolution, however, and rejected the idea of two independent states across the Taiwan Strait.[76]

As a condition of the diplomatic rapprochement between the United States and China, Washington recognized Beijing as the sole legal government of China in 1979. It severed diplomatic ties with Taiwan. The United States also abrogated its 1954 defense pact with Taiwan but continued to sell arms to Taiwan to equip the island to defend itself. After the Sino-U.S. rapprochement in the 1970s, it was not clear that Washington would support Taiwan militarily in a crisis with the mainland until 1995-6.

China's political aim in a limited war over Taiwanese independence is to prevent the Taiwan from becoming formally independent of the mainland, but not necessarily to forcibly reunify Taiwan with the mainland. Reunification is a political goal of the mainland government, but Chinese leaders have not advocated for forcible reunification or a set a timeline for reunification. A Taiwanese pro-independence provocation could provide the mainland with an opportunity to achieve reunification using force. But if Beijing could not achieve a military victory resulting in reunification, it wants to prevent a political defeat resulting in Taiwanese independence. Even today, the PLA only has the capability to attempt reunification through compellence, not brute force. While it can inflict pain on Taiwan through a naval blockade or missile strikes, it does not have the ability to conduct an amphibious invasion of the island.[77] A cross-Strait war would be a limited war for both Washington and Beijing, but not for Taipei.

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[76] See M. Taylor Fravel, *Strong Borders, Secure Nation: Cooperation and Conflict in China's Territorial Disputes* (Princeton, N.J.: Princeton University Press, 2008), 233–56.
[77] Eric Heginbotham et al., "The U.S.-China Military Scorecard" (Santa Monica, C.A.: RAND Corporation, 2015).

In 1995-6, China conducted a number of conventional military exercises to protest Taiwanese and U.S. actions that it viewed as increasing Taiwan's independence from the mainland. The crisis focused the PLA's attention on planning for a limited war over Taiwanese independence with U.S. intervention, rather than preparing for a limited war with any country on China's periphery. As outlined in greater detail in the next chapter, in July 1995, the PLA fired six DF-15 missiles into the East China Sea in the Shenjian-95 exercises to protest the United States granting a visa to Taiwanese President Lee Teng-Hui to attend a university reunion. Mainland leaders viewed the act as violating the U.S. recognition as the legal government of China. China also conducted joint military exercises to try to influence the outcome of presidential elections in Taiwan on March 23, 1996. The 1996 exercise began with two test conventional missile launches on March 8-12, followed by air and naval maneuvers, and an amphibious landing exercise. The United States dispatched two aircraft carriers to the Taiwan Straits on March 10 and 11, 1996. In their after-action reports and meetings evaluating the missile exercises, PLA leaders concluded that the exercises were very successful in giving China strategic leverage over Taiwan and the United States.

China's Post-Taiwan Straits Crisis Nuclear Posture

China tested its approach to maximizing strategic leverage using non-nuclear strategic weapons in the 1995-6 Taiwan Straits Crisis and was satisfied with the result. After the crisis, Chinese leaders continued to assess that they could make more credible threats to use non-nuclear strategic weapons than nuclear weapons in a limited war. As outlined in the following chapter, China responded to the deterioration in its threat environment due to the crisis by

bolstering its conventional missile posture. The statements of Chinese defense industry, military and political leaders in the late 1990s confirm that China continued to view nuclear threats as lacking strategic credibility, giving China a strong motivation for developing non-nuclear strategic weapons.

The clearest affirmation of China's approach to maximizing strategic leverage in a limited war came from nuclear scientist Zhu Guangya. By the mid-1990s, Zhu was an influential figure in China's defense industry and led the CMC's high-level advisory group on weapons development from 1998.[78] He viewed nuclear weapons as too destructive to use: "in the past 200 years the destructive capability of war and weapons has kept increasing, eventually developing nuclear weapons and biological and chemical weapons of mass destruction. But the extreme increase in lethality, on the contrary, has given rise to many political problems and has limited their use." Non-nuclear strategic weapons did not, however, have these problems. He explained that "using precision-guided weapons to destroy the enemy centers, or precisely and discriminately using information warfare weapons (computer viruses, signals deception) and weapons use not ordered by governments (*fei zhengming wuqi*) make the enemy lose its ability, without using firepower to destroy it." These non-nuclear strategic weapons were less destructive and therefore more credible sources of strategic leverage than nuclear weapons: "employing capabilities with precision and discrimination can, on the one hand, reduce the loss of life and [increase] political influence, making decisions more flexibly and in an intersecting manner using both armed force and diplomatic methods." They were also cheaper.[79]

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[78] That group was the Science and Technology Committee of the General Armaments Department, which was established in 1998.

[79] Du, *Zhanlue Kexue Jia Zhu Guangya*, 347.

Top PLA leaders made similar assessments about the strategic credibility of nuclear weapons in limited wars. Reflecting on nuclear weapons development in the early 1990s, then-CMC Vice-Chairman Admiral Liu Huaqing wrote that, "facing Western nuclear powers' power politics and hegemonism, the attitude we must adopt is to resolutely develop a lean and effective nuclear weapons [arsenal] possessing a deterrent power."[80] Li Jijun, who was Deputy Director of the General Office supporting the CMC from 1987 until 1992, wrote that "nuclear weapons and nuclear strategy were a military revolution when they appeared, but now nuclear blackmail has already gone down a dead end, the originators also became deterred adversaries."[81] In February 1999, GSD Chief of General Staff Fu Quanyou wrote that China needed to prepare for a high-technology local war, which meant "achieving limited war goals," and "implementing limited-scale (*youxian guimo*) war within a local area."[82] He cited the Cold War as evidence that two nuclear powers could no longer fight a total war and had to resolve their disputes in limited wars. Despite the Berlin and Cuba crises: they did not dare to directly clash with each other, war forces above a certain extent [nuclear weapons] were confined (*yihua*) to war limiting forces."[83]

[80] Liu, *Liu Huaqing Huiyi Lu*, 681.
[81] Li Jijun, *Lun Zhanlue [On Strategy]* (Beijing: Jiefangjun Chubanshe, 2001), 53.
[82] Fu Quanyou, *Fu Quanyou Wenxuan [Selected Works of Fu Quanyou]* (Beijing: Jiefangjun Chubanshe, 2015), 653.
[83] Ibid., 654–55.

III. The Debate over Changing China's No-First-Use Policy

A debate over China's No First-Use policy that took place in the early 2000s offers clear evidence that Chinese leaders were not willing to use its nuclear weapons to maximize strategic leverage when a sudden deterioration in its threat environment exposed inadequacies in China's existing sources of leverage. A series of events, beginning with the U.S. bombing of the Chinese embassy in Belgrade in May 1999, worsened China's threat environment. Chinese strategists considered the option of using nuclear weapons to maximize strategic leverage to respond to that change in threat environment, which demonstrates some modest variation in China's strategic credibility motivation for pursuing non-nuclear strategic weapons capabilities. But Chinese leaders rejected any changes to its nuclear posture. Left with a need for strategic leverage, Chinese leaders responded by enhancing their conventional missile posture and establishing force postures for their space and cyber weapons.

In the early 2000s, some Chinese strategists suggested that China should add conditions to its No First-Use policy. Those strategists assumed that China could make credible threats to use its nuclear weapons to gain strategic leverage over the United States in a Taiwan contingency. Other strategists argued, however, that nuclear threats would not be credible in that limited war scenario. China could make more credible threats to use non-nuclear strategic weapons to maximize its strategic leverage. There is no available evidence to indicate whether leaders in the Politburo Standing Committee and CMC, who had the authority to change China's nuclear posture, were sympathetic to either of these viewpoints. But those leaders maintained China's

strict retaliatory nuclear doctrine. A number of Western scholars documented this debate at the time.[84] This section uses new sources to provide a more complete account of the debate.

The Belgrade Embassy Bombing and Nuclear Policy

Chinese strategists debated whether to change its No First-Use nuclear force posture from approximately 2000 until 2006 for two reasons. First, China risked a military defeat in a limited war scenario across the Taiwan straits because of its conventional military inferiority, especially if the United States intervened. Second, strategists worried that the combination of China's small nuclear arsenal and No First-Use policy was insufficient to deter the United States from conducting a disarming first-strike against China's nuclear arsenal, especially as Washington moved ahead with missile defenses and conventional long-range precision strike capabilities. There is no evidence to suggest whether the CMC or Politburo played a role in initiating the debate, but they certainly ordered it to end around 2006.

The accidental U.S. bombing of the Chinese embassy in Belgrade triggered a major re-examination of the PLA's short-term and long-term preparedness for a limited war, which may have included a review of China's nuclear posture. On the instructions of Jiang Zemin, CMC Vice-Chairman Zhang Wannian oversaw efforts in the General Armaments Department (GAD), General Staff Department (GSD), and PLA research institutions to find ways to defeat the

[84] Thomas J. Christensen, "The Meaning of the Nuclear Evolution: China's Strategic Modernization and US-China Security Relations," *Journal of Strategic Studies* 35, no. 4 (2012): 447–87; Fravel and Medeiros, "China's Search for Assured Retaliation: The Evolution of Chinese Nuclear Strategy and Force Posture"; Gregory Kulacki, "Chickens Talking With Ducks: The U.S.-Chinese Nuclear Dialogue," *Arms Control Today*, October 2011; Andrew S. Erickson, Michael S. Chase, and Christopher Yeaw, "Chinese Theater and Strategic Missile Force Modernization and Its Implications for the United States," *Journal of Strategic Studies* 32, no. 1 (2009): 67–114.

United States from China's position of conventional military inferiority. There is clear evidence that these efforts led to the establishment of PLA cyber and space force postures, outlined in the following chapters. But there is no evidence to suggest that General Secretary Jiang Zemin or CMC Vice-Chairman Zhang Wannian instructed Chinese strategists to consider whether its nuclear weapons could be used to maximize its strategic leverage and compensate for its conventional military inferiority. In 1999, top armaments adviser to the CMC Zhu Guangya interpreted Jiang Zemin's instructions to the PLA in response to the incident as requiring China to continue developing its nuclear weapons, "the strategic position of nuclear capabilities has not changed, they are still the main area of great power arms races."[85]

The Second Artillery's response to the Belgrade embassy bombing involved ensuring that the nuclear missile force could ride out an attack using the kind of precision-guided munitions that the United States used to destroy the Chinese embassy. The missile force participated in meetings coordinated by the GSD Chief of Staff to study the embassy attack, along with their counterparts from the GAD, Air Force, and space experts. Those meetings provided initial recommendations to the CMC in the second half of 1999.[86] According to then-Deputy Commander of the Second Artillery, Ge Dongsheng, after the embassy bombing the missile force varied its combat positions (*zuozhan chendi*) and researched how its bases could withstand advanced surveillance techniques and conventional attacks using precision-guided munitions.[87]

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[85] Du, *Zhanlue Kexue Jia Zhu Guangya*, 360.
[86] Wang Xuedong, *Fu Quanyou Zhuan [Biography of Fu Quanyou]* (Beijing: Jiefangjun Chubanshe, 2015), 208.
[87] Ge, *Nanwang Lijian Suiyue*, 263.

At the time of the embassy bombing, the Second Artillery was commencing a major base construction program. The program would enable the missile force to fight, conceal, and defend its conventional and nuclear missiles in peacetime, as well as conventional wars of any intensity, including high-technology regional wars, and a large-scale conventional war in which a nuclear war was possible. In other words, the missile force was preparing for a war to prevent a Taiwanese bid for independence in which the United States intervened, raising the prospect of nuclear escalation.[88] In such a conflict, the role of the Second Artillery's conventional missile force was to "be the first to fight and precisely strike the weak point" (*shouzhan yongwo, jingda yaohai*) while the nuclear missile force's primary task was "self-defense against nuclear war with an emphasis on deterrence" (*ziwei kanghe, zhongdian weishe*).[89]

The 1999 Belgrade embassy bombing was only the first of a series of events that worsened China's threat environment into the early 2000s. A few months after the bombing, on July 9, 1999, Chinese President Lee Teng-Hui told a German journalist that China-Taiwan relations should be handled on a "state-to-state basis" prompting Chinese leaders to fear that Taiwan was going to take further steps towards independence. Lee was succeeded by the pro-independence Democratic Progressive Party's Chen Shui-bian in 2000, who indicated that he might hold a referendum on Taiwanese formal independence in 2002. After the Bush Administration took office in early 2001, a U.S. spy plane and a Chinese fighter jet collided off China's coast, which triggered a diplomatic crisis. The Administration's 2001 Nuclear Posture Review mentioned a Taiwan contingency and indicated that the United States would

[88] Ibid., 216-217.
[89] Ibid., 216.

pursue missile defense, conventional long-range precision strike capabilities, and small nuclear weapons.

Between 1999 and 2002 a number of reports from military research and teaching institutions examined the adequacy of China's nuclear posture, including its No First-Use policy. The Second Artillery Campaign Outline, which outlined a singular nuclear counterattack campaign for China's missile forces, was issued in January 1999, five months before the Belgrade embassy was bombed. The Outline formed the point of departure, rather than a restriction, on the content of the debate.[90] With the exception of the *Science of Second Artillery Campaigns* published in 2004, none of these materials are publicly available. The *Science of Second Artillery Campaigns* likely reflected the views of the Second Artillery in that debate. Chinese experts deny that there was any discussion of altering China's No First-Use policy at the Politburo or CMC level.[91] The CMC received a "'grand answer' style report the CMC members (*shouzhang*) to consider when making decisions," from the AMS some time during or after 2002,[92] but that report did not examine the No First-Use policy.

In the midst of this debate, Jiang Zemin gave a speech to the CMC in December 2002 indicating that China's existing sources of strategic leverage were inadequate. But he also signaled that the CMC was unlikely to look to its nuclear weapons to maximize China's strategic leverage, leaving it with a need for strategic leverage it would have to satisfy with other capabilities.

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[90] For a list of publications, see Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 46. On the role of the Outline, see also the afterword of Yu Jixun, *Di'er Paobing Zhanyi Xue [The Science of Second Artillery Campaigns]* (Beijing: Jiefangjun Chubanshe, 2004).

[91] Author's interviews, Beijing and Shanghai, 2015, 2016.

[92] Although the role of AMS is to provide research support to the CMC, it is unclear whether the CMC requested the report. Ge, *Nanwang Lijian Suiyue*, 333.

Jiang instructed the PLA to improve its strategic deterrence capability not by increasing the role of its nuclear weapons but using other methods of deterrence: "as military technology develops, strategic deterrence methods are constantly increasing. Based on what is now available and developing with foresight, we must gradually form a strategic deterrence system bringing together many methods." [93] Jiang's remarks also indicate that the Bush Administration's nuclear posture influenced China's pursuit of diverse sources of strategic deterrence. He referred to the new U.S.' "new triad" deterrence strategy, which "included nuclear and non-nuclear attack systems, active and passive defense systems, basic defense facilities, its core thought is to make deterrence methods more usable (*shiyong hua*)."[94]

Some Chinese strategists have interpreted the additional means of deterrence Jiang mentioned as referring to conventional missiles,[95] as well as space and information domain deterrence.[96] Foreshadowing Jiang's instructions, the 2001 *Science of Military Strategy* indicated that, "it is increasingly difficult to cope with the actual and potential threats to the national security by reliance on the single means and unitary approach of military deterrence. Only by combining nuclear deterrence, conventional force deterrence, space force deterrence, information deterrence and deterrence of people's war, and concurrently coordinating with the struggle in

[93] Jiang Zemin, *Jiang Zemin Wenxuan (San Juan) [Selected Works of Jiang Zemin (Volume 3)]* (Beijing: Zhongyang Wenxian Chubanshe, 2006), 585.
[94] Jiang, *Jiang Zemin Wenxuan (San Juan)*, 585.
[95] Zhao Zekuan, "Xin Shiqi He Weishe Lilun Yu Shijian de Xin Fazhan [New Development in Nuclear Deterrent Theory and Practice in the New Period]," *Zhongguo Junshi Kexue [China Military Science]*, no. 1 (2009): 17; Shou Xiaosong, ed., *Zhanlue Xue [The Science of Military Strategy]* (Beijing: Junshi Kexue Yuan Chubanshe, 2013)142.
[96] Xiao Tianliang, *Xiao Tianliang Jianggao Zixuanji [Selected Lectures of Xiao Tianliang]* (Beijing: Guofang Daxue Chubanshe, 2015), 119–23.

the fields of diplomacy, economy, science and technology to enable deterrent means to complement each other, can the strategic deterrence be exerted to the utmost extent."[97]

The Case for Amending No First-Use

Chinese strategists, especially those from the Second Artillery, identified three disadvantages of China's No First-Use policy and four situations in which China could make an exception to that policy to remedy these disadvantages. The first disadvantage was that China had no options to counter limited nuclear use by an opponent without escalating to the use of its strategic nuclear weapons.[98] Second, China's nuclear force could be compromised, or even eliminated, by an opponent equipped with conventional offensive and defensive capabilities without crossing the nuclear threshold, exploiting China's No First-Use policy.[99] Finally, as the weaker party in a future limited conventional war, China could be forced to accept defeat in a war over Taiwanese independence with U.S. interference if it maintained its strict retaliatory nuclear posture.[100] Second Artillery officer Deng Lizhong wrote in a prize-winning master's thesis, "It [No First-Use] is beneficial for placing China in a position of initiative politically, for arms control and for managing China's relationships on its periphery. But it is not at all a concrete policy for winning an informationized local war with the intervention of a stronger power."[101]

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[97] Peng Guangqian and Yao Youzhi, eds., *The Science of Military Strategy* (Beijing: Military Science Publishing House, 2005), 226. The Chinese edition of this publication appeared in 2001. The English translation, published in 2005, is cited here for ease of reference.
[98] Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 9; Ge, *Nanwang Lijian Suiyue*, 343.
[99] Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 8; Ge, *Nanwang Lijian Suiyue*, 342.
[100] Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 11; Peng Guanqian and Rong Yu, "Nuclear No First-Use Revisited," *China Security* 5, no. 1 (Winter 2009): 83–84.
[101] Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 15.

The first situation in which China could make an exception to No First-Use was after an enemy state attacked China's nuclear weapons with its conventional weapons.[102] This exception was intended to deal with U.S. conventional precision strike. Deng Lizhong explained that, "a strong adversary seeking support through 'precise and real time intelligence,' and 'using non-nuclear weapons to substitute for nuclear weapons strike power,' [could] make countries adhering to the 'No First-Use of nuclear weapons' lose their nuclear counterattack ability in a future war."[103] This exception to No First-Use may have been the only adjustment to China's nuclear posture resulting from the 2000 debate, if even. Interviews with Chinese experts in 2014 indicated that, while the Chinese government made no explicit changes to its No First-Use policy, it had made a decision on how to respond to this contingency. It would not make its decision public.[104] Arms control expert Sun Xiangli wrote that China's nuclear weapons were hardened to withstand a nuclear attack and would not be affected by conventional long-range strike weapons.[105] Sun's assessment which accords with the Second Artillery's efforts to improve the survivability of the force after the Belgrade embassy bombing. While this exception would strictly be a violation of a No First-Use policy, it adheres to the goals of a retaliatory nuclear posture.

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[102] Ibid., 9–11; Sheng Dingli, "Nuclear Deterrence in the 21st Century," *China Security* 1, no. 1 (Autumn 2005): 12; Peng and Rong, "Nuclear No First-Use Revisited," 83–84.
[103] Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 8.
[104] Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Strategy and U.S.-China Strategic Stability," *International Security* 40, no. 2 (Fall 2015): 21.
[105] Sun Xiangli, *He Shidai de Zhanlue Xuanze - Zhongguo He Zhanlue Wenti Yanjiu [Strategy Choices in the Nuclear Era - Research on China's Nuclear Strategy]* (Mianyang: Zhongguo Gongcheng Wuli Yanjiu Yuan Zhanlue Yanjiu Zhongxin, 2013), 147.

The second exception would be for China to use nuclear weapons in response to a conventional attack on strategic targets with consequences as devastating as a nuclear attack.[106] Examples of such targets included the Three Gorges Dam and nuclear power stations.[107] The third exception would be for China to use nuclear weapons if an adversary decided to expand a local conventional war by striking strategic targets or even invading the mainland. According to the *Science of Second Artillery Campaigns*, the CMC could decide to "lower the nuclear deterrence threshold" if the adversary attacks China's capital or a major city, or "when conventional war continues to escalate, the strategic situation for us is very unfavorable, national security faces a serious threat to its existence, in order to force an adversary not to invade."[108] A fourth exception would be to use nuclear weapons on the United States if China were losing a conventional war over Taiwan.[109]

Chinese strategists described different ways in which China could use its nuclear weapons to maximize leverage in these situations. Some strategists advocated changes to China's declaratory policy, while others suggested making preparations for nuclear first-use without making any adjustments to declaratory policy.[110] A third option was to reveal its willingness to use nuclear weapons first in a conflict, leaving the No First-Use pledge intact in peacetime.[111] A fourth option would be for China to publicly declare that it was "lowering the nuclear

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[106] Guo Shunyuan and Wang Heng, "Zhanyi Zhong de Di'er Pao Zuozhan Zhihui Juece" [Second Artillery Command and Control Decision-making During a Joint Campaign], *Junshi Xueshu*, July 2004, p. 65, quoted in Fravel and Medeiros, "China's Search for Assured Retaliation," 80; Shen, "Nuclear Deterrence in the 21st Century," 12; Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 9–11.
[107] Yu, *Di'er Paobing Zhanyi Xue*, 294; Guo Shunyuan and Wang Heng, "Zhanyi Zhong de Di'er Pao Zuozhan Zhihui Juece" p. 65, quoted in Fravel and Medeiros, "China's Search for Assured Retaliation"; Peng and Rong, "Nuclear No First-Use Revisited," 83–84.
[108] Yu, *Di'er Paobing Zhanyi Xue*, 294.
[109] Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 11.
[110] Ibid., 15.
[111] Ibid., 15.

deterrence threshold"[112] without making a threat to use nuclear weapons first or actually using them. Strategists who did advocate for China to actually use nuclear weapons first recommended using them in ways that would be less destructive than attacking U.S. cities or military bases, as envisaged in the Second Artillery's nuclear counter-attack campaign.

The *Science of Second Artillery Campaigns* describes a deterrence campaign action of "lowering the nuclear deterrence threshold (adjusting nuclear policy)" but does not indicate that China would actually use a nuclear weapon after making such an announcement. The action was likely added to the Second Artillery's menu of signaling options that would be provided to the CMC after 2000. To publicize that the CMC had ordered the Second Artillery to lower the nuclear threshold, the Second Artillery would display weapons, conduct exercises, and name targets. Naming targets would be "the highest level of nuclear deterrence, and also the lowest extent of lowering the nuclear threshold."[113] Commanders would be required to be able to pull back and carefully consider what to do if deterrence fails, to ensure continuing deterrence and the ability to counterattack.[114]

The 2004 *Science of Second Artillery Campaigns* does not suggest that China could "lower the deterrence threshold" to gain leverage in the fourth situation described above, in which China was losing a limited war over Taiwan, unless losing that war escalated to one of the other three situations involving attacks on mainland strategic targets. The book stated that "lowering the

[112] Yu, *Di'er Paobing Zhanyi Xue*, 294–96; Jixun Zhao, ed., *Shezhan [Coercive Warfare]* (Beijing: Guofang Daxue Chubanshe, 2003), 170; Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 39.
[113] Yu, *Di'er Paobing Zhanyi Xue*, 295.
[114] Ibid., 295–96.

nuclear deterrence threshold refers to when a militarily strong adversary with nuclear weapons relies on its high-technology conventional weapons absolute superiority to intensely and continuously conduct air strikes on our important strategic targets, and we have no good plan for defending against the enemy."[115]

The *Science of Second Artillery Campaigns* contains no description of a nuclear first use campaign that the force could carry out in any of these situations. By contrast, unofficial sources do describe how China would actually use its nuclear weapons first. If China was losing a conventional war over Taiwan, Deng Lizhong described an "occasional first-use campaign" that would "take advantage of nuclear weapons first-use to paralyze an adversary's space information systems, destroying its superiority, preventing the escalation or continuation of the war" when "not using nuclear weapons is not enough to turn the battlefield situation around."[116] NDU Professor Zhu Chenghu, who is often described as a hawk, commented in 2005 that China might consider using nuclear weapons first in a Taiwan conflict if the United States attacked the mainland.[117] Deng warned that making an announcement to "lower the nuclear threshold" could damage the credibility of both China's nuclear reassurances and threats. On the one hand, making an announcement that China had lowered the nuclear threshold could "put us in a passive position due to 'words not being credible,'" if the warning failed to coerce an adversary to change its behavior and China did not follow through with nuclear use. On the other hand, "both using [nuclear weapons] early or when one should not use nuclear weapons can make the [No First-Use] policy our country has adhered to for half a

[115] Ibid., 294.
[116] Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 41.
[117] Joseph Kahn, "Chinese General Threatens Use of A-Bombs If U.S. Intrudes," *The New York Times*, July 15, 2005.

century lose its sincerity."[118] Other strategists pointed out that an adversary would prepare for China to abandon its No First-Use policy regardless of what it said. Academic Shen Dingli noted that, "frankly speaking, in a military contingency, no adversary would fail to prepare for a change in China's position on NFU, as this choice is always an option for China."[119]

The Case for Maintaining No First-Use

Other members of China's strategic community recognized that China's existing sources of strategic leverage were inadequate but they opposed changes to the No First-Use policy, in part because nuclear threats would not be credible in a limited war. NDU Professor Pan Zhenqiang, a former General Staff Department officer, emphasized that no country could win a nuclear war.[120] Sun Xiangli argued that Chinese leaders had no intention of changing its NFU policy because "the possibility of a large-scale conventional offensive against China by any country is almost zero." She implied that nuclear first-use would only be credible if China's survival were at stake. Further, Sun pointed out that non-nuclear weapons were available as substitutes for using nuclear weapons as sources of strategic leverage, "China's capability in resisting conventional offensives has been greatly improved in recent years with the introduction of advanced and new technologies for its conventional forces."[121]

Retaining a No First-Use policy traded military advantage for political advantages. Chinese strategists judged that the trade-off was worthwhile to avoid China from being perceived as aggressive. This danger that nuclear threats might be mistaken as a signal of a state's aggressive

[118] Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 37.
[119] Shen, "Nuclear Deterrence in the 21st Century," 12.
[120] Pan Zhenqiang, "China's Insistence on No First-Use," *China Security* 1, no. 1 (Autumn 2005): 6–7.
[121] Sun Xiangli, "Analysis of China's Nuclear Strategy," *China Security* 1, no. 1 (Autumn 2005): 28.

intentions is one reason why states are motivated to compensate for their conventional inferiority with non-nuclear weapons in the theory of strategic substitution. In a June 2002 lecture NDU Professor Xiao Tianliang pointed out that, from a military standpoint, using nuclear weapons first allowed a state to seize the initiative while a No First-Use policy left a country weakened and in an unfavorable situation. But "it is necessary to see that in international political and military struggles, the ability to win the initiative and strive for victory, the most fundamental [element] is political advantage and justness." Xiao explained that "our insistence on a defensive position, the no first-use of nuclear weapons, is sufficient to completely show our good faith for peace, which is favorable for gaining the strategic initiative."[122] Pan Zhenqiang also referred to these political costs of abandoning the No First-Use policy, which he speculated would cause political tensions, arms racing, and incentives to use nuclear weapons first in a crisis with the United States, while threatening China's non-nuclear neighbors.[123]

Even the strategists who viewed nuclear weapons as a credible source of leverage in those four situations recognized that space and cyber "deterrence" could be superior sources of leverage in limited wars. Second Artillery officer Deng recommended a nuclear strike on U.S. space systems as a way of using nuclear weapons first to maximize leverage that would damage U.S. military capabilities but would not cause a loss of life.[124] He also noted that cyber attacks paralyzing an enemy society would be more effective than nuclear weapons. While nuclear weapons are unparalleled in their effectiveness for deterring large scale invasions: "in

[122] Xiao, *Xiao Tianliang Jianggao Zixuanji*, 256.
[123] Pan, "China's Insistence on No First-Use," 6–7.
[124] Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 43.

preventing local wars, they are not as useful as information deterrence." Cyber attacks were cheap, hard to defend against and especially effective against a more information-dependent society.[125] An NDU researcher wrote that, "compared to nuclear deterrence, information deterrence has more actual credibility in military affairs." Information deterrence could not substitute for nuclear deterrence, but the two could support each other. For example, nuclear deterrence offered a strong shield for using information deterrence.[126]

Advice to the Leadership

As strategists debated whether China could gain strategic leverage in a limited war using nuclear weapons, the AMS sent a report to CMC leaders on China's nuclear posture. Ge Dongsheng, who retired from the Second Artillery as Deputy Commander in 2002, led the report team in his new capacity Vice-Commandant of the AMS. The report recommended a more flexible and diverse offensive nuclear force including both strategic and tactical weapons, investment in space weapons, and organizational reforms to improve coordination across China's nuclear weapons complex. The AMS report is worth examining in detail because it may have informed the CMC's decision not to change China's nuclear posture. The AMS report would have been influential because it drew on consultations with more than 120 specialists in over 20 civilian and military organizations related to China's nuclear weapons.[127]

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[125] Ibid., 27–28.
[126] Wang Zhongchun and Wen Zhonghua, *Busan de He Yinyun: He Wuqi Yu He Zhanlue, Cong Zuotian Dao Mingtian [The Unfading Nuclear Cloud: Nuclear Weapons and Nuclear Strategy, from Yesterday to Tomorrow]* (Beijing: Guofang Daxue Chubanshe, 2000), 295–97.
[127] Ge, *Nanwang Lijian Suiyue*, 334.

The report's assessment of the threats China faced specifically mentioned U.S. nuclear modernization and the Kosovo conflict, which confirms that those changes in China's threat environment triggered a review of nuclear posture. The Kosovo intervention was the "most typical, most real example" of using Western concepts of "limited sovereignty" to overturn the governments of a few sovereign countries."[128] The report did not examine how China could use nuclear weapons as a source of strategic leverage to compensate for its conventional inferiority in a Taiwan scenario. Instead, it focused on how to update China's nuclear force structure and weapons complex to effectively deter future nuclear threats. Ge saw China's nuclear weapons as the "ultimate weapon" and the most effective way to counter U.S. efforts to contain China because they were "a country's final means of displaying its power in warfare."[129]

At the time the report was written, China's nuclear arsenal would not have been able to deliver these benefits in future given U.S. nuclear acquisition plans. China's first generation nuclear force had to be modernized to "break the new nuclear blackmail and deterrence."[130] The "new" blackmail and deterrence relied on missile defense, which could "result in the passive situation in which our adversary can sufficiently attack us at will, and we will have difficulty effectively counterattacking."[131] It also relied on small nuclear weapons, resulting in the "continued lowering of the nuclear threshold, turning nuclear weapons from a deterrence-style weapon that is hard to use in actual war into a very usable actual war weapon that can be launched on the battlefield to change the war situation, influencing the progression and termination [of

[128] Ibid., 338.
[129] Ibid., 341.
[130] Ibid., 341-2.
[131] Ibid., 342.

war]."[132] To meet these threats, China's nuclear capabilities needed to ensure "effective deterrence and self-defensive counterattack (*youxiao weishe, ziwei haiji*)"[133] involving both "an absolutely reliable counterattack capability, and a flexible and effective tactical attack capability."[134]

The report offered both principles and more concrete recommendations for China's future nuclear force structure. It recommended that China retain its principle of a "lean and effective" force. The strategic force should prioritize survivability, penetrability and precision.[135] China needed to be selective in countering U.S. capabilities, to "increase asymmetric strategic balancing capabilities; ... make offensive actions the main means; through lean, small systems with multiple capabilities, destroy the adversary's large systems."[136] For example, China could "target an adversary's missile defense weak points, employing 'gouge the eyes, plug the ears, and interrupt system links' information attack methods to hit pressure points."[137]

The report recommended a number of new capabilities to diversify China's new force, including tactical nuclear weapons and delivery systems, a second-generation SSBN, and space weapons. The strategic force would be a sea-based and land-based dyad. The tactical force would be composed of "small and tiny nuclear weapons attack platforms, which required a triad of land, sea and air platforms to realize."[138] The report also strongly emphasized China's need to develop space weapons in secret. It needed anti-satellite and missile interceptor

[132] Ibid., 343.
[133] Ibid., 342.
[134] Ibid., 345.
[135] Ibid., 344.
[136] Ibid., 344.
[137] Ibid., 344.
[138] Ibid., 345.

weapons to quickly attack adversary space targets.[139] Other strategists also pointed out the need to pursue space weapons to ensure the effectiveness of China's nuclear force.[140] These efforts are outlined in further detail in Chapter 6.

Chinese leaders appear to have by and large accepted and implemented the report's recommendations. With the notable exception of establishing a tactical nuclear weapons force, China's strategic nuclear force modernization has emphasized mobility, penetrability, precision, adoption of information technology, and the addition of a sea-based leg. The force modernization priorities set out in the AMS report are very similar to the priorities set by Chinese leaders in the late 1980s and early 1990s for the second-generation nuclear force. The PLA also appeared to follow the recommendations on developing anti-satellite and missile interceptor weapons, in secret, at least until it began to test them in 2005.

Concluding the Debate

The debate over China's No First-Use policy continued until the leadership made a decision not to change its retaliatory nuclear strategy. They made that decision in 2006 at the latest, when the government prohibited further debate over the No First-Use policy.[141] In a lecture to the Academy of Military Sciences in 2006, Xiao Tianliang made it very clear that China was not considering using nuclear weapons in a Taiwan contingency, "if we are forced to enter an anti-Taiwanese independence war in the future ... nuclear weapons cannot be used, Taiwanese

[139] Ibid., 345.
[140] Du, *Zhanlue Kexue Jia Zhu Guangya*, 360.
[141] Evan S. Medeiros, "'Minding the Gap': Assessing the Trajectory of the PLA's Second Artillery," in *Right-Sizing the People's Liberation Army: Exploring the Contours of China's Military*, ed. Roy Kamphausen and Andrew Scobell (Carlisle, P.A.: Strategic Studies Institute and Army War College Press, 2007), 156.

nuclear facilities cannot be attacked, otherwise how could one face international society, and explain [ourselves] to our grandchildren[?]"[142] It is not possible with existing sources to determine who made the decision to end the debate and how they justified that decision. Arms control expert Sun Xiangli criticized strategists for using "conventional weapons strategy and tactical thinking" about nuclear weapons. She stated that their personal opinions did not influence official policies or official thinking on nuclear weapons strategy questions.[143] But other strategists do recognize that a debate occurred.[144] Fravel and Medeiros also note that "Chinese officials grudgingly acknowledge this debate but highlight that it concluded with continued adherence to this policy."[145]

Instead of using China's nuclear weapons as a source of strategic leverage, the PLA followed Jiang Zemin's instructions to develop a diversified strategic deterrence system. The PLA combined nuclear weapons as "defensive deterrence" with space, conventional missile, and cyber "offensive deterrence." China lacked space and cyber force postures when the debate began, but it was in the process of establishing those force postures when the debate concluded. Deng Lizhong's suggestion for a campaign to attack enemy space information networks was likely adopted, only using a conventionally-tipped anti-satellite missile rather than a nuclear one. Xiao Tianliang concluded in a May 2005 lecture at NDU that "our country currently is not sufficiently equipped to implement all of the requirements of strategic deterrence of conventional-nuclear dual deterrence and offensive-defensive dual deterrence capabilities; the

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[142] Xiao, *Xiao Tianliang Jianggao Zixuanji*, 127. See also Ge, *Nanwang Lijian Suiyue*, 136.
[143] Sun Xiangli, "Zhongguo He Zhanlue Yanjiu [Research on China's Nuclear Strategy]," in *He Zhanlue Bijiao Yanjiu [Comparative Research on Nuclear Strategy]*, ed. Zhang Tuosheng, Li Bin, and Fan Jishe (Beijing: Shehui Kexue Wenxian Chubanshe, 2014), 20–21.
[144] Author's interviews, Beijing, 2015-6.
[145] Fravel and Medeiros, "China's Search for Assured Retaliation," 80.

method of strategic deterrence is singular."[146] By 2009, one AMS scholar affirmed that China's nuclear weapons would play a "backstop" role, despite the development of new "information weapons," including laser weapons and directed energy weapons, because those weapons could not substitute for nuclear weapons.[147]

The Resilience of Retaliation: 2010s

Current discussions of nuclear posture within China focus on how to ensure that its nuclear arsenal can carry out a retaliatory strike, given the bipartisan commitment to missile defense and conventional strike capabilities in the United States since approximately 2012. China could be re-considering whether it needs tactical nuclear weapons for proportionate retaliation following the Trump Administration's announcement that it will develop a low-yield submarine-launched ballistic missile.

In light of U.S. capabilities developments, there is an ongoing discussion within China about shifting its nuclear weapons to a launch-on-warning alert status to improve the survivability of the force. Top leader Xi Jinping asked the Second Artillery to maintain a "high alert status" in a 2012 speech, leading some Western analysts to warn that China was moving towards a higher alert status.[148] Xi said, "it is necessary to speed up the establishment of a combat duty system (*zuozhan zhiban tixi*) that is unified in peacetime and war, on a high level of alert (*gaodu*

[146] Xiao, *Xiao Tianliang Jianggao Zixuanji*, 119.
[147] Zhao, "Xin Shiqi He Weishe Lilun Yu Shijian de Xin Fazhan," 20. See also Sun, *He Shidai de Zhanlue Xuanze - Zhongguo He Zhanlue Wenti Yanjiu*, 184.
[148] Gregory Kulacki, "China's Military Calls for Putting Its Nuclear Forces on Alert" (Cambridge, M.A.: Union of Concerned Scientists, 2016), 4.

jianbei), and able to fight at the appropriate time, increasing the overall level of day-to-day war preparedness (*tigao richang zhanbei gongzuo zhengti shuiping*)."[149] Xi's comments do not indicate that China has decided to increase the alert status of its nuclear forces. Nor does China have the space-based early warning systems to support a higher alert status. The 2013 and 2015 editions of the *Science of Military Strategy* both, however, imply that launch on warning is consistent with China's No First-Use policy.[150] Other strategists dispute that a launch on warning alert status would be consistent with China's No First-Use policy.[151] They also question the desirability of the alert status given its technological demands, crisis stability risks, and risks for the security of China's arsenal.[152]

Chinese strategists have not yet thoroughly interrogated whether using its non-nuclear strategic weapons to maximize leverage in a Taiwan contingency could increase rather than decrease the likelihood of nuclear war. Chinese strategists have maintained a relatively relaxed attitude towards inadvertent escalation, as demonstrated by the overlap in base-level infrastructure supporting its conventional and nuclear missiles.[153] There are some signs, documented in the space chapter, that Chinese strategists are starting to consider these problems from the perspective of its space posture. There is also some nascent discussion within China about how to respond to a cyber attack on Chinese nuclear command and control systems. Chinese

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[149] Zhongguo Renmin Jiefang Jun Zong Zhengzhi Bu [China People's Liberation Army General Political Department], *Xi Jinping Guanyu Guofang He Jundui Jianshe Zhongyao Lunshu Xuanbian [Selection of Chairman Xi's Important Treatises on National Defense and Military Development]* (Beijing: Jiefang Jun Chubanshe, 2014), 25.

[150] Shou, *Zhanlue Xue*, 175; Xiao Tianliang, ed., *Zhanlue Xue [The Science of Military Strategy]* (Beijing: Guofang Daxue Chubanshe, 2015), 368.

[151] Cunningham and Fravel, "Assuring Assured Retaliation," 30–31.

[152] Sun, *He Shidai de Zhanlue Xuanze - Zhongguo He Zhanlue Wenti Yanjiu*, 188.

[153] Cunningham and Fravel, "Assuring Assured Retaliation," 30–31.

strategists have labeled the U.S. decision to leave a nuclear response on the table for cyber attacks as disproportionate and not credible.[154]

Conclusion

This chapter demonstrated that once China faced a limited war scenario in which it would be conventionally inferior to an adversary in the post-Cold War era, its still did not view nuclear threats as a viable source of strategic leverage. When changes for the worse in China's threat environment prompted its strategists to respond in some way to maximize its strategic leverage over Taiwan and the United States, they made a judgment nuclear weapons were not a credible source of leverage against either of those two adversaries in a limited cross-Strait war. Moreover, they had more credible options to maximize strategic leverage: their non-nuclear strategic weapons. Both at the end of the Cold War and after the Belgrade embassy bombing, some Chinese strategists suggested using nuclear weapons as a source of strategic leverage. Those strategists' suggestions were rejected by Chinese leaders. As a result, after 1988 and 1999 respectively, China had to look elsewhere than to its nuclear weapons to respond to changes in its threat environment. A need for strategic leverage in those years led Chinese leaders to establish force postures for its conventional missile, space and cyber weapons. In the following chapters I examine each of these force postures.

[154] Author's interviews, Beijing, 2015, 2016.

Chapter 4: China's Conventional Missile Force Posture

Introduction

As the PLA transitioned from planning for a total war of invasion to a limited conventional war in 1988, Chinese leaders decided to establish a conventional missile posture to maximize its strategic leverage against Taiwan. The 1995-6 Taiwan Straits crisis demonstrated that the United States would likely intervene in a limited conflict to prevent Taiwanese independence. In that crisis, Chinese leaders used conventional missile tests in the East China Sea to try to deter Taiwan from taking steps towards independence that would spark a cross-Strait war. Although the crisis changed China's threat environment for the worse, it also demonstrated to Chinese leaders that their non-nuclear strategic weapons could deter the outbreak of a Taiwan conflict. After the crisis, Chinese leaders bolstered their conventional missile posture to gain strategic leverage over the United States as well as Taiwan. They extended the range of the conventional missile force to bring U.S. bases in the East Asian region and aircraft carriers into range. The U.S. bombing of the Chinese embassy in Belgrade during the Kosovo War in May 1999 prompted China to accelerate its timeline for enhancing its missile force and improve the precision of its missiles.

Chinese leaders initially adopted a brinkmanship force posture for their conventional missile force around 1996, but improvements in precision have shifted the posture closer to calibrated escalation posture in the past five years. Doctrinal writings indicate that missile strikes would be limited in a crisis, but less restrained once a limited war broke out. Beijing has made few

efforts to clarify its thresholds for using conventional missiles to Washington or Taipei to reassure either country that it would withhold its most destructive medium- and intermediate-range missiles until late in a conflict. Nevertheless, the increasing precision of China's conventional missiles allows the PLA to focus on military targets for its missile strikes and limit their collateral damage. China's expected cost of retaliation for a conventional missile attack is much more difficult to estimate than for cyber or space attacks. On the one hand, China is less exposed to a ground-based conventional missile attack than Taiwan or the United States than vice-versa. On the other hand, China is equally exposed to a U.S. conventional missile attack as vice-versa if conventional missiles are launched from submarines, ships or aircraft, as well as from land. China's expected cost of retaliation is either low or moderate, depending on how in-kind retaliation is defined.

The theory of strategic substitution explains China's 1988 decision to pursue a conventional missile capability. That decision occurred once China satisfied all scope conditions for the theory, which gave China a need for strategic leverage because it could not achieve its limited war aims against Taiwan with nuclear threats or its conventional military power. The theory has more difficulty accounting for China's choice of conventional missile force posture because of the aforementioned difficulty of estimating the expected cost of retaliation. Moreover, regardless of how one measures China's expected cost of in-kind conventional missile retaliation, the theory cannot account for the gradual shift in China's conventional missile posture from a brinkmanship posture by 1998 towards a calibrated escalation posture from approximately 2013 onwards. There is little evidence available of how and why China selected its conventional missile posture to determine why the theory fails to account for

variation in China's conventional missile force posture. China's conventional missile posture choices could be the result of a PLA organizational preference for a missile posture optimized for fighting conventional operations, or improvements in missile technology, rather than its optimal posture for coercion. There is evidence to suggest that the organizational interest of the missile force in its continuing relevance in an age of limited wars contributed to China's pursuit of a coercive conventional missile capability in 1988. By contrast, emulation theory cannot explain China's establishment of a conventional missile posture because both superpowers had just signed the INF treaty when China decided to develop a conventional missile capability.

This chapter unfolds as follows. First, I provide a brief description of ideal-type brinkmanship and calibrated escalation postures for conventional missiles. Second, I demonstrate that China adopted a brinkmanship posture until approximately 2013. Third, I analyze three key decisions Chinese leaders made for evidence of the independent variables: to pursue a coercive conventional missile capability in 1988, and adjust that posture after the 1995-6 Taiwan Straits crisis, and after the Belgrade embassy bombing in 1999. I also examine how the Second Artillery and defense industry implemented those decisions. The fourth section examines adjustments to the range, precision and organizational arrangements for China's conventional missiles that have shifted its force posture from a brinkmanship posture towards calibrated escalation since approximately 2013. The fifth section evaluates the performance of the theory of strategic substitution compared to the alternative explanations.

I. Categorizing Conventional Missile Postures

What does an ideal-type brinkmanship and calibrated escalation posture for conventional missiles look like? I outline the components of each posture below.

Brinkmanship Missile Postures

A brinkmanship posture involves optimizing a state's capabilities, doctrine, command and control arrangements, and transparency to accelerate the pace of escalation once conventional missiles are used. The adversary has the last clear chance to avoid the unrestrained use of conventional missiles by choosing to capitulate to the threatening state's political demands.

Capabilities for a brinkmanship include missile weapons of all ranges. Those missiles do not need to be accurate. Nor does the state need to have the capability to conduct battle damage assessments to evaluate the success of attacks and conduct follow-on attacks if necessary.

Doctrine for a brinkmanship missile posture would specify that the use of conventional missiles is conditional on an adversary's unacceptable political actions before or during a crisis, its decision to initiate a limited conventional war, or its decision to continue fighting a limited conventional war. The conditional nature of missile strikes indicates that those strikes are coercive rather than part of a state's brute force capabilities to win a military victory to achieve its political aims. The posture envisages the early use of conventional missiles in a crisis or conflict, which could range from a large-scale conventional missile attack on an adversary's

military forces in the conflict theater to a single missile strike on its homeland. The posture aims to destroy targets that would have the greatest effect on an adversary's calculations about continuing to fight, such as civilian infrastructure, military bases, or high-value military assets such as an aircraft carrier, with little regard for civilian casualties.

Brinkmanship command and control arrangements can be either strict or delegated. Either theater commanders or top military or civilian leaders could have the authority to launch those attacks. The state may combine tactical conventional missiles and other conventional weapons in the same units to limit the ability of leaders to withhold their use of conventional missiles once a conflict begins. Brinkmanship postures are distinguished by their minimal transparency. The state's intent is to create uncertainty in the adversary's mind about the willingness and ability of its leaders to control the most destructive use of its conventional missiles, such as attacking an adversary's homeland or aircraft carriers. A state with a brinkmanship posture is likely to reveal its possession of missile capabilities to its adversary, but no further details of when and how it would use its missiles in a crisis or conflict.

Calibrated Escalation Missile Postures

Calibrated escalation missile postures optimize capabilities, doctrine, command and control arrangements, and transparency to control escalation. The posture aims to balance threats to use force with assurances to withhold the most destructive use of conventional missiles until late in a conflict.

A calibrated escalation posture requires a variety of capabilities. The state's shorter- and medium-range missiles should be relatively accurate to limit collateral damage, while longer-range missiles that would target an adversary's homeland may be less accurate. It is worth noting, however, that precise shorter- and medium-range missiles can be used to carry out the most destructive conventional missile attacks because those missiles must be accurate to hit a high-value target such as a dam, nuclear power station, or aircraft carrier. The posture also requires imaging satellites for battle damage assessment to ensure that the attacks are both effective and no more destructive than anticipated.

Doctrine for a calibrated escalation posture acknowledges that the state intends to control the escalation of conventional missile warfare. It will also acknowledge that the use of conventional missiles is conditional on an adversary's unacceptable political actions in a crisis, or its decision to initiate or continue fighting a limited conventional war. A calibrated escalation posture envisages early, limited, short-range conventional missile strikes either in a crisis or at the outset of a conflict. Initially, the state would aim to destroy targets that are local and symbolic, but it would conduct more destructive attacks on more valuable targets if the two states enter a tit-for-tat spiral of attacks and counter-attacks. The use of longer-range conventional missiles and/or attacks on more valuable targets is contingent on an adversary's retaliation for those initial, short-range strikes. Both a state's missiles and cueing capabilities for its longest range and most destructive missile attacks must be survivable throughout a limited war.

Under calibrated escalation posture command and control arrangements, either theater commanders or top military or civilian leaders could have the authority to launch short-range missile attacks. Only top military or civilian leaders would be able to authorize the most destructive missile strikes, which usually require medium- and intercontinental-range attacks beyond the theater of conflict. If the state has different command and control arrangements for its tactical and longer-range conventional missiles, it may deploy longer-range missiles to separate units from tactical missiles to make it easier for leaders to exercise strict authority over the use of its most destructive weapons. Calibrated escalation postures need to be very transparent to reassure an adversary that the state's conventional missile attacks would be limited. The state is likely to reveal its possession of missile capabilities to its adversary. It may have a declaratory policy stating its intention to use conventional missiles for controlled coercive bargaining. The state may engage in arms control or confidence building measures with its adversary to ensure that the adversary is aware of its thresholds for using tactical, medium and intercontinental-range conventional missiles, or for attacking high-value targets.

Observable Implications for Posture Choice

How can these two postures be distinguished from each other and what posture would the theory of strategic substitution expect China to adopt?

In the section that follows, I look for the following features of conventional missile posture to classify China's choice. The two distinguishing features of a brinkmanship missile posture are (1) a disregard for civilian casualties in targeting, and (2) a lack of transparency about the

posture to an adversary, with the exception of demonstrating that the state has conventional missile weapons.

A calibrated escalation missile posture has five distinguishing features: (1) the state's capabilities to carry out the most destructive conventional missile attacks are survivable in a protracted conflict; (2) the state's doctrine is explicit about its intent to both coerce an adversary and control escalation, (3) authority to use weapons is restricted to commanders or leaders higher up the chain of command as the range of the missile or the value of the target increases, (4) tactical-range missiles and longer-range weapons are deployed to different units, and (5) the state is transparent about most features of its missile posture to its adversary.

The theory of strategic substitution explains a state's choice of force posture according to its expected cost of retaliation for carrying out a missile attack. Two factors determine a state's expected cost of retaliation: its exposure to counter-attack and the feasibility of controlling escalation once that strategic weapon is used. It is, however, difficult to determine the expected cost of in-kind conventional missile retaliation for China. On the one hand, Taiwan and the United States both lack land-based short- and medium-range conventionally-tipped missiles that they could use to retaliate in-kind throughout the 1990s and 2000s. Taiwan acquired a short-range ballistic missile capability in 2001 and a land-attack cruise missile capability in 2011. The United States is bound by the INF Treaty, signed with the Soviet Union in 1987, not to possess ground-launched ballistic and cruise missiles with ranges between 500 and 5500 kilometers. On the other hand, the United States has the ability to deliver a substantial number

of cruise missiles within that range using surface vessels, submarines and aircraft.[1] The number of missiles it could deliver would be constrained by the availability of these multi-role platforms and, moreover, they are much more expensive per missile than a ground-based ballistic missile.

The theory of strategic substitution would expect China to select a calibrated escalation posture for its conventional missiles, notwithstanding the difficulty of measuring the expected cost of retaliation. If "in-kind retaliation" is narrowly defined as retaliation using ground-based missiles only, China's expected cost of retaliation is low. But if it is defined more broadly as using any conventional missile, China's expected cost of retaliation is moderate. The broader definition is more realistic because it would defy commonsense for China to mistake retaliation for its conventional missile strikes using a sea- or air-launched missile as an opportunistic escalation of the conflict. As the expected cost of missile retaliation has not changed for China since it began to prepare to fight a limited war in the late 1980s, the theory would not expect China's conventional missile posture to change over time.

Emulation theory would expect China not to deploy a ground-based conventional missile force at all. The United States and Soviet Union are parties to the INF Treaty, which was signed in 1987, before China's choice to establish a conventional missile posture in 1988. Organization theory makes no clear predictions about China's posture choice if civilians dominate the decision-making process. But it would expect China's missile posture to include some features of a brinkmanship posture if the decision-making process were dominated by military officers.

[1] China's integrated air defenses deployed in recent years make it difficult for the United States to launch missiles from non-stealthy air platforms while the radars and batteries supporting those systems remain intact.

That posture involves delegating authority to use conventional missiles to theater commanders to increase their organizational autonomy in planning and fighting a war,[2] rather than to increase the credibility of the state's threats to use those weapons. The low transparency of a brinkmanship posture would also suit a military organization's preference for operational surprise.[3]

II. China's Conventional Missile Posture

China adopted a brinkmanship posture for its conventional missile force at some stage between 1993, when its first conventional missile unit became launch-ready, and 1998, when the CMC promulgated its first official doctrine for conventional missile campaigns. China's choice of a brinkmanship posture supports both the theory of strategic substitution and organization theory explanations for its non-nuclear strategic posture choices. It maintained that posture until approximately 2013, when its posture shifted towards a calibrated escalation posture as the accuracy of its missiles improved.

Capabilities

China's missile force structure is consistent with a brinkmanship and calibrated escalation posture. Its arsenal includes some inaccurate short-range missiles, although it has improved

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[2] Morton H. Halperin, Priscilla A. Clapp, and Arnold Kanter, *Bureaucratic Politics and Foreign Policy*, 2nd ed. (Washington, D.C.: Brookings Institution Press, 2006), 51, 60–61.

[3] Brendan Rittenhouse Green and Austin Long, "Invisible Doomsday Machines: The Challenge of Clandestine Capabilities and Deterrence," *War on the Rocks* (blog), December 15, 2017, https://warontherocks.com/2017/12/invisible-doomsday-machines-challenge-clandestine-capabilities-deterrence/.

the precision of its conventional missiles since 1993. It has only a limited ability for cueing its missiles to hit long-range targets and battle damage assessment. Although its missiles would survive a protracted exchange of missile strikes, as they would need to for a calibrated escalation posture, its space-based and terrestrial support capabilities may not survive into a protracted conflict, which would stop China from being able to use its anti-ship ballistic missiles.

China's land-based conventional missile force consists of short-range, medium-range, and intermediate-range ballistic missiles, with varying accuracies, and some battle damage assessment capabilities.[4] All systems are road-mobile and solid-fueled, which makes them flexible in their launch location, quick to launch, and therefore hard for an adversary to destroy preemptively. The workhorse of China's short-range ballistic missile (SRBM) force is the road-mobile, solid-fueled DF-15 SRBM, which has a range of 600 kilometers and is quite inaccurate with a circular error probability (CEP) of 300 meters.[5] The missile was first deployed in 1993. The PLA has deployed two longer-range and more accurate variants of the DF-15, the DF-15A with a range of 900 kilometers and a CEP of 45 meters, and the DF-15B with a range of 800 kilometers and a CEP of 5 meters, fielded in 2009.[6] China also possesses a shorter range, solid-fueled road-mobile SRBM, the DF-11, with a range of 280 kilometers and a CEP of 600 kilometers, deployed in 1999.[7] The DF-11 also has an extended-range, more accurate variant,

[4] China has a number of close-range ballistic missile systems (maximum range of 280 kilometers) which are not listed here.
[5] All missile ranges and CEPs are unofficial estimates.
[6] Nuclear Threat Initiative, "Design Characteristics of China's Ballistic and Cruise Missile Inventory," 2018, https://www.nti.org/media/pdfs/design_characteristics_of_chinas_ballistic_cruise_missiles_3.pdf?_=1421279197.
[7] Ibid; Mark A. Stokes, "The People's Liberation Army and China's Space and Missile Development: Lessons from the Past and Prospects for the Future," in *The Lessons of History: The Chinese People's Liberation Army at*

the DF-11A, fielded around 1999, with a range of 350 kilometers and a CEP of 200 meters.[8] The newest SRBM in China's arsenal is the solid-fueled road-mobile DF-16, deployed around 2012, with a range of 800-1000 kilometers.[9]

China has a number of ground-launched cruise missiles, including the HN-1A with a range of 600 kilometers, fielded around 1996, the HN-2B with a range of 1800 kilometers, fielded around 2002, and the DH-10 with a range of 1500-2000 kilometers,[10] fielded around 2002. In 2015, approximately 5-7 DF-11 brigades, 2-4 cruise missile brigades, and two DF-15 brigades were fielded by ten Second Artillery brigades.[11] The United States government estimated that China had approximately 1,200 SRBM launchers in 2017.[12]

China possesses conventional medium- and intermediate-range conventional ballistic missiles, but it does not yet have an intercontinental-range conventional strike option, using missiles or any other platform. The road-mobile, solid-fueled DF-21C, fielded in approximately 2005, has a range of approximately 1700 kilometers and a terminal guidance package that allowed it to achieve a CEP of 40-50 meters.[13] The DF-21D is an anti-ship ballistic missile (ASBM) has a

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75, ed. Laurie Burkitt, Andrew Scobell, and Larry Wortzel (Carlisle, P.A.: Strategic Studies Institute and Army War College Press, 2003), 219–20.

[8] Nuclear Threat Initiative, "Design Characteristics of China's Ballistic and Cruise Missile Inventory."

[9] Richard D. Fisher Jr, "China's DF-16 Medium-Range Ballistic Missile," *Aviation Week*, September 12, 2012, http://aviationweek.com/blog/chinas-df-16-medium-range-ballistic-missile. Office of the Secretary of Defense, "Annual Report to Congress on the Military Power of the People's Republic of China" (Washington, D.C., 2017).

[10] National Air and Space Intelligence Center, "2017 Ballistic and Cruise Missile Threat Report" (Ohio: U.S. Air Force, 2017), 35.

[11] Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Strategy and U.S.-China Strategic Stability," *International Security* 40, no. 2 (Fall 2015): 43.

[12] Office of the Secretary of Defense, "Annual Report to Congress on the Military Power of the People's Republic of China," 31.

[13] Mark A. Stokes, "China's Evolving Space and Missile Industry: Seeking Innovation in Long-Range Precision Strike," in *Forging China's Military Might: A New Framework for Assessing Innovation*, ed. Tai Ming Cheung (Baltimore, M.D.: Johns Hopkins University Press, 2014), 261.

range of approximately 1500-2000 kilometers and a CEP of 20 meters. The missile has never been tested against a moving target at sea. According to U.S. military officers, the missile achieved initial operating capability around 2010.[14] In 2014, China began to field the road-mobile, solid-fueled DF-26 intermediate-range ballistic missile (IRBM) which has a range of more than 3000 kilometers.[15] The DF-26 likely has both ground-attack and anti-ship variants, and a smaller CEP than the DF-21C.[16] In late 2016, China reportedly began testing an air-launched ballistic missile based on the DF-21 series, which may carry a nuclear or conventional warhead.[17]

China's satellite and terrestrial support capabilities for off-board cueing and battle damage assessment for its conventional missiles are less-developed and quite vulnerable to an adversary's attack. The actual range of its conventional missiles may be truncated by the range of its sensors, especially for moving targets at sea. Between 2006 and 2014, China launched 26 remote sensing satellites in its Yaogan series, equipped with optical and synthetic aperture radars, which could provide it with a battle damage assessment capability following a missile attack.[18] As yet, however, China has not deployed radar ocean reconnaissance satellites (RORSATs) that would allow it to find and track moving objects in the ocean, a critical cueing

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[14] Ron Christman, "China's Second Artillery Force: Capabilities and Missions for the Near Seas," in *China's Near Seas Combat Capabilities*, ed. Peter Dutton, Andrew S. Erickson, and Ryan Martinson (Newport, R.I.: U.S. Naval War College, China Maritime Studies Institute, 2014), 37.

[15] Shi Yijie, "Wei Daying Xinxi Hua Zhanzheng Chashang Tengfei [Plugging into Rapid Advances in Capabilities for Winning Informationized Wars]," *Huojian Bingbao [Rocket Force Daily]*, December 2, 2014.

[16] The Department of Defense noted the missile was intended for precision strikes. Office of the Secretary of Defense, "Annual Report to Congress on the Military Power of the People's Republic of China," 31.

[17] Ankit Panda, "Revealed: China's Nuclear-Capable Air-Launched Ballistic Missile," *The Diplomat*, April 10, 2018, https://thediplomat.com/2018/04/revealed-chinas-nuclear-capable-air-launched-ballistic-missile/.

[18] Kevin Pollpeter, Jordan Wilson, and Fan Yang, "China Dream, Space Dream: China's Progress in Space Technologies and Implications for the United States," Report Prepared for the U.S.-China Economic and Security Review Commission, March 2, 2015, 64.

capability for its ASBM. China may be able to detect offshore targets using its land-based over-the-horizon radars, which is have a range of approximately 2000 kilometers. But these sensors may not be able to provide sufficiently precise location and target discrimination data to cue a missile.[19]

Unlike China's mobile missile launchers, its land- and space-based sensors for cueing and battle damage assessment are fixed and therefore vulnerable to attack. If these sensors were destroyed in a conflict, China could still strike an adversary's fixed targets, using targeting information gathered in peacetime. But it would not be able to target its anti-ship ballistic missiles. Chinese leaders would face "use-or-lose" pressures to use those weapons early in a conflict before an adversary could attack its sensors. Those weapons cannot function as a survivable strategic weapon that Chinese leaders could confidently withhold until late in a conflict. China's medium- and intermediate-range ballistic missiles for striking fixed targets could, however, fulfil that role, an important requirement of a calibrated escalation posture.

Doctrine

China's conventional missile doctrine has the defining characteristics of a brinkmanship posture in wartime, but its plans for using missiles in a crisis resembles a calibrated escalation posture. The PLA's first operational regulations for conventional missile strikes, the "Second Artillery Conventional Missile Brigade-Battalion Combat Regulations" (*Di'er Paobing Changgui Daodan Lü-Ying Zhandou Tiaoling*) appeared in China's fourth generation of official

[19] Eric Heginbotham et al., "The U.S.-China Military Scorecard" (Santa Monica, C.A.: RAND Corporation, 2015).

combat regulations, promulgated in 1999 after a two-year drafting process.[20] There is no evidence to indicate that the PLA had adopted any operational doctrine for conventional missile operations when it conducted a coercive campaign of missile tests to intimidate Taiwan during the 1995-6 Taiwan Straits Crisis.[21] The PLA drafted but never implemented a fifth generation of combat regulations in 2007,[22] so it is likely that the 1999 combat regulations still roughly reflect China's conventional missile doctrine. Identical descriptions of China's Conventional Missile Strike Campaign appear in the 2001 *Guide to Campaign Theory* and 2003 *Science of Second Artillery Campaigns*, both of which are based on the 1999 regulations.

China intends to use its conventional missiles to deter the outbreak of crises and limited wars, and compel a favorable conclusion to a limited war. The *Guide to Campaign Theory* claims that conventional missile units can be used as a source of strategic leverage because they "can not only directly destroy and weaken an adversary's military power in a military sense, but can also shock the adversary psychologically in a political sense and cause its will to waver, to stop the process of a war escalating or increasing in tempo."[23] All aspects of a conventional missile campaign "have quite a strong strategic nature and its influence on the war situation has strategic meaning."[24] Unlike nuclear missiles, which would "stop an adversary from possibly

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[20] Some or all of the set of regulations for the Second Artillery were in draft form at the time the regulations were promulgated. Ren Jian, ed., *Zuozhan Tiaoling Gailun [An Introduction to Operations Regulations]* (Beijing: Junshi Kexue Yuan Chubanshe, 2016), 51.

[21] No conventional missile campaign is outlined in a 1996 publication outlining Second Artillery campaigns Di'Er Paobing Siling Bu [Second Artillery Command], ed., *Di'Er Paobing Zhanyi Fa [Second Artillery Campaigns]* (Beijing: Lantian Chuban She, 1996).

[22] The fifth-generation combat regulations would have included a Second Artillery Missile Base Campaign Outline, which would have included both nuclear and conventional units, and ten subordinate Combat Regulations for units (*budui*), subunits (*fendui*) and services (*junzhong*). Ren, *Zuozhan Tiaoling Gailun*, 53.

[23] Xue Xinglin, *Zhanyi Lilun Xuexi Zhinan [Campaign Theory Study Guide]* (Beijing: Guofang Daxue Chubanshe, 2001), 394. Other texts also describe China's conventional missile force as preventing the outbreak and escalation of conventional war. Huo Xiaoyong, ed., *Junzhong Zhanlue Xue [The Science of Service Strategy]*, 2nd ed. (Beijing: Guofang Daxue Chubanshe, 2007), 301.

[24] Xue, *Zhanyi Lilun Xuexi Zhinan*, 394.

initiating a nuclear war against us," China's conventional missiles would be used as a source of strategic leverage to "prepare us to win future high-technology local wars."[25] More recent texts described the conventional missile force as having "a very strong deterrent role against a strong adversary."[26]

China's conventional missile campaign involves two missions: military deterrence (*junshi weishe*) in a crisis and an attack campaign at the outset of a conflict. The attack campaign involves the first-use of conventional missiles to quickly exert the maximum amount of strategic leverage over an adversary and compel it to capitulate to China's demands and end a limited war, reflecting the features of a brinkmanship posture. The deterrence campaign also involves the first-use of conventional missiles in a crisis, but in a limited and symbolic manner more similar to a calibrated escalation doctrine.

Military deterrence operations are defined as "using threats of use or the use of a low number of conventional missile weapons to frighten (*zhenshe*) the adversary, preventing the outbreak of war or controlling a series of combat actions." The deterrence campaign would be implemented "according to the needs of the political, diplomatic and military struggle" In a similar manner to the Second Artillery's missile launches into the Taiwan Straits during the 1995-6 crisis, during a deterrence mission "conventional missile units will enter war preparations, organize actual military exercises (*shibing yanxi*) and launch actual missiles towards a defined area, to be seen and heard (*shixian zaoshi*), displaying our will and capability,

[25] Huo, *Junzhong Zhanlue Xue*, 299.
[26] Shou Xiaosong, ed., *Zhanlue Xue [The Science of Military Strategy]* (Beijing: Junshi Kexue Yuan Chubanshe, 2013), 231.

forcing the adversary to not take rash actions or [to] show some restraint."[27] The deterrence mission is also mentioned in more recent texts. For example, the 2015 *Science of Military Strategy* notes that the most serious deterrence action China could take would be "military warning strikes to oppose a serious enemy provocation" using "strategic and operational missiles."[28]

There are no authoritative written sources indicating what kinds of targets the PLA would strike, if any, in a deterrence operation. The 2015 *Science of Military Strategy* recommends that any military warning strike should "use a small amount of force and a small-scale attack" on a "military, political target that is suitable for an isolated attack and does not hurt civilians."[29] That book also describes the deterrence action of "limited military maneuvers," which involves military exercises, tests or creating no-fly or no-ship exclusion zones to "control and isolate local seas and airspace."[30]

An attack campaign would involve the use of conventional missiles as part of a joint firepower campaign to create favorable conditions at the outset of a conflict for an air force or naval attack.[31] The campaign has a clear operational as well as a coercive objective. It involves preemptive, large-scale attacks to inflict maximum damage on an adversary. The campaign has two principles. "Subduing the enemy at the decisive moment" (*xianji zhidi*) involves attacking the adversary when it is unprepared and attacking before one's own forces enter combat to

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[27] Xue, *Zhanyi Lilun Xuexi Zhinan*, 393.
[28] Xiao Tianliang, ed., *Zhanlue Xue [The Science of Military Strategy]* (Beijing: Guofang Daxue Chubanshe, 2015), 131.
[29] Ibid., 131.
[30] Ibid., 131.
[31] Yu Jixun, *Di'er Paobing Zhanyi Xue [The Science of Second Artillery Campaigns]* (Beijing: Jiefangjun Chubanshe, 2004), 323.

reduce their losses. "Key point surprise attacks" (*zhongdian tuji*) involves "increasing the intensity of the first surprise attack," concentrating attacks, and striking key points.[32]

Missile attacks would take aim at "the targets with the greatest influence on the adversary, that have a clear status, are easy to have effects on, and hard to recover."[33] Those initial targets include adversary communications and electronic warfare facilities, then aircraft, airfields, and hangars, repair facilities and munitions storage.[34] The overall target set includes cities and economic targets as well.[35] The 2007 *Science of Military Campaigns* also describes a "missile firepower blockade" mission to "damage" (*pohuai*) an adversary's ground, air, and naval maneuvers.[36]

More recent descriptions of conventional missile targets are more focused on adversary military assets,[37] reflecting China's gradual shift towards a calibrated escalation posture since approximately 2013. The 2013 *Science of Military Strategy* notes that when conventional missiles are used in joint operations they are used to attack targets out of range of other conventional capabilities, "targets that pose a great threat to our military, have an important influence on the process of combat, and have a sustaining role on the entire war situation."[38]

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[32] Xue, *Zhanyi Lilun Xuexi Zhinan*, 395. For further evidence that China intends to use conventional missiles before other military capabilities, see Yu, *Di'er Paobing Zhanyi Xue*, 324.
[33] Xue, *Zhanyi Lilun Xuexi Zhinan*, 395.
[34] Yu, *Di'er Paobing Zhanyi Xue*, 328–29.
[35] The overall target set included military targets, such as information centers and concentrated reserve forces, command and control centers and strategic warning and reconnaissance systems, economic targets that directly and indirectly support an adversary military, transport targets, cities, air defense facilities, electronic warfare facilities, and energy facilities. Xue, *Zhanyi Lilun Xuexi Zhinan*, 398; Yu, *Di'er Paobing Zhanyi Xue*, 325.
[36] Zhang Yuliang, *Zhanyi Xue [The Science of Military Campaigns]* (Beijing: Guofang Daxue Chubanshe, 2006), 600.
[37] The target set listed in the *Science of Military Strategy* in 2013 is narrower: reconnaissance and warning systems, electronic warfare systems, anti-air and anti-missile bases, and air bases. Shou, *Zhanlue Xue*, 232.
[38] Ibid., 236.

The campaign also describes measures to ensure missile unit survivability and battle damage assessment, which is not a necessary part of a brinkmanship posture.[39]

Command and Control

China's conventional missile command and control arrangements are consistent with both a brinkmanship and a calibrated escalation posture. The level of authority required to order the use of China's conventional missiles varies depending on when they are used in a conflict. In stand-alone deterrence missions during a crisis, the conventional missile force would be "under the direction of the Central Military Commission,"[40] (CMC) which is made up of China's top military leaders and is chaired by the top civilian leader. When participating in joint firepower operations, however, conventional missile strikes may be ordered by theater commanders. PLA military reforms upgraded the Second Artillery, the organization responsible for China's nuclear and conventional missile units, to become a full service called the PLA Rocket Force (PLARF) in 2016.

According to the *Science of Second Artillery Campaigns,* before the recent PLA reforms, there was a Conventional Missile Corps Command Unit (*bu*) under each theater command's Joint Campaign Command Unit. The Joint Campaign Command Unit would carry out unified command over conventional missile and other firepower assets in wartime. Leaving the Second

[39] Forces should, "according to the war situation report and reconnaissance results, ascertain the attack's effectiveness, assess the extent of achieving the campaign intention, to offer campaign commanders a foundation for setting their ensuing resolve (*houxu juexin*) and to offer suggestions for supplementary attacks." Xue, *Zhanyi Lilun Xuexi Zhinan*, 398. See also Yu, *Di'er Paobing Zhanyi Xue*, 335.
[40] Xue, *Zhanyi Lilun Xuexi Zhinan*, 393.

Artillery outside of that coordinated command "is not favorable to achieving a certain intensity of firepower density and the destruction requirements."[41] These arrangements are, however, for wartime only. In peacetime, conventional missile units are under the exclusive authority of the CMC through the direct command and control arrangements for Second Artillery/PLARF missile bases. These command arrangements ensured that "it takes a short time to transform from peace to war, it is favorable for Second Artillery stability and development."[42] It is possible that the CMC maintains some authority over conventional missile units even once they are assigned to joint campaigns under theater commanders in wartime.[43]

Conventional missile capabilities are not commingled with other conventional military forces in the same units, which is one step a state could take to enhance the credibility of its threats to use conventional missiles under a brinkmanship posture. Conventional missile units do, however, share some infrastructure with nuclear missile units. The PLA commingles conventional and nuclear units for reasons of organizational efficiency, but those decisions have implications for its force posture. In particular, it dampens U.S. incentives to preemptively attack China's conventional missile capabilities for fear of triggering nuclear escalation.[44]

The PLA Rocket Force (PLARF) is divided into five regional bases, each of which has between four and ten subordinate nuclear and conventional missile brigades. The *Science of Second*

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[41] Yu, *Di'er Paobing Zhanyi Xue*, 161.
[42] Ibid., 161.
[43] For example, firepower campaign plans setting out the target set, level of destruction, weapons and bases "can be implemented after higher levels examine and approve them," once they are drawn up by a commander, presumably at the theater command level. Xue, *Zhanyi Lilun Xuexi Zhinan*, 396.
[44] See, for example, Joshua Rovner, "Two Kinds of Catastrophe: Nuclear Escalation and Protracted War in Asia," *Journal of Strategic Studies* 40, no. 5 (2017): 696–730; Caitlin Talmadge, "Would China Go Nuclear? Assessing the Risk of Chinese Nuclear Escalation in a Conventional War with the United States," *International Security* 41, no. 4 (Spring 2017): 50–92.

Artillery Campaigns explained that while conventional missiles were dispersed throughout the country in peacetime, "in wartime, through inter-combat theater maneuvers, many conventional missile forces can be concentrated on the main direction, it is not realistic to rely on a single missile base to implement operational command for all conventional missile units participating in war."[45] The 2006 *Science of Service Strategy* also indicated that in wartime, the CMC would divide units, presumably from different bases, into nuclear counterattack combat groups (*juntuan*) and conventional missile combat groups," in which they would "carry out combat according to their combat formation."[46] Brigades are geographically separated from Second Artillery bases and armed with only one variant of a missile launcher. All DF-21 conventional missile brigades were made up of two battalions of six missile launchers each until about 2017, when conventional missile battalions were re-structured to include five missile launchers only.[47] Unlike nuclear units, conventional missile launchers "have the same structure (*bianzhi*) in wartime as peacetime."[48] Nuclear missile units, but not conventional missile units, have equipment inspection support units that are likely responsible for handling nuclear warheads in wartime once they are distributed by the PLA's central nuclear warhead base.[49]

The command and control infrastructures supporting conventional and nuclear missile brigades are likely to be different today but may have been the same in the past. The dedicated command

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[45] Yu, *Di'er Paobing Zhanyi Xue*, 160.
[46] Huo, *Junzhong Zhanlue Xue*, 385.
[47] I thank Mark Stokes and Dennis Blasko for drawing my attention to this point.
[48] Huo, *Junzhong Zhanlue Xue*, 387.
[49] A command organization chart in the *Science of Second Artillery Campaigns* also indicates that missile bases command both nuclear launch brigades and equipment inspection support units. Those inspection units coordinate with China's central warhead base command. Conventional units do not have equipment inspection units or a command relationship with the warhead base, suggesting that conventional missile warheads are stored on missile bases or brigade garrisons, or are mated to their launchers in peacetime. See Yu, *Di'er Paobing Zhanyi Xue*, 162.

and control network (*zhihui zhuanwang*) of conventional missile units is linked into the integrated command platform (ICP) for all PLA regular forces.[50] Meanwhile, there is no evidence that nuclear units are connected to this system.[51] The ICP is intended to give the PLA a common operational picture for conventional forces fighting jointly.[52] The system was operational by approximately 2012.[53] Both conventional and nuclear missile units are commanded using an automated command system (*zidong hua zhihui xitong*) adopted by the Second Artillery in approximately 2001.[54] The system allows commanders to transmit commands, synthesize intelligence, and monitor launches in real-time.[55] The system facilitates command and control over mobile missile brigades from bases and enables skip-echelon command from Second Artillery headquarters in Beijing. Conventional units do not have pre-delegated authority to launch missiles. If a brigade's communications are interrupted, units would "adopt indirect (*yushi*) communications or skip echelon command (*yueji*) methods, to restore command for the unit."[56]

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[50] For example, a report on the information network structure of a operational test and evaluation battalion for the DF-26 refers to the ICP. Shi, "Wei Daying Xinxi Hua Zhanzheng Chashang Tengfei."

[51] Second Artillery/PLARF units referred to in media reports as connected the ICP are most likely all conventional units.

[52] Kevin Pollpeter et al., "Enabling Information-Based System of System Operations: The Research, Development, and Acquisition Process for the Integrated Command Platform," Policy Brief (UC Institute on Global Conflict and Cooperation, January 9, 2014).

[53] Joe McReynolds and James Mulvenon, "The Role of Informationization in the People's Liberation Army under Hu Jintao," in *Assessing the People's Liberation Army in the Hu Jintao Era*, ed. Roy Kamphausen, David Lai, and Travis Tanner (Carlisle, P.A.: Strategic Studies Institute and Army War College Press, 2014), 240–43.

[54] Chi Haotian, *Chi Haotian Junshi Wenxuan [Selected Military Works of Chi Haotian]* (Beijing: Jiefangiun Chubanshe, 2009), 726.

[55] Yu, *Di'er Paobing Zhanyi Xue*, 168.

[56] Ibid., 336.

Transparency

China has been transparent about its conventional missile capabilities but no other aspects of its posture. It is characteristic of a brinkmanship posture for a state to maintain ambiguity over how it would use its missiles in a crisis or conflict and who has authority to order their use. Nevertheless, China is even more opaque about its calibrated escalation space weapons posture. China has displayed its conventional missiles in PLA military parades to signal its capabilities. The DF-15 missile appeared in the October 1, 1999 parade, the DF-21C appeared in the October 1, 2009 parade, and both conventional variants of the DF-21 and the DF-26 appeared in the September 3, 2015 parade. China has no official declaratory policy for its conventional missile force that is similar to its No First-Use declaratory policy for its nuclear force. Missile exercises are frequently reported in the PLA's official newspaper, the *PLA Daily*, and the Second Artillery/Rocket Force's official newspaper, the *Rocket Force Daily*.[57] China has retained significant ambiguity over its conventional missile force command and control arrangements. In particular, it has made no effort to help an adversary distinguish between its nuclear and conventional missile units, their command and control infrastructure, or clarified the extent of commingling. This ambiguity enhances the risk of mutual disaster resulting from an adversary's preemption or retaliation for a Chinese conventional missile strike.

[57] See, for example, Kenneth W. Allen and Jana Allen, "Building a Strong Informatized Strategic Missile Force: An Overview of the Second Artillery Force with a Focus on Training in 2014" (Washington, D.C.: Jamestown Foundation, 2015).

III. China's Conventional Missile Force Posture Decisions

To explain why China established a conventional missile force posture and why it initially selected a brinkmanship posture, I examine the three major decisions Chinese leaders made to establish and adjust its conventional missile force, in 1988, 1995-6, and 1999. Before analyzing these decisions, I briefly outline the different observable implications of the theory of strategic substitution and alternative explanations for the timing and process of China's conventional missile force posture decisions.

Observable Implications

The theory of strategic substitution would expect China to pursue or enhance its coercive missile capability following changes in its threat environment, and change its force posture following changes in the expected cost of retaliation. An observable implication of the theory is that China would pursue a conventional missile capability or alter that capability at four points of time: when its primary conflict scenario became a limited war and after its threat environment changed for the worse on three occasions. Around 1988, the PLA adjusted China's national military strategy to re-orient the force from preparing for a total war to a local war. The first change for the worse in China's threat environment occurred in 1995-6, when the Taiwan Straits Crisis focused China's limited war preparations focused on a Taiwan scenario with U.S. intervention. The second change occurred in 1999 after the United States bombed the Chinese embassy in Belgrade in May during the Kosovo War, the Taiwanese president made pro-independence remarks in July, and a Chinese fighter jet collided with a U.S. spy

plane in 2001. The third change occurred when the Obama Administration announced its Pivot to Asia in 2011, which signaled that the United States would counter China's rise with a more muscular military presence in East Asia.

Organization theory would expect either the PLA or Second Artillery to advocate for a conventional missile capability as soon as conventional missile technology became available in the early 1980s. But the success of those efforts would be contingent on civilian approval as the PLA did not have the authority to decide to pursue a conventional missile capability. Organization theory would also expect the Second Artillery to advocate for a conventional missile force to arrest a decline in its influence within the PLA on two occasions. In 1988 China began to plan for local wars, which were unlikely to involve the use of the Second Artillery's nuclear missile units. In 1992, a number of nuclear missile bases were downgraded in the PLA's military rank system, which would have reduced their influence and resources. Emulation theory would expect China to copy the United States' successful use of conventional missiles, if broadly defined beyond ground-based missiles, in conflicts such as the 1991 Gulf War, 1998 Desert Fox air strikes on Iraq, and its decision to pursue a conventional prompt global strike capability in its 2001 Nuclear Posture Review.

Force posture decisions motivated by the pursuit of strategic leverage would look quite different to a decision-making process driven by organizational interests or emulation. An observable implication of the theory of strategic substitution is that leaders recognize they have a need for strategic leverage due to the combination of their threat environment, the difficulty of making credible nuclear threats and their conventional inferiority in a limited war. Leaders

would recognize the superior credibility of conventional missile threats compared to nuclear weapons in limited wars, or that those weapons can compensate for China's inability to deter Taiwanese independence or U.S. intervention with its conventional capabilities. Finally, leaders would recognize that China's optimal force posture choice was a calibrated escalation posture, given its exposure to U.S. missile retaliation.

By contrast, an observable implication of emulation theory is that leaders would express a fear of falling behind in military technology, likely using the phrase, "backwardness invites attack" (*luohou jiu aida*) common in the Chinese strategic lexicon. An observable implication of organization theory is that the most vocal advocates of a conventional missile force are officers from the PLA or missile force. Those officers might acknowledge that they are seeking to further their organizational interest in greater influence, autonomy, and resources by establishing a conventional missile force. They may resist force posture choices or changes that would concentrate authority to use weapons in the hands of civilian leaders.[58]

The 1988 Decision to Establish the Force

Chinese leaders decided to pursue a conventional missile capability in 1988, as China's main conflict scenario shifted from a total war to a limited war. A conventional missile capability equipped China with a credible source of strategic leverage to deter Taiwan from taking steps towards formal independence that could lead to a cross-Strait war. Second Artillery leaders

[58] See, for example, Halperin, Clapp, and Kanter, *Bureaucratic Politics and Foreign Policy*, 60–61. The close integration of Party and PLA interests may, however, dampen this competitive civil-military dynamic observed in the United States in China.

advocated for the establishment of a conventional missile posture to ensure their branch of the PLA played a role in a Taiwan conflict. The timing of the decision supports the theory of strategic substitution, which would expect China to establish a force posture for its non-nuclear strategic weapons when it began to prepare for limited war scenarios in 1988. Chinese strategists' speech evidence during the decision-making process indicates that they recognized China's need for strategic leverage in its new conflict scenario because nuclear threats lacked strategic credibility in a limited war context.

The Availability of Conventional Missiles

Deng Xiaoping's assessment that China no longer faced an existential threat of Soviet invasion by 1984 created the opportunity for China to establish a conventional missile force, perhaps by accident rather than by design, because it made conventional missiles available to the Second Artillery in 1988. When Deng Xiaoping downgraded his assessment of the threat of a Soviet invasion, he reduced the military budget and diverted resources to economic development. This policy of military "patience" required the PLA to wait for China's civilian economy to further develop before it would receive the funds to modernize. China's defense research and industrial complex were starved of funding from the national budget. The defense industry was encouraged to finance weapons research and development through exports of military technology.

One of the research institutes encouraged to survive on defense exports was in the process of designing the DF-15 conventional missile. The First Academy of the 7th Ministry had designed and produced the workhorse of the Chinese nuclear arsenal in the 1970s and 1980s, the DF-3

MRBM. [59] The Academy reportedly proposed to develop of short and medium-range conventional missiles for operational purposes in the spring of 1984 and commenced conceptual design work on the DF-15 in April.[60] The DF-15 project lost its funding around 1985 and the design team was encouraged to "find their own rice for the pot (*zhaomi xiahu*)"[61] to fund it. They developed and produced the DF-15 missile as the M-9 missile to export to Arab states but China was forced to cancel the sale of the M-9 missiles under U.S. pressure.[62] The M-9 missiles were therefore available in 1988 when top civilian leaders, the PLA and the Second Artillery began to prepare for local wars. According to Ge Dongsheng, the commander of the first Second Artillery base to establish a conventional missile brigade and later the Second Artillery Deputy Commander, "our country's second-generation missile weapons equipment, especially solid-fueled conventional missiles, were not at all national or military development programs, rather they arose out of the exigencies of the principle of "[military] patience."[63]

The Need for Strategic Leverage

Chinese leaders decided to develop the conventional missile force because they had a need for strategic leverage due to their new, limited war scenario and that the Second Artillery's existing nuclear missile force was not a credible source of strategic leverage in a limited war. There is no speech evidence to indicate that they also had a conventional inferiority motivation to

[59] Ge, *Nanwang Lijian Suiyue*, 124. See also John Wilson Lewis and Hua Di, "China's Ballistic Missile Programs: Technologies, Strategies, Goals," *International Security* 17, no. 2 (1992): 11, 30–31.
[60] Mark A. Stokes, "The People's Liberation Army and China's Space and Missile Development: Lessons from the Past and Prospects for the Future," in *The Lessons of History: The Chinese People's Liberation Army at 75*, ed. Laurie Burkitt, Andrew Scobell, and Larry Wortzel (Carlisle, P.A.: Strategic Studies Institute and Army War College Press, 2003), 212.
[61] Ge, *Nanwang Lijian Suiyue*, 124.
[62] Ibid., 125.
[63] Ibid., 124-125.

develop the force. Pursuing a conventional missile capability also aligned the missile force's organizational interests with its need for strategic leverage.

The Second Artillery proposed to top Party leaders that the missile force be equipped with the M-9 conventional missile in 1988 after those leaders asked the missile force to define its role in limited conventional wars. The leader who made the decision to establish a conventional missile force was the civilian First Vice-Chairman of the Central Military Commission (CMC), Zhao Ziyang, who was also General Secretary of the Communist Party and President of the People's Republic of China.[64] On the afternoon of April 23, 1988, Zhao called the Second Artillery Commander, Li Xuge, and Political Commissar, Liu Lifeng, to the Chinese leadership compound at Zhongnanhai to report on the development of the missile force.[65] According to Li Xuge's biographers, "Once Zhao Ziyang had finished listening to the report, he raised a topic with both Second Artillery leaders, requiring them to research the question of what effect the Second Artillery would have in a local war and a conventional war scenario."[66] Zhao's instructions imply that China's civilian leaders had no intention of using nuclear weapons to maximize strategic leverage in a limited conventional war, despite the debate over nuclear posture that was taking place at the time, outlined in the previous chapter.

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[64] The CMC Chairman was China's top leader at the time, Deng Xiaoping, who had retired from all other government posts.

[65] Cheng Baoshan, ed., *Di'Er Pao Bing Gaoji Jiangling Zhuan [Biographies of Second Artillery High-Level Leaders]* (Beijing: Di'Er Pao Bing Zhengzhi Bu, 2006), 488.

[66] Ibid., 488. It is possible that the two missile force leaders proposed the conventional missile force in April 23 report unprompted. According to Ge, "one of it [the report's] important topics was should the Second Artillery develop ground-to-ground conventional missiles? Commander Li and Commissar Liu at once declared their position, the Second Artillery should at once energetically develop this kind of missile. As a result, the CMC determined that the Second Artillery must be armed with conventional missiles and form a conventional missile unit." GDS memoir, 129.

The Second Artillery swiftly proposed to China's top civilian and military leaders that they pursue a conventional missile capability. That same evening, "Li Xuge returned to the Second Artillery office and promptly directed the [Second Artillery] General Secretary to report up to the CMC, to convene relevant departments of the Second Artillery to research and implement an opinion, and on May 5, 1988 [he] reported to the CMC on what effect the Second Artillery would have in a local war, recommending arming [it with] conventional missiles."[67] The report handed up by the Second Artillery was called "On the Issue of the Effect of the Second Artillery in Local Conventional Wars."

The proposal for a conventional missile capability appeared to have support across the PLA and among top military leaders who were not members of the missile force. On May 30, 1988, CMC Vice-Chairman Admiral Liu Huaqing convened a group to study the report, which included the Deputy Chief of the General Staff Department (GSD) He Qizong, leaders of the GSD Operations and Armaments Departments, and Shen Rongzhun, the deputy chief of the defense industry conglomerate the Commission on Science, Technology and Industry (COSTIND).[68] At a regular meeting of the CMC on June 10, China's top military and civilian leaders gave full approval to the Second Artillery's report.[69]

The series of leadership, Second Artillery, PLA and defense industry decisions between 1989 and 1993 to establish an operational conventional missile unit provide further evidence that China pursued a conventional missile capability to maximize its strategic leverage over Taiwan.

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[67] Cheng, *Di'Er Pao Bing Gaoji Jiangling Zhuan*, 488.
[68] Jiang Weimin, ed., *Liu Huaqing Nianpu [Chronology of Liu Huaqing]*, vol. 2 (Beijing: Jiefangjun Chubanshe, 2016), 782.
[69] Cheng, *Di'Er Pao Bing Gaoji Jiangling Zhuan*, 488.

The Second Artillery Commander Li Xuge and Ge Dongsheng, the commander of Base 2, which established and commanded China's the first conventional missile unit, both advocated for the conventional missile unit to further the organizational interests of the branch and base. The account of these decisions below draws heavily on Ge Dongsheng's detailed description of the process of establishing the force. Some aspects of his account could not be corroborated with other sources.

After the CMC approved the Second Artillery's proposal to pursue a conventional missile capability, the missile force had to make repeated requests to the CMC to equip the force with the conventional missile. To make those requests as persuasive as possible, Second Artillery Commander Li Xuge and Base 2 Commander Ge Dongsheng pointed out the advantages of using conventional missiles in a Taiwan conflict. At the time, a Taiwan conflict was not the primary conflict scenario for the PLA, so the Second Artillery's arguments were both opportunistic and perspicacious. Ge commanded the missile base in Anhui province in China's east, opposite Taiwan. He explicitly connected the conventional missile force to a Taiwan contingency because it gave him "an extremely good opportunity to develop the base." He requested that his base be the first to be armed with a conventional missile unit at a Second Artillery military affairs work meeting in Xi'an in 1988 because of its ideal location, "Taiwan is in front, facing us across the sea. The range of the DF-15 could carry out complete firepower coverage over Taiwan and its outlying islands."[70]

[70] Ge, *Nanwang Lijian Suiyue*, 130.

By May 1990, the PLA still had not made any decisions about where to establish its first conventional missile unit. Two factors likely caused the delay. First, the PLA did not fully update its national military strategy to account for the shift to a limited war scenario until 1993, after the Gulf War demonstrated the "local wars under high-technology conditions" that the PLA would need to fight in the future. Second, the pro-democracy movement that culminated in the brutal crackdown of June 4, 1989 disrupted PLA modernization as the military both played a role in ending the protests and created disunity in the Party following the incident.[71]

In May 1990, Ge repeated his request to receive the Second Artillery's first conventional missile unit to Commander Li. His strategic arguments for the establishment of conventional missile units strongly support the theory of strategic substitution. His first argument was that China needed strategic leverage for a Taiwan contingency. Not only was peaceful reunification with Taiwan one of the Party's priorities that Deng Xiaoping identified at the 12th Party Congress, but the cross-Strait situation was worsening. Peaceful reunification would require "a strong armed force as a backstop."[72] Ge reiterated that a DF-15 unit deployed to his base would be able to strike the main Taiwan island, outlying islands, and surrounding seas.[73] Second, Ge pointed to the Iran-Iraq War as an example of how other countries had recently used conventional missiles for strategic leverage, "missile strikes on cities during the Iran-Iraq War made it clear that a combat style using missile weapons has already become one of the important aspects of contemporary high technology warfare. The deterrence utility and attack capability of conventional missiles can create a lot of psychological and political pressure on

[71] M. Taylor Fravel, "Shifts in Warfare and Party Unity," *International Security* 42, no. 3 (Winter 2017): 73–79.
[72] Ge, *Nanwang Lijian Suiyue*, 135.
[73] Ibid., 135.

an adversary."[74] Third, Ge recognized that China could not use nuclear weapons as a source of strategic leverage in a Taiwan conflict. Not only did China have a No First-Use policy, but "against our common brethren (*tongbao*) it is even more impossible to use nuclear weapons!" If the Second Artillery remained a nuclear-only force, it would be irrelevant in a cross-Strait war, "once the Party and country cannot but use force to recover Taiwan, our base may be the Second Artillery's only force opposite the Taiwan combat area, but we would not have the military means or power to participate in the war."[75]

Ge also made organizational arguments for the Second Artillery to pursue a conventional missile capability. The organizational prestige of his base and the entire Second Artillery demanded that the force expand its missions beyond nuclear deterrence. If the missile force did not have conventional missiles to participate in a Taiwan conflict, "that [situation] would be our base and even the whole Second Artillery's galling shame and deep humiliation.'"[76] He dismissed an argument that the nature of the Second Artillery would change if it was armed with conventional missiles. The Second Artillery had no authority to use its existing nuclear missiles and it would not gain authority to use missiles if it was equipped with conventional missiles. He explained that "both levels, the bases and Second Artillery, could not have decision authority or command authority." Given the strategic effects of using conventional missiles, the command authority to use them would be "the same as using nuclear missile weapons, both are concentrated in the hands of the Politburo and Central Military Commission, we can only resolutely carry out orders."[77]

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[74] Ibid., 135.
[75] Ibid., 136.
[76] Ibid., 136.
[77] Ibid., 137.

These arguments likely persuaded the leadership to take further steps establish the conventional missile force. Ge received notice that the Second Artillery would receive the DF-15 a month later, in June 1990.[78] The Second Artillery Party Committee decided to equip Base 2 with a test model (*shizhuang*) DF-15 in April 1991.[79]

Evidence from the Second Artillery's cooperation with other services to establish the first conventional missile unit confirms that China's decision to pursue its first non-nuclear strategic weapons capability was driven by its need for strategic leverage. In preparation for fielding the DF-15, the Second Artillery cooperated with the GSD and the Nanjing Military Region. The missile brigade would be garrisoned and operate in that command's area of operations. In December 1991, a working group made up of members from the Second Artillery and GSD Operations Department briefed the Nanjing Military Region Commander, Xiang Shouzhi, on the conventional missile unit preparations. Commander Xiang, who was himself a former Second Artillery Commander, commented that, "this [unit's goal] is to protect national sovereignty and territorial integrity, in particular to create the requisite conditions to realize Taiwan 's peaceful reunification with the motherland." Xiang also saw the benefits of the conventional missile units for his theater command, "at the same time it shows a high degree

[78] In June 1990, the Base 2 Chief of Staff Chen Youguo received notice that the DF-15 would be given to the Second Artillery while accompanying the Central Chief of Staff and a Second Artillery working group during an inspection of a base. Ibid., 141.

[79] Ibid., 120. According to two NDU researchers, the Second Artillery began to build the first conventional missile unit a little later, in August 1991. Lan Rongchong and Li Wei, "Xin Zhongguo 60 Nian Di'er Paobing Jianshe Fazhan de Lishi Jingyan Ji Qishi [Historical Experience and Lessons of 60 Years of Building of New China's Second Artillery]," *Zhongguo Junshi Kexue [China Military Science]*, no. 4 (2009): 33.

of confidence in the Nanjing Military Region, it provides strong support for the Military Region's force building and development."[80]

Ge Dongsheng also used the conventional missile unit to protect his base from being demoted within the PLA hierarchy, which demonstrates both the importance China's top military leaders placed on the conventional missile force and the importance of organizational interests in the eventual establishment of the force. Base 2 escaped a CMC decision to reduce the rank of some missile bases in mid-1992, despite fulfilling the criteria for a downgrade, because it would soon receive the DF-15 conventional missile. The CMC's decision to downgrade missile bases was probably made some time in May, to re-allocate resources to economic development and other military modernization projects.[81] Base 2 met the criteria for a downgrade from its full corps leader grade (*zhengjun ji*) because it neither had enough personnel or missiles of intercontinental-range.[82] The imminent deployment of the DF-15 and second-generation nuclear ICBMs allowed the base to retain its full corps leader grade.[83]

An impromptu visit to the base by CMC Vice-Chairman Liu Huaqing in early June was instrumental to the base maintaining its grade. The visit was almost certainly orchestrated by Second Artillery Commander Li Xuge. After learning of the base downgrade policy at a

[80] Ge, *Nanwang Lijian Suiyue*, 148.
[81] CMC Vice- Chairman Liu Huaqing heard reports from COSTIND and the GSD Equipment Department on a nuclear weapons development plan on May 12, 1992. He also heard a report from Second Artillery commander Li Xuge and convened a meeting between the relevant leaders of the GSD, COSTIND, the Second Artillery and the military trade office to research the Second Artillery's development plan on May 20, 1992. Jiang, *Liu Huaqing Nianpu*, 2:978–79.
[82] Ge, *Nanwang Lijian Suiyue*, 150-152. The range limit applied to both long (*yuancheng*) and intercontinental (*zhouji cheng*) missiles. Long-range missiles would refer to China's DF-4 missile, which had a range of approximately 5000 kilometers. The United States classifies the DF-4 as a "limited-range" ICBM.
[83] Ibid., 150-152.

Second Artillery Party Committee meeting, Ge appealed to Li Xuge and the missile force Political Commissar Liu Lifeng to petition the CMC for Base 2 to retain its full corps leader grade. He argued that the "tasks of fielding the conventional missile and second-generation nuclear missiles were in a crucial phase."[84] A day later, Commander Li informed Ge that CMC Vice-Chairman Liu Huaqing would make an impromptu visit to Base 2. Demonstrating a lack of widespread support within the Second Artillery for pursuing a conventional missile capability, Commissar Liu denied Ge permission to leave the Party Committee meeting to return to the base to prepare for the visit, while Commander Li granted permission.

Ge's Deputy Commander, Qing Zhiyuan, briefed CMC Vice-Chairman Liu Huaqing on the base's activities during the visit on June 9, 1992.[85] Qing petitioned the Vice-Chairman for the CMC to officially deploy the DF-15 to Base 2 and to establish the first DF-15 missile brigade. Vice-Chairman Liu approved the request in full.[86] On August 7, 1992, the CMC met and decided not to downgrade Base 2.[87] Not only did the visit allow Base 2 to maintain its military grade, but it also accelerated the process of fielding the DF-15. In September 1992, the Second Artillery received an order that it would be armed with the DF-15, and that Base 2 would receive surface launch testing equipment and a training missile.[88] During the final steps of fielding the DF-15, Base 2 encountered more organizational hurdles from within the Second

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[84] Ibid., 151.
[85] Jiang, *Liu Huaqing Nianpu*, 2:981.
[86] Ge, *Nanwang Lijian Suiyue*, 150-152. On June 12, Liu Huaqing told a Second Artillery base to "strengthen quality building, strengthen our national power and military might." It is not clear whether this was Base 2 or another Second Artillery Base. Jiang, *Liu Huaqing Nianpu,* 2:981.
[87] Ge, *Nanwang Lijian Suiyue*, 150-152. Liu Huaqing's chronology notes that the CMC held a regular meeting that day, but does not mention any decisions regarding Second Artillery bases. Jiang, *Liu Huaqing Nianpu,* 2:986.
[88] Ge, *Nanwang Lijian Suiyue*, 153.

Artillery.[89] The PLA's first DF-15 battalion was finally established on April 5, 1993 and became launch-ready in late November, 1993.[90]

The Expected Cost of Retaliation

Chinese leaders probably did not select a brinkmanship posture for their conventional missile force until the mid-1990s. When the PLA was transitioning from preparing for a total war against a superpower to a local conventional war in the late 1980s, it lacked a clear adversary.[91] There is no evidence to suggest that leaders estimated China's expected cost of retaliation for conventional missile strikes against Taiwan or the United States in 1988. Taiwan was the only target named in the decisions to pursue China's conventional missile capability in 1988. Furthermore, the range of the DF-15 limited its potential targets to Taiwan and the Paracel Islands China claims in the South China Sea.[92]

The 1995-6 Taiwan Straits Crisis: Brinkmanship and Bringing the U.S. Into Range

In July 1995, the PLA fired six DF-15 missiles into the East China Sea in the Shenjian-95 exercises to protest Taiwanese President Li Teng-hui's visit to his U.S. alma mater, Cornell University. The Second Artillery also fired four DF-15 conventional missiles as part of the Lianhe-96 joint exercises, which were intended to influence the outcome of presidential elections in Taiwan on March 23, 1996.

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[89] Ibid., 153.
[90] Ibid., 160. See also Lan and Li, "Xin Zhongguo 60 Nian Di'er Paobing Jianshe Fazhan de Lishi Jingyan Ji Qishi," 33.
[91] M. Taylor Fravel, *Active Defense: China's Military Strategy Since 1949* (Princeton, N.J., 2019), ch. 5.
[92] Okinawa is approximately 650 kilometers from China's east coast, placing it beyond the 600-kilometer range of the first variant of the DF-15 conventional missile.

The 1995-1996 Taiwan Straits Crisis was an important incident for China's conventional missile posture for four reasons. First, as the theory of strategic substitution would expect, the deterioration in threat environment produced by the crisis gave China a need for strategic leverage. It led to improvements in its missile force to bring U.S. East Asian bases and aircraft carriers into range. Conventional missiles, branded as "shashoujian" (assassin's mace) weapons, became a major focus of the PLA's weapons equipment development program following the crisis. Second, the crisis focused the PLA's attention on planning for a limited war to prevent Taiwanese independence in which the United States would intervene to back Taipei.[93] Until that point, a Taiwan war was one of a number of limited wars the PLA was preparing for and it was not clear that the United States would intervene to back Taipei. Third, the crisis tested China's approach to maximizing strategic leverage in limited wars. It affirmed that non-nuclear strategic force postures could give Beijing credible strategic leverage while maintaining a retaliatory nuclear posture. Fourth, it allowed Chinese leaders to experiment with a brinkmanship conventional missile force posture, which likely formed the basis of its 1998 official doctrine for conventional missile campaigns.[94]

The Need for Strategic Leverage

China's missile tests in 1995 and 1996 were part of a carefully orchestrated campaign of military exercises and diplomatic messaging designed to deter Taiwan from taking further actions to demonstrate its independence from the mainland. The PLA's General Staff Department planned the 1995 missile tests, but there is no evidence to indicate which service

[93] Robert S. Ross, "Navigating the Taiwan Strait: Deterrence, Escalation Dominance, and U.S.-China Relations," *International Security* 27, no. 2 (Fall 2002): 68–69.
[94] Stokes refers to a 1996 manuscript entitled "PLA Second Artillery Joint Campaign." Stokes, "The People's Liberation Army and China's Space and Missile Development," 240 footnote 71.

or individual suggested that the missile tests be a part of the exercises. On February 5, 1995, PLA Chief of General Staff, Zhang Wannian, ordered a meeting of the GSD Party Committee to study Jiang Zemin's speeches on Taiwan. According to his biography, "he required the GSD to pay close attention to the Taiwan situation and related aspects, to provide assurance to the Politburo and Central Military Commission's decisions and commands, to make preparations for a military struggle with a sense of responsibility and urgency, to ensure that the Polituro and CMC's strategic intentions could be realized."[95]

It was likely not until late May, when Taiwanese President Lee received a visa to visit the United States, that China's top leaders instructed the PLA to prepare for military action. Zhang Wannian and other top leaders, including Xiong Guangkai who sat on the Taiwan Leading Small Group that made the decision to conduct the exercises, met many times with the GSD Operations Department "to do special research and preparatory work for deployments in a military struggle." The GSD received their instructions to prepare for the exercises from the CMC and Jiang Zemin, around June 16, 1995. By mid-July, a decision had been made to conduct the exercises.[96]

The Expected Cost of Retaliation

There is only weak evidence to suggest that expected cost of conventional missile retaliation factored into Chinese leaders' choice of conventional missile launches to coerce Taiwan. Chinese leaders reportedly preferred missile launches to testing other military capabilities to

[95] Guo Xiangjie, *Zhang Wannian Zhuan [The Biography of Zhang Wannian]* (Beijing: Jiefangjun Chubanshe, 2011), 240.
[96] Ibid., 241.

"minimize the risk of a direct confrontation between mainland and Taiwanese military forces that might lead to an exchange of fire."[97] Although China took a number of steps to try to prevent the exercises from triggering a war, the missile exercises demonstrated many aspects of a brinkmanship posture. Officials were dispatched to Taipei and Washington to reassure both capitals that it did not intend to invade Taiwan. China publicly announced the exercises, centralized control of all military actions through the GSD, and monitored international reactions to the test.[98] On the other hand, Chinese leaders expected that either reassurances or fear of conflict escalating would deter both Washington and Taipei from reacting militarily to the missile launches. They fired missiles into the seas near Taiwan's ports and continued missile tests after U.S. aircraft carriers were deployed in the vicinity, despite lacking the ISR assets to track and avoid hitting commercial ships or U.S. military vessels.

Experimenting with a Brinkmanship Posture

The missile exercises began on July 20, when the PLA was placed on high alert. The GSD Operations Department gave the order to the entire PLA that the "military deterrence mission to frighten (*zhenshe*) 'Taiwanese Separatists' had begun."[99] China launched two conventional missiles in the early hours of the morning on July 21, 1995, followed by another two test launches each on the mornings of July 22 and July 24. Xinhua News Agency publicly announced the start and finish of the launches. The PLA later carried out naval exercises in September and October, and a major amphibious landing exercise in the Nanjing military region in November 1995.

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[97] Ibid., 237.
[98] Andrew Scobell, "Show of Force: Chinese Soldiers, Statesmen, and the 1995–1996 Taiwan Strait Crisis," *Political Science Quarterly* 115, no. 2 (2000): 227–46.
[99] Guo, *Zhang Wannian Zhuan*, 241.

The missile launches were carried out under strict and centralized command and control, which is characteristic of a calibrated escalation posture but also consistent with a brinkmanship posture. Zhang Wannian, who was a CMC Member as well as the Chief of General Staff, gave the launch orders and commanded the entire exercise from the GSD Operations Department Command Center.[100] The chain of command during the exercises went from the top civilian leader, Party General Secretary Jiang Zemin, and the top military leaders, the CMC Vice-Chairmen, to the GSD Chief of Staff, to the Second Artillery Commander and Political Commissar, who then transmitted the commands to the conventional missile brigade. Jiang Zemin, Liu Huaqing and Zhang Zhen kept a close eye on the exercises and "made many calls to the Operations Department to make inquiries." Zhang also transmitted instructions from General Secretary Jiang to the Second Artillery Commander and Political Commissar, which included instructions to Second Artillery officers to "closely pay attention to changes in the orientation of the Taiwanese authorities, and to make preparations for follow-on launches."[101] The two Vice-Chairmen instructed the PLA to watch the reactions of Taiwan, Hong Kong and other countries.[102]

In their after-action reports and meetings evaluating the 1995 missile exercises, PLA leaders concluded that the exercises were very successful in maximizing China's strategic leverage over Taiwan and the United States. Zhang Wannian judged that the tests gave China strategic leverage, "first, they showed the strong resolve of the PLA in protecting national unity; second, they warned outside intervening powers; third, they warned and taught the Taiwanese people,

[100] Ibid.
[101] Ibid., 242.
[102] Ibid., 242–43.

and encouraged and supported forces for peaceful reunification on the island."[103] Fu Quanyou, who replaced Zhang Wannian as Chief of General Staff, reported to a CMC enlarged meeting on December 5, 1995 that "[the exercises] were all extremely successful, they attacked the power of 'Taiwan Separatists' represented by Lee Teng-hui, warned the United States as the main outside intervening power, forcefully accompanied political and diplomatic struggles, and received a high appraisal from the Politburo and Central Military Commission."[104] Fu advocated for further military deterrence actions to show that "the Chinese government could not be frightened by a little 'carrier strike group,'" following the U.S. deployment of a carrier strike group near Taiwan in December 1995. He argued that inaction would encourage Taiwanese independence and show the world that China was afraid of the U.S. naval presence.[105]

The success of the exercises in deterring Taiwanese steps towards independence and U.S. support of Taiwan led PLA leaders to prioritize conventional missile weapons in their subsequent military modernization plans. Between the two sets of missile exercises, from the end of November until December 2, 1995, Fu Quanyou convened a meeting to study new war methods and tactics to prepare for a future war over Taiwan, which included participation from the highest levels of the PLA leadership.[106] The meeting drew lessons from the missile tests

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[103] Ibid., 248.
[104] Wang Xuedong, *Fu Quanyou Zhuan [Biography of Fu Quanyou]* (Beijing: Jiefangjun Chubanshe, 2015), 156.
[105] Ibid., 157.
[106] Participants included CMC Vice-Chairmen Zhang Zhen, Zhang Wannian, and Chi Haotian, Second Artillery Commander Yang Guoliang and Jinan Military Region Commander Zhang Taiheng, and others from the GSD, General Logistics Department, General Political Department and Second Artillery.

and island landing exercises.[107] Among its outcomes were "a set of preliminary policies" provided to the CMC to inform "next steps in planning and directing military struggles."[108]

This meeting took place as Chinese leaders were finalizing a five year plan for the armaments the PLA would develop in the near future. That plan prioritized "shashoujian" weapons, which Zhang Wannian had first mentioned in 1992 in the context of China's preparations for local wars. Fu recommended that the PLA emphasize the development of "shashoujian equipment such as precision conventional missiles, new models of submarines, fighter jets and electronic warfare." Fu remarked that the mainland's missiles, Su-27 fighter jets and submarines had led the Taiwanese army to "remain quiet with fear" (*jinruo hanchan*), which "is the role of 'shashoujians.'" He observed that "shashoujians often can play the role of 'deciding everything' (*ding qiankun*)," and would help the PLA gain "overall (*zongti*) superiority over Taiwan in military affairs."[109]

At the beginning of 1996, Jiang Zemin ordered further military exercises to try to intimidate Taiwanese voters not to return Lee Teng-hui to office in Taiwan's presidential elections. Jiang ordered Zhang Wannian, was promoted to the rank of CMC Vice-Chairman, to plan and command a large-scale exercise. The 1996 exercise began with two test missile launches on March 8 and 11, followed by air and naval maneuvers on March 12-20, and an amphibious landing exercise on March 18-25. The missile launches prompted the United States to announce on March 10 that it was dispatching the *USS Independence* aircraft carrier towards

[107] Wang, *Fu Quanyou Zhuan*, 157.
[108] Ibid., 159.
[109] Ibid., 157–58.

the Taiwan Strait. On March 11, it announced that the *USS Nimitz* carrier was also heading to the area. Zhang's biographers report that "upon receiving the news that the U.S. carriers were headed for the seas near Taiwan, Zhang Wannian immediately informed Jiang Zemin."[110]

Strict command and control arrangements did not preclude China from using its conventional missiles as a brinkmanship doctrine envisaged, as Jiang Zemin himself ordered the exercises to continue after the carriers were dispatched. Jiang Zemin ordered Zhang Wannian to "rush to the site of the exercises" where he "directly took control of the situation, commanding the ongoing exercises himself."[111] Zhang instructed the GSD and forces participating in the exercises to monitor the carriers' movements. He consulted with top leaders from the GSD, Navy, Air Force, Second Artillery, and Nanjing Military Region to study U.S. intentions, possible complications that could arise, and what China's response should be. After the meeting, he gave a detailed report to Jiang Zemin and recommended that the exercises continue. Jiang consented.[112] Subsequently, one military officer claimed that the PLA lost track of some of its missiles during the tests due to disruptions of their satellite guidance, which could have made the tests even riskier.[113]

The Decision to Enhance China's Conventional Missile Posture

In late 1995, PLA leaders likely made the decision to develop medium-range conventional ballistic missiles and increase the size of its short-range ballistic missile force. This decision

[110] Guo, *Zhang Wannian Zhuan*, 250.
[111] Ibid., 250.
[112] Ibid., 251.
[113] At the time China was relying on the U.S. Global Positioning Satellite system. Minnie Chan, "'Unforgettable Humiliation' Led to Development of GPS Equivalent," *South China Morning Post*, November 13, 2009, http://www.scmp.com/article/698161/unforgettable-humiliation-led-development-gps-equivalent.

motivated by need for strategic leverage resulting from the Taiwan Straits crisis. That crisis changed China's threat environment for the worse by demonstrating that the United States might back Taipei in a future cross-Strait war, while Taiwan's actions in 1995 demonstrated that another crisis was certainly possible. These changes in China's threat environment revealed the inadequacy in China's existing sources strategic leverage, and neither conventional weapons nor nuclear weapons provided a suitable option for addressing this inadequacy. China's need for strategic leverage could, however, be satisfied with greater investments in its conventional missile posture. From around 1995, PLA leaders referred to China's conventional missiles as "shashoujian" (assassin's mace) or "sashoujian" (trump card) weapons. "Shashoujian" weapons were a major priority in the PLA's 9th Five Year Plan armaments plan, which came into effect in 1996.

The categorization of conventional missiles as "shashoujian" weapons indicates that Chinese leaders enhanced their conventional missile posture because of strategic credibility and conventional military inferiority considerations. Zhang Wannian first mentioned the concept of "shashoujian" weapons during a research meeting on the Gulf War that took place in 1992, as China was formulating its 1993 strategic guideline.[114] The term refers to a select few high-technology weapons systems that would allow China to scare its adversary, without catching up across the board with an adversary military's advanced conventional weapons. Zhang clearly described the strategic role of "shashoujian" weapons in China's approach to winning local wars from a position of conventional military inferiority during an enlarged meeting of

[114] In that same speech, however, Zhang Wannian distinguished between *shashoujians* and conventional missiles, which he categorized as fists (*quantou*) with strong maneuver capabilities. Fravel, *Active Defense*, ch5. citing Wannian Zhang, *Zhang Wannian Junshi Wenxuan [Selected Military Works of Zhang Wannian]* (Beijing: Jiefangjun Chubanshe, 2008), 365.

the CMC on December 12, 1995. He explained, "in a situation in which there is a big discrepancy in our weapons equipment quality, the quantitative superiority of our military cannot substitute for the inferiority of our weapons quality."[115] After noting that countries surrounding China were investing in advanced weaponry, he remarked that "falling behind is passively inciting attack (*beidong aida*). Our circumstances are limited, we cannot pursue everything, but we absolutely cannot fall behind." China needed to pursue advanced technology and solve the problem of "looking far, striking far, striking precisely."[116] Zhang instructed the PLA to emphasize "the development of 'shashoujians' that effectively subdue the enemy."[117]

At that CMC meeting, top military leaders approved the PLA's Military Building Plan Outline for the 9th Five Year Plan period. One of the aims of the plan was to "ensure that around 2000, [China has] some 'shashoujians' with relatively strong deterrent power."[118] The program likely included a conventional variant of China's DF-21A medium-range nuclear ballistic missiles.[119] It may have also included an increase in the size of the short-range ballistic missile force. It is possible that China added development of the DF-21D anti-ship ballistic missile to the "shashoujian" program after the 1996 U.S. carrier deployment to the Taiwan Straits, the year after PLA's armaments plan was approved.[120]

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[115] Guo, *Zhang Wannian Zhuan*, 164–65.
[116] Ibid., 164–65.
[117] Ibid.
[118] Ibid., 82.
[119] Ibid., 164.
[120] Stokes, "China's Evolving Space and Missile Industry," 260.

The decision-making process that led to the final Plan Outline demonstrates that PLA leaders viewed conventional missiles as a way of maximizing strategic leverage in a limited war over Taiwanese independence. The planning process for the Plan Outline commenced long before the 1995 missile exercises. But the key phase for determining the content of the plan coincided with the exercises and likely influenced its final content.

One of the main aims of the 9th Five Year Plan for the PLA would be to improve the quality of existing systems and to transform technologies that China already had into armaments. Developing a conventional variant of China's medium-range nuclear missile, the DF21A, would have fit well with these priorities. As CMC Vice-Chairman Liu Huaqing explained in guiding remarks on February 18, 1995, "we do not need to go and make many more new things, [we should] consolidate results that we have already obtained and continue to improve on the foundation that we already have." Vice-Chairman Liu also made it quite clear that China would not emulate other countries in its choice of arms to develop, "if other countries don't have something, we will make it, we should learn from other's strong points to offset our weaknesses through innovation and development."[121]

The PLA already intended to develop "shashoujian" weapons during the 9th Five Year Plan period when the CMC initiated the drafting process for the PLA's the Plan Outline in February 1995 before the Taiwan crisis. Days before the missile tests, on July 5, Zhang Wannian indicated that missile weapons, advanced aircraft and an automated command system were "shashoujians" that should receive priority in the plan.[122] At an LSG planning meeting the day

[121] Jiang, *Liu Huaqing Nianpu*, 2:1173, 1171.
[122] Guo, *Zhang Wannian Zhuan*, 80.

before the first missile tests began, Zhang emphasized that China "needed effective 'moves' and 'shashoujians' that are sufficient to realize the requirements of deterring the adversary and defeating the enemy."[123]

Chief of General Staff Zhang Wannian was appointed the chair of the 9th Five Year Plan Period Military Building Plan Leading Small Group (LSG) on January 27, 1995.[124] That group was tasked with setting the plan's principles and overall goals.[125] At the LSG's first meeting on February 14, 1995, Zhang Wannian set out a number of principles for the group's work. Contrary to the expectations of emulation theory, Zhang specifically warned that China should not copy other militaries: "[the PLA should] boldly borrow lessons, absorb the relevant experience of foreign militaries, but also not blindly and rigidly imitate [them], [we should] maintain and develop the distinctive characteristics of our military."[126] The "foundations" for the plan included China's 1993 strategic guideline to fight local high-technology wars, its national security and international security environment, its economic and technological capacity to support arms development, and the ability of the PLA to make use of new arms.

The missile test launches occurred while the LSG was still consulting within and outside the PLA on the content of the Plan Outline. The perceived success of the missile tests likely led to a greater emphasis on conventional missiles in the final plan. After the missile tests in July,

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[123] Ibid., 81.
[124] The Vice-Chairmen of the LSG were the Deputy Chief of General Staff Xu Huici, GPD Deputy Director Zhou Ziyu, GLD Deputy Director Wang Tailan. Other members were drawn from the three central departments, Second Artillery, Navy, Air Force, National Defense University, Academy of Military Sciences, COSTIND, and CMC General Office. Ibid., 78.
[125] Ibid., 78.
[126] Zhang, *Zhang Wannian Junshi Wenxuan [Selected Military Works of Zhang Wannian]*, 489–92.

CMC members discussed draft plans at least four regular meetings.[127] The LSG consulted with 36 military organizations, the Ministry of Finance and State Planning Committee, and sent a report to Jiang Zemin before soliciting suggestions from leaders of all major PLA units at a meeting in September.[128] On November 8, Liu Huaqing and Zhang Wannian heard a report on the plan from the GSD and COSTIND, during which Liu noted that "all programs are suitable to the requirements of high-technology, and paid attention to electronic and missile technology."[129] The Plan Outline was formally approved by the CMC on December 15.[130] There are signs that the defense industry moved forward with developing medium-range conventional ballistic missiles after the plan was approved. Feasibility studies for an anti-ship variant of China's existing medium-range nuclear ballistic missile, the DF-21D, began to appear in 1997.[131]

Once again, Chinese leaders did not examine their expected cost of retaliation for conventional missile strikes. The closest they came to considering this factor was to repeatedly affirm that they would build "what the enemy feared" in the late 1990s. After the 1995 plan was approved Chinese leaders provided further guidance for defense industry arms development. They emphasized the pursuit of strategic weapons to compensate for China's conventional inferiority. At an enlarged meeting of the CMC on December 7, 1997, Jiang Zemin announced the principle of "having some things but not others" (*you suowei, yousuo buwei*) to guide China's

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[127] Jiang, *Liu Huaqing Nianpu*, 2:1207, 1210–11, 1225. The Plan Outline was discussed alongside the "'9th Five Year Plan" Period Military Organizational Structure Building Plan" drafted by the same LSG.
[128] Guo, *Zhang Wannian Zhuan*, 81.
[129] Jiang, *Liu Huaqing Nianpu*, 2:1235.
[130] Ibid., 2:1225.
[131] Stokes, "The People's Liberation Army and China's Space and Missile Development," 240, fn 73.

military modernization in a fiscally constrained environment.[132] At an all-military equipment work meeting on December 1, 1997, Zhang Wannian mentioned similar themes, noting that China would spread its resources too thinly if it tried to build everything. He also recognized that China should exploit its adversary's vulnerabilities in its choice of arms to develop, "we will focus on developing whatever military struggles require and whatever our enemy most fears."[133] But he did not identify the lack of U.S. or Taiwanese ground-based conventional missile weapons as vulnerabilities.

Despite these efforts, China's defense industry made little progress on "shashoujian" weapons programs between 1996 and 1999. One reason for the delay was that Jiang Zemin implemented sweeping defense industry reforms as a prerequisite to PLA modernization, together with Premier, Zhu Rongji.[134] They established the General Armaments Department (GAD) in April 1998 to make the armaments procurement process more efficient and responsive to the PLA's needs. To establish the GAD, they broke up the defense industry giant COSTIND and reformed defense technology research institutes to increase their efficiency.[135] Although defense industry organizational reforms were complete by the end of 1998, the main reason China accelerated the development of medium-range conventional missiles at the beginning of 1999 was a deterioration in its threat environment. Once again, Chinese leaders had a need for strategic leverage.

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[132] Jiang Zemin, *Jiang Zemin Wenxuan (Er Juan) [Selected Works of Jiang Zemin (Volume 2)]* (Beijing: Zhongyang Wenxian Chubanshe, 2006), 85.
[133] Guo, *Zhang Wannian Zhuan*, 166.
[134] Jiang recognized that "modernization would have no hope" without solving problems in the defense industry including its bloated and dispersed nature, distance from PLA operators, and low quality. Jiang, *Jiang Zemin Wenxuan (Er Juan)*, 86. See also Tai Ming Cheung, *Fortifying China: The Struggle to Build a Modern Defense Economy* (Ithaca, N.Y.: Cornell University Press, 2008), 120–22.
[135] Ibid., 110, 112.

The 1999 Belgrade Embassy Bombing: Catalyzing the "Shashoujian" Program

Although PLA leaders planned for a larger, longer-range conventional ballistic missile arsenal to maximize their strategic leverage in a Taiwan conflict after the 1995 crisis, it took yet another change for the worse in China's threat environment for those plans to be realized. The catalyst for those enhancements to China's conventional missile posture was the U.S. bombing of the Chinese Embassy in Belgrade on May 8, 1999 during the Kosovo War. Although the bombing was an accident, according to Washington, Chinese leaders refused to believe them and interpreted it as a signal of U.S. hostility. This deterioration in threat environment gave China a need for strategic leverage because its leaders ruled out the use of nuclear threats to maximize China's strategic leverage over the United States. In addition, China's need for strategic leverage was amplified by its conventional inferiority compared to the United States, which it could not correct in the foreseeable future. The incident prompted a major effort within the PLA to ensure its preparedness to fight if a war broke out over Taiwan. China increased investments into priority weapons programs and initiated new programs that would allow the PLA to "win from a position of inferiority."

The series of decisions that Chinese leaders made in response to the embassy bombing offers the most persuasive speech evidence to connect the need for strategic leverage to China's conventional missile force posture of the three major decisions outlined in this chapter. But neither Chinese leaders nor the PLA referred to China's expected cost of retaliation for conventional missile strikes or otherwise justified their choice of a brinkmanship force posture. Nor is there evidence from the decision-making process to support an argument that

organizational incentives or efforts to emulate the United States drove PLA efforts to build out their conventional missile posture in 1999.

The PLA was already planning to speed up its military modernization before the embassy bombing, after demonstrations of U.S. military power in the Operation Desert Fox air strikes on Iraq in December 1998 and NATO's intervention in the Kosovo War. In the first half of 1999, the PLA held a number of meetings to examine ways to accelerate its advanced weapons programs. On January 27, 1999, Zhang Wannian attended an All-PLA Equipment Special Work Meeting to research Desert Fox and heard reports on the progress of China's "shashoujian" armaments.[136] At an April 10, 1999 CMC meeting, Vice-Chairman Chi Haotian "allegedly announced that CMC Chairman Jiang Zemin had signed a work report to speed up and intensify R&D on 15 projects and to advance and expand production on 12 programs." The CMC reportedly lobbied for funds to finance defense research and development once the NATO air campaign in Kosovo began in March 1999.[137]

The Need for Strategic Leverage

The CMC prioritized qualitative and quantitative improvements to China's conventional missile force in the wake of the Belgrade Embassy bombing. On May 8, 1999, General Secretary Jiang Zemin instructed the CMC to strengthen China's military to prevent future attacks in an emergency Politburo meeting.[138] CMC Vice-Chairman Zhang Wannian called an

[136] Guo, *Zhang Wannian Zhuan*, 169.
[137] Stokes, "The People's Liberation Army and China's Space and Missile Development," 216.
[138] Jiang, *Jiang Zemin Wenxuan (Er Juan)*, 323, 326; Wang, *Fu Quanyou Zhuan*, 206.

emergency CMC meeting on the same day to implement the Politburo's instructions to the PLA.[139]

Chinese leaders invested in conventional missile weapons to maximize strategic leverage in a Taiwan conflict as quickly as possible, given China's conventional inferiority compared to the U.S. military. One of Zhang's emergency orders to the PLA on May 8 was to speed up the development of "shashoujian" equipment.[140] At a May 11 regular CMC meeting, Zhang Wannian remarked that NATO's operations in Kosovo were a specimen for how the PLA should fight in the future. But China also needed to be able to win a political victory in a Taiwan conflict in the short-term. To that end, "according to his sense of responsibility and urgency," Zhang ordered the PLA to "invest urgently in the leadership of important engineering projects such as forging 'shashoujians.'"[141]

Conventional missiles were a more expedient source of leverage in a limited war than building up symmetrical conventional military power to the United States. Zhang again emphasized the importance of developing "shashoujian" weapons at work meetings on military equipment on June 30 and November 2-6, 1999.[142] At the November meeting, Zhang stated that China would develop "shashoujian" weapons to "build what the enemy fears" quickly and within its financial means. Serbian forces lacked comprehensive sets of weapons equipment, especially "shashoujian" weapons, which contributed to their defeat. Zhang also emphasized that China

[139] Guo, *Zhang Wannian Zhuan*, 416.
[140] Guo, *Zhang Wannian Zhuan*, 416.
[141] Ibid., 418.
[142] Ibid., 420.

needed support capabilities such as satellites, warning capabilities and information support systems, to ensure that advanced weapons gave the PLA an actual operational capability.[143]

In May 1999, Chinese leaders adjusted Deng's longstanding policy of "military patience" by allocating a greater share of the national budget to defense. The additional funds allowed China to accelerate key weapons acquisitions under a program called "Project 995."[144] Among those programs was likely the hit-to-kill technology shared by China's DF-21D anti-ship ballistic missile and its anti-satellite weapons.[145] At a national science and technology innovation meeting on August 23, 1999, Jiang Zemin instructed meeting participants to "quickly grasp new 'shashoujians' that protect national sovereignty and security."[146]

PLA and defense industry organizations below the CMC Zhang Wannian also saw "shashoujian" weapons as an expedient source of strategic leverage. On May 9 and 18, China's two aerospace entities met to "review the status of key R&D programs and develop a game plan for acceleration of weapon system R&D."[147] According to Stokes, at the May 18 meeting, experts concluded that, "future warfare depends on precision guided munitions and long-range precision strike"[148] and "the solution to China's security lies in trump card (shashoujian) weapons and increasing the precision of China's tactical missiles."[149]

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[143] Zhang, *Zhang Wannian Junshi Wenxuan*, 735.
[144] "Jiefangjun Shenmi '995 Gongcheng' Shi Wuqi Zhuangbei Cheng Jingpen Shi Fazhan [The PLA's Mysterious '995 Project' Caused a Surge in Weapons Equipment Development]," *Huanqiu Shibao [Global Times]*, March 13, 2015, http://news.sina.com.cn/c/2015-03-13/102031602956.shtml.
[145] Gregory Kulacki and Jeffrey G. Lewis, "Understanding China's Antisatellite Test," *The Nonproliferation Review* 15, no. 2 (2008): 336; Stokes, "The People's Liberation Army and China's Space and Missile Development," 216.
[146] Zemin Jiang, *Jiang Zemin Wenxuan (Er Juan)*, 394.
[147] Stokes, "The People's Liberation Army and China's Space and Missile Development," 216.
[148] Ibid., 216.
[149] Ibid., 217.

Chief of General Staff Fu Quanyou called a meeting in the wake of the bombing on May 21, 1999, at which he recognized that China needed to maximize its strategic leverage to counter the United States, Fu remarked that, "when dealing with the United States, it is not good to lack power, backwardness invites attack."[150] On or after May 21, the GSD sent a report on the "Initial Summary of the Situation of NATO's Air Attacks Against Serbia." The report made recommendations for China based on the lessons the PLA drew from the Kosovo War, including speeding up the "shashoujian" program. Zhang Wannian requested that the GSD develop more concrete recommendations and report back to the CMC.[151] In October 1999, the GSD circulated a report throughout the PLA that, "required our military to borrow lessons from the useful experience of the Serbian army in defeating the strong from a position of weakness (*yilie kangyou*)" which included tactical innovation as well as to "accelerate the development of 'shashoujian' weapons equipment, [to] establish the confidence to defeat the strong from a position of weakness."[152]

China again turned to developing "shashoujian" weapons to rapidly augment its strategic leverage when its threat environment deteriorated further a few months after the Belgrade embassy incident. In July, Taiwanese President Lee Teng-hui told a German journalist that China-Taiwan relations should be handled on a "state-to-state basis." Chinese leaders feared that Taiwan was going to take further steps towards independence. Two days after President

[150] Although Fu used the phrase 'backwardness invites attack' that is generally indicative of emulation motivations, in this context his remarks refer to China's lack of leverage over the United States rather than a shortcoming in a specific technological system. Wang, *Fu Quanyou Zhuan*, 207.
[151] Ibid., 208.
[152] Ibid., 209.

Lee's remarks, on Jiang Zemin's instructions, Zhang Wannian called a meeting of the CMC to craft a response. One of Zhang's recommendations was "with a spirit of wasting no time, time does not wait for us, seize the development of 'shashoujian' weapons." The CMC approved Zhang's other recommendations in an afternoon session chaired by Jiang Zemin. It is likely that they also approved of the recommendation to accelerate the "shashoujian" program.[153]

Implementing the "Shashoujian" Program

Evidence from China's defense industry planners charged with developing China's conventional missiles on an accelerated timeline indicates that China was not emulating U.S. capabilities to bolster its strategic leverage. PLA leaders' decisions to accelerate the "shashoujian" weapons program were likely incorporated into the PLA's weapons development plans in 2000, as it formulated its 10th Five Year Plan. At a GAD Science and Technology Committee annual meeting on March 28, 2000, the group discussed "important weapons equipment and their supporting technologies to be developed before 2020 – [their] mission requirements, development trajectories, key technologies, innovation pathways, policy recommendations."[154] Zhu Guangya gave his reactions to the Kosovo War at the meeting, which included following the Serbian militias' successes in studying and attacking U.S. weaknesses, "increasing our research of our adversary's high technology weapons equipment technology principles and weapons."[155] Zhu Guangya also drafted a "Critical Defense Technologies Report" that year to selectively develop key military technologies to strengthen

[153] Guo, *Zhang Wannian Zhuan*, 260.
[154] Xi Qixin, ed., *Zhu Guangya Zhuan [Biography of Zhu Guangya]* (Beijing: Renmin Chubanshe, 2015), 591.
[155] Ibid., 591–92.

the PLA without trying to copy everything an adversary military possessed, "according to the principle of 'having some things but not others' (*you suowei, yousuo buwei*)."[156]

In addition to developing more advanced, longer-range conventional ballistic missiles, China also significantly expanded the size of its DF-15 SRBM force. According to Stokes, "one source indicates that during annual meetings at Beidaihe in August 1999, China's senior leadership decided to accelerate the production and deployment of enough ballistic missiles to outfit four SRBM brigades by 2002."[157] This decision likely resulted in adequate funding to carry out Second Artillery plans to expand the size of its SRBM force opposite Taiwan. In his memoir, Ge Dongsheng mentions that when he was promoted to become the Second Artillery Deputy Commander in March 1999, a major construction project was under way to build conventional missile bases in preparation for a Taiwan conflict.[158] According to Ge, two major Second Artillery base construction efforts in the past were chronically underfunded.[159] The Second Artillery leadership was skeptical that the Ministry of Finance would adequately fund the third major base construction effort, and was surprised when adequate funding was forthcoming to complete the project.[160]

Little evidence is available of the testing and deployment process of China's DF-21C conventional ballistic missile and DF-21D anti-ship ballistic missile before the two missiles were fielded around 2006 and 2009, respectively. In a speech to the Second Artillery on July

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[156] Ibid., 593.
[157] Stokes, "The People's Liberation Army and China's Space and Missile Development," 218–19.
[158] Ge, *Nanwang Lijian Suiyue*, 212
[159] Ibid., 219-224.
[160] Ibid., 221-224.

19, 2001, Zhang Wannian remarked that the force had made progress in nuclear and conventional force development and its overall operational capability. He instructed the force to "pay equal attention to nuclear/conventional" and increase its "dual deterrence" and "dual operations" capability.[161] The Second Artillery likely established its first test battalion for the DF-21C conventional missile under the Second Artillery's base in Yunnan province in 2000.[162] That spring, the Second Artillery formed a launch battalion, technical battalion and logistics team to establish a "shashoujian" unit. The unit conducted a successful test launch in which the missile hit its target in 2003.[163] A U.S. Admiral commented that the DF-21D reached initial operational capability in 2010, although the PLA has never conducted an over-the-water test of the missile.[164]

IV. Recent Trends in Posture and Force Development

China's conventional missile force posture has evolved towards a calibrated escalation posture in recent years due to improvements in the precision of its missiles. A relatively recent description of China's conventional missile doctrine in the 2015 *Science of Military Strategy* affirmed the coercive role of the posture. It reiterated that nuclear and conventional missiles play different roles in China's national defense, as "the main goal of nuclear counter-attack is limited retaliation, conventional [missile] combat on the other hand is to resolutely win and be

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[161] Zhang, *Zhang Wannian Junshi Wenxuan*, 828.
[162] When the first DF-21C missile unit successfully tested the missile for the first time, Wei Fenghe was the commander of the base commanding that unit. Wei was given command of the Yunnan missile base in 2003.
[163] Di'er Paobing Zhengzhi Bu [Second Artillery Political Department], *Huihuang Niandai: Huigu Zai Gaige Kaifang Zhong Fazhan Qianjin de Di'er Paobing [Golden Age: A Review of the Development and Progress of the Second Artillery in the Reform and Opening Period]* (Beijing: Zhongyang Wenxian Chubanshe, 2008), 351, 354, 356. The test took place the same day as China's first manned space launch, the Shenzhou V mission. The Shenzhou V mission was launched on October 15, 2003.
[164] Yoichi Kato, "China's New Missile Capability Raises Tensions," *Asahi Shimbun,* January 27, 2011.

victorious." China's conventional missiles have a deterrence role in peacetime "in the same way as our country's other strategic capabilities, preventing the outbreak of war" and a combat role in wartime.[165] The book also notes that conventional missiles compensate for China's conventional inferiority, "in possible future military confrontations, we will not have superiority in the symmetry of the use of capabilities," but "the inherent strengths of ground-ground missile forces," give China an asymmetric solution to this problem and "may compensate for our air and naval combat capability insufficiencies, with important strategic meaning."[166]

The elevation of the Second Artillery to become a full service named the PLA Rocket Force on January 1, 2016 has thus far not led to any clear changes in China's conventional missile command and control arrangements. When announcing the details of the reform plan at a CMC meeting on November 24, 2015, General Secretary Xi Jinping explained that "considering that the Second Artillery in reality carries out the functional missions of a service, we decided to re-name it the Rocket Force."[167] According to one article published in the *People's Daily* shortly after the Rocket Force was established, "what has changed with the Rocket Force is its name and formations (*zhenxing*), what has not changed is its capabilities and character as a strategic missile force."[168] Xi Jinping's remarks to the force also indicated continuity in its

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[165] Effectiveness refers to the ability of the force to destroy its targets with sufficient precision, adequate command, etc. Sufficiency refers to the size of the force, "conventional missiles primarily attack an adversary's important military targets, again during a campaign, this kind of target is both strategic and operational, and they are quite numerous." Xiao, *Zhanlue Xue*, 369–70. See also Zhou Xinsheng, ed., *Junzhong Zhanlue Jiaocheng [Study Guide to Military Service Strategy]* (Beijing: Junshi Kexue Yuan Chubanshe, 2013), 208.
[166] Xiao, *Zhanlue Xue*, 363.
[167] Zhonggong Zhongyang Wenxian Yanjiu Shi [Central Party Documents Research Office], *Xi Jinping Guofang He Jundui Jianshe Zhongyao Lunshu Xuanbian (San) [Edited Selection of Chairman Xi's Important Treatises on National Defense and Military Development (Volume 3)]* (Beijing: Zhongyang Wenxian Chubanshe, 2016), 61.
[168] Ni Guanghui, "Cong Di'er Paobing Dao Huojianjun Bian Yu Bubian," *Renmin Ribao [People's Daily]*, January 10, 2016.

coercive role and command arrangements. In a speech to the first PLA Rocket Force Party Committee meeting in Beijing on September 26, 2017, he described the Rocket Force as "China's core strategic deterrence force," and encouraged the newly-elevated service to implement the rocket force's development goals under 13th Five Year Plan Outline, and to "become deeply absorbed into the all-military joint command structure."[169]

The main driver of China's gradual shift towards a calibrated escalation missile posture in recent years appears to be the increase in the accuracy of its conventional missiles, especially its DF-16 SRBM and DF-26 IRBM. The *2013 Science of Second Artillery Campaigns* identifies precision as one of the features of conventional missiles that allow China to use them for strategic leverage: "compared to other conventional weapons, ground-ground conventional missile weapons possess the characteristics and advantages of long-distance attack [capabilities], the ability to precisely hit a target, strong penetrability, quick reaction, and complete reliance on operations on one's own territory."[170] The book noted that precision improvements was one of the priorities for the force because precision is an important factor "influencing the employment scope in actual war of conventional missile weapons and attack target types."[171]

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[169] Wei Zhang, "Xi Jinping: Nuli Jianshe Yizhi Qiangda de Xiandai Hua Huojian Jun [Xi Jinping: Diligently Build a Strong Modern Rocket Force]," *Sina.Com*, September 26, 2017, http://news.sina.com.cn/china/xlxw/2016-09-26/doc-ifxwevmc5560129.shtml. This comment likely refers to the PLARF liaison in the Theater Command structure and linking up to the ICP to facilitate joint campaigns. PLARF participation in joint campaigns described in China's conventional missile doctrine was likely more an aspiration than a reality until recently, as the conventional missile force has engaged in few instances of actual joint training with other PLA services. See Allen and Allen, "Building a Strong Informatized Strategic Missile Force," 3.

[170] Shou, *Zhanlue Xue*, 229. This list is quite similar to texts from the early and mid-2000s.

[171] Ibid., 234.

The increasing accuracy of China's missiles improves its ability to control escalation following missile strikes. While accuracy improvements are necessary to strike certain high-value targets, such as the terminal guidance necessary to attack a moving aircraft carrier, they can also help to control escalation from a conventional missile strike by reducing collateral damage from strikes on fixed military targets. There is some evidence to suggest that China would use its more precise conventional missile force to reduce collateral damage. As a brinkmanship posture demonstrates a disregard for collateral damage from conventional missile strikes, China's intent to minimize collateral damage from missile strikes indicates that it is moving towards a calibrated escalation posture. An AMS text indicates that China's conventional precision-strike MRBMs would be used precisely, to "implement reasonable, favorable, phased (*youjie*), controlled operations." Furthermore, China would "abide by international law principles and requirements" in its conventional precision firepower strikes, "controlling the choice of attack targets and intensity."[172]

Nevertheless, China's conventional missile posture retains three elements of a brinkmanship posture. First, some of its medium and intermediate range conventional missiles, which are intended to destroy high-value U.S. targets, rely on vulnerable sensors that increase pressure on the PLA to use those missiles early in a conflict. Second, if the PLA prioritized controlling escalation from a first-use of conventional missiles, it would likely take steps to reduce the risk of inadvertent nuclear escalation due to the physical and organizational commingling of its conventional and nuclear missiles. Third, the PLA has not signaled an intention to control escalation from the use of conventional missiles to Taiwan or the United States, an important

[172] Zhou, *Junzhong Zhanlue Jiaocheng*, 208.

characteristic of a calibrated escalation posture. An alternative explanation for China's shift towards a calibrated escalation conventional missile posture is that the Rocket Force intends to use conventional missiles more effectively in conventional military operations to substitute for China's inferiority in air and naval power, rather than as a substitute for nuclear weapons in China's methods of strategic coercion.

V. Evaluating Theoretical Explanations for China's Conventional Missile Force Posture

China's conventional missile force posture was its first non-strategic nuclear force posture and the only non-nuclear strategic weapon that China has ever used to deter the outbreak of war in a crisis. During the 1995-6 Taiwan straits crisis, China's conventional missile posture served as proof-of-concept that its "strategic substitution" approach to maximizing strategic leverage in a limited war was a viable alternative to using nuclear threats that lacked credibility and raised the risk of nuclear war. The theory of strategic substitution explains the timing of the PLA's decisions to pursue a conventional missile coercive capability in 1988 as China began to prepare for limited wars in which it was conventionally inferior to its opponents. It also explains the timing of the PLA's improvements to conventional missile capabilities after 1995 and after 1999, following changes for the worse in its threat environment. In addition, the theory explains the decision-making process for China's pursuit and enhancement of a conventional missile capability on these three occasions. Chinese leaders were motivated to invest in conventional missile capabilities by the lack of strategic credibility of nuclear threats, especially in 1988, and China's conventional inferiority compared to the United States in 1995 and 1999.

There is, however, a surprising lack of evidence from the decision-making process to indicate that Chinese leaders took the expected cost of retaliation into account at all when deciding which force posture to adopt for their conventional missiles. Moreover, the theory of strategic substitution cannot account for China's gradual evolution from a brinkmanship to a calibrated escalation force posture in recent years. There are two possible explanations for this lack of evidence. First, it is possible that Chinese leaders did consider the expected cost of retaliation, but I have not uncovered the evidence of those decisions. Given the scarcity of sources outlining how the PLA formulated its conventional missile doctrine, this is quite likely. A second possibility is that the expected cost of retaliation was simply irrelevant to how the PLA selected its force posture. Its leaders may have assumed it would already be in a shooting war with the United States and expected large-scale U.S. conventional strikes on its homeland regardless of whether China used conventional missiles first or not. This explanation is less likely, given that Chinese leaders used conventional missiles in 1995 and 1996 during a crisis. The most likely explanation for China's drift towards calibrated escalation is that it initially lacked the precision technology to control escalation from missile strikes and brought its force posture into line with its moderate expected cost of retaliation as its missile technology improved.

The theory of strategic substitution better explains China's conventional missile posture than the alternative explanations of emulation theory and organization theory. China had no superpower posture to emulate because it established its conventional missile force just after the two Cold War superpowers had decided to give up their intermediate range ground-based

missiles under the 1987 Intermediate Nuclear Forces (INF) Treaty. Furthermore, there is also strong speech evidence from a number of PLA leaders throughout the 1990s that they actively avoided emulating the United States by selectively developing weapons technology and looking for U.S. weaknesses to exploit.

Organization theory helps to explain China's decision to develop a conventional missile posture in 1988. China's need for strategic leverage aligned with the organizational interests of the missile force in its own survival, which made it much easier for China to pursue a coercive conventional missile capability. Second Artillery Commander Li Xuge and Base 2 commander Ge Dongsheng were instrumental in realizing the establishment of China's first conventional missile unit. Those two individuals were clearly motivated by organizational interests, to ensure the survival and interest of the missile force and missile Base 2, respectively. On the other hand, other parts of the Second Artillery were at best indifferent and at worst obstructed the establishment of a conventional missile unit. The force did not advocate for authority to use conventional missiles to increasing their autonomy over their operations, as organization theory would expect of an organization looking to increase its autonomy. But this is not surprising given the unusually cooperative nature of Party-PLA relations in China. Second Artillery organizational interests played less of a role in the 1995 and 1999 decisions to bolster China's conventional missile capabilities.

Conclusion

China's leaders established a conventional missile force to maximize strategic leverage in a limited conventional war. Conventional missiles were more credible sources of strategic leverage than threatening to use nuclear weapons in a Taiwan contingency. They also offered a cheaper and faster way of compensating for the PLA's conventional military inferiority. China's shift to a limited war contingency and changes for the worse in its threat environment combined with these two motivations to give China a need for strategic leverage in 1988, 1995 and 1999. China developed a conventional missile posture as it began to prepare for a limited war scenario after 1988. It made plans to extend the size and range of its conventional missile force after the 1995-6 Taiwan Straits crisis worsened its threat environment but demonstrated that conventional missiles were credible sources of strategic leverage against Taiwan and could be used to coerce the United States as well. Those plans were not fully realized until China's threat environment deteriorated once again following the 1999 bombing of the Chinese embassy in Belgrade. China initially adopted a brinkmanship posture for its missiles between 1993 and 1998, which has evolved towards a calibrated escalation posture in recent years as the precision technology of its missiles has improved. There is little evidence connecting those posture choices to leaders' assessments of the expected cost of Taiwanese or U.S. conventional missile retaliation.

Chapter 5: China's Cyber Force Posture

Introduction

In the wake of the bombing of the Chinese Embassy in Belgrade on May 8, 1999, Chinese leaders decided to pursue a coercive cyber weapons capability to gain strategic leverage over the United States in a limited conventional war over Taiwanese independence. Chinese leaders exploited the digital dependence of the U.S. military and society, and China's relative lack of dependence on cyberspace, by selecting a brinkmanship cyber posture to maximize their strategic leverage against Washington. China's exposure to cyber attacks increased substantially by 2010, prompting PLA researchers and leaders to recognize that a cyber brinkmanship posture was sub-optimal for China. Top military and civilian leaders needed to exercise more control over the development and use of cyber attack capabilities to avoid damaging retaliatory strikes on Chinese networks and to enhance the effectiveness of PLA cyber operations. They did not, however, change China's cyber posture to bring it more into line with these requirements until 2014.

China adopted a calibrated escalation posture in late 2014 that would allow it to use cyber weapons to gain strategic leverage without triggering uncontrolled escalation. Two factors explain China's delayed decision to adopt a calibrated escalation posture in 2014. First, the U.S. indictment of PLA hackers in May 2014 may have offered proof of concept to Chinese analysts that cyber attacks could be attributed to their perpetrators. If states could not confidently attribute cyber attacks to state perpetrators, a calibrated escalation cyber posture

would not have been a viable option for the PLA. A state that retaliated for a cyber attack against the wrong state would could escalate a conflict in unpredictable ways. Second, the posture change aligned with Communist Party General Secretary Xi Jinping's efforts to assert Party control over the PLA and implement an anti-corruption campaign. A calibrated escalation posture increased the control of top civilian and military leaders over PLA cyber units, and reduced opportunities for those units to profit from their expertise through "illegal activities online." It is also possible that it simply took time for the PLA to devise and approve a new posture once it recognized the problems with its brinkmanship posture.

China is in the process of implementing a calibrated escalation posture through new doctrine and PLA organizational reforms to centralize most of its cyber capabilities within a new branch of the PLA, the Strategic Support Force. It is also adding capabilities in attribution and defense, building broad and deep PLA cyber expertise, including through China closer cooperation with China's civilian technology sector, and reducing its reliance on foreign information and communications technology (ICT) products. China has also become much more transparent about its cyber posture and is tentatively engaging in cyber diplomacy to identify escalation thresholds for cyber attacks and communicate them to Washington.

The theory of strategic substitution explains China's 1999 decision to pursue a coercive cyber weapons capability and adopt a brinkmanship cyber force posture shortly thereafter. It also explains Beijing's decision to change its cyber force posture to a calibrated escalation posture in 2014. The theory cannot explain why China maintained a brinkmanship force posture between 2010 and 2014. In that period, China's high expected cost of retaliation meant that

China would not have gained much strategic leverage from threatening cyber attacks against the United States, given the disruption it would suffer itself from a cyber conflict that would have likely escalated rapidly. Beijing would have had to worry that the United States would dismiss its threats to use cyber weapons. Organization theory can, however, account for the PLA's adherence to a sub-optimal cyber posture during those years.

The first section of this chapter describes ideal-type brinkmanship and calibrated escalation force cyber postures. The second section analyzes the components of China's brinkmanship force posture for evidence to support the theory of strategic substitution, and alternative explanations of emulation theory and organization theory. The third section examines China's decision to simultaneously develop a cyber force posture and adopt a brinkmanship posture between 1999 and 2000. It also examines the evolution of Chinese cyber force posture until approximately 2010. The fourth section examines China's implementation of a calibrated escalation posture since 2014. The fifth section documents the increase in China's actual and perceived cyber vulnerability and exposure to attack from 2010-2014, which resulted in its decision to adopt a calibrated escalation force posture in 2014. I conclude with an evaluation of theoretical explanations for China's cyber force posture.

I. Categorizing Cyber Force Postures

What do brinkmanship and calibrated escalation cyber postures look like in practice? Below I describe the components of each posture in detail. In this chapter I use the term "cyber weapon" and "cyber attack" to refer to any action a state takes to disrupt or destroy the regular functions

of another state's computer networks (computer network attack) rather an intrusion into an enemy network (computer network exploitation). "Strategic" cyber attacks disrupt a state's homeland critical infrastructure networks, and/or damage nuclear command and control systems, either causing large-scale paralysis of its society or threatening nuclear escalation.[1] "Tactical" cyber attacks disrupt or damage the functioning of the information networks supporting an adversary's military capabilities deployed to a conventional battlefield.

Brinkmanship Cyber Postures

Brinkmanship postures involve optimizing a state's military cyber capabilities, doctrine, command and control arrangements, and transparency to increase an adversary's uncertainty about when and how severely it will be attacked with cyber weapons. The posture exploits an adversary's fears of rapid and uncontrolled escalation to the worst-case scenario in which both countries use their cyber weapons without restraint on each other's strategic networks. The posture gives the adversary the last clear chance to avoid this outcome by capitulating to the threatening state's political demands. A brinkmanship cyber doctrine will specify that the use of cyber weapons is conditional on an adversary's unacceptable crisis or conflict actions, and is intended to have a coercive effect on its decision to fight a limited war. The posture envisages that cyber attacks would be carried out early in a crisis or conflict, whether large-scale tactical attacks on an adversary's combat systems, a small-scale "warning" strategic attack on its critical infrastructure, or a large-scale strategic attack to paralyze those critical networks. A

[1] Martin Libicki, *Cyberdeterrence and Cyberwar* (Santa Monica, C.A.: RAND Corporation, 2009). Austin Long, "A Cyber SIOP? Operational Considerations for Strategic Offensive Cyber Planning," *Journal of Cybersecurity* 3, no. 1 (2017): 7.

state takes aim at the targets that would cause the maximum amount of disruption to an adversary's military and society. Brinkmanship postures require a state to have the capabilities to execute either tactical and/or strategic cyber attacks, but it does not require those attacks to be survivable or have predictable effects.

The authority to order cyber attacks under a brinkmanship posture can be either strictly held among top military and civilian leaders or delegated to operational commanders. To increase the credibility of threats to use cyber weapons, a military may organize its forces to ensure that they cannot withhold the use of cyber weapons once a conflict begins. For example, they may task the same units with carrying out both cyber espionage and strategic attacks, or commingle tactical cyber and conventional capabilities in the same units. Brinkmanship postures are distinguished by their lack of transparency. The state's intent is to create uncertainty in the adversary's mind about the willingness and ability of its leaders to control the use of its strategic cyber weapons. As a result, the state needs to demonstrate its cyber attack capability, which may involve exercises or reporting of its tactical cyber attack capability, or using cyber intrusions into an adversary's critical infrastructure networks to signal that it could attack those networks in a crisis or conflict.

Calibrated Escalation Cyber Posture

Calibrated escalation cyber postures optimize capabilities, doctrine, command and control arrangements, and transparency to control escalation. The posture is premised on a tacit agreement between two states to avoid rapid and uncontrolled escalation to the worst-case

scenario of cyber attacks. Both adversaries may want to avoid major disruptions to their strategic networks because the stakes of a limited war are not worth that much pain to either of them. The posture therefore balances threats to use force with assurances to withhold the use of the state's most destructive weapons until late in a conflict. The state's cyber doctrine will not only mention that the use of cyber attacks is conditional on an adversary's unacceptable crisis or conflict actions, but also that the state intends to control the escalation of cyber conflict. A calibrated escalation posture envisages tactical cyber attacks or a limited strategic cyber attack as a "warning shot" either in a crisis or at the outset of a conflict. If an adversary retaliates, the two states may continue tit-for-tat cyber attacks of increasing intensity until one state decides that the issue at stake is not worth absorbing any more damage and acquiesces to the other state's political demands.

A calibrated escalation cyber posture requires a variety of sophisticated cyber capabilities. The state must possess tactical and strategic cyber weapons to attack a variety of military and civilian targets, with effects of varying duration and severity. The posture also requires capabilities for attribution, defenses, resilience and recovery of one's own networks. The military must also be able to train their operators and test cyber weapons to maximize their effectiveness and precision. Under command and control arrangements for a calibrated escalation posture, only top military or civilian leaders could authorize strategic attacks, but they may delegate authority to use tactical cyber weapons down the chain of command. If tactical and strategic attacks are subject to different command and control arrangements, the state would separate its strategic and tactical attack capabilities into different units. This organizational division allows top leaders to exercise stricter authority over the use of its most

disruptive capabilities and signal its restraint to an adversary. Because cyber intrusions and attacks are indistinguishable to an adversary if detected in advance of an attack, a state may equally strict command and control arrangements to its espionage units. Calibrated escalation postures need to be very transparent to assure an adversary of the state's restraint in carrying out its most destructive cyber attacks. In addition to demonstrating its capabilities, a state may make try to make explicit some aspects of its tacit agreement with an adversary to avoid the cyber worst-case scenario, for example through declaratory policy or bilateral confidence building measures.

Observable Implications for Posture Choice

How can these two postures be distinguished from each other and what posture would the theory of strategic substitution expect China to adopt?

In this chapter, I look for the following features of cyber force posture to classify China's choices. The distinguishing features of a brinkmanship cyber force posture are (1) an absence of attribution and testing capabilities, and (2) a lack of transparency to maximize an adversary's uncertainty about how the state might use its cyber military capabilities in a crisis or conflict. A lack of attribution capabilities indicates that the state will not wait to be attacked in cyberspace before using its cyber weapons, while a state that does not test its weapons indicates that it is not concerned how disruptive its cyber attacks would actually be. The distinguishing features of a calibrated escalation cyber posture are: (1) the state's doctrine is explicit about its intent to control escalation, (2) authority to use strategic weapons is restricted to top military

and civilian leaders, (3) the organizational separation of units tasked with conducting strategic attacks and units tasked with espionage and tactical attacks, if those units are subject to different command and control arrangements; and (4) the state's transparency about the components of its posture.

The theory of strategic substitution would expect China to select a brinkmanship posture until approximately 2010 because it faced a low expected cost of retaliation from the United States. Relative to the United States, China was much less exposed to cyber attacks until approximately 2010 because its military, society and government were much less dependent on computer networks. Between 2010 and 2013, the theory would expect China not to have a coercive cyber posture because it faced a high expected cost of retaliation.

By 2010 China and the United States were roughly equally exposed to cyber attacks, but it was not feasible to control escalation from cyber attacks because it was widely believed among U.S. non-governmental experts and the PLA that it was impossible to attribute cyber attacks to a state actor with any confidence.[2] If a state chose to retaliate against another state for a cyber attack, it risked mis-attributing the attack and retaliating against the wrong state, which could lead the wrongly-accused state to retaliate, escalating the conflict in unpredictable ways. In 2014 the U.S. Department of Justice released evidence attributing cyber intrusions and data theft to the PLA. This proof of concept of cyber attribution made it feasible to control escalation from the use of cyber weapons and moderated China's expected cost of retaliation.

[2] See, for example, Libicki, *Cyberdeterrence and Cyberwar*, 52–54.

The theory of strategic substitution would therefore expect China to adopt a calibrated escalation posture around 2014.

Organization theory would expect China to adopt a brinkmanship posture that delegated authority to develop and use cyber weapons to PLA theater commanders. Delegated authority to use cyber weapons would allow the organization to have autonomy over how it uses cyber capabilities and to put those capabilities to full use in supporting conventional military operations. The low transparency of a brinkmanship posture would also suit a military organization's preference to maximize surprise at the outset of a conventional campaign.[3] Organization theory would not necessarily expect a change in China's force posture in 2014, but it could explain that change. The PLA has the authority to decide which cyber posture to adopt and could therefore select a posture that suited these organizational preferences. The PLA retained that authority even as civilian organizations increased their influence over PLA cyber force posture around 2014, and General Secretary Xi Jinping increased the Communist Party's control over the military. But the greater civilian influence over PLA force posture may have empowered advocates for a calibrated escalation posture within the military to overcome organizational inertia to change.

Emulation theory would expect China to copy the components of U.S. cyber force posture by adopting the organizational and transparency characteristics of a brinkmanship posture before 2009 and a calibrated escalation posture after 2009. In 2009, the United States established Cyber Command and began to speak openly about its offensive cyber capabilities.

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[3] Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany between the World Wars* (Ithaca, N.Y.: Cornell University Press, 1984), 48.

II. China's Brinkmanship Cyber Force Posture

China adopted a brinkmanship force posture for its cyber weapons in approximately 2002 and maintained that posture until 2014. China's cyber force posture displayed the two distinguishing features if a brinkmanship posture. The government denied that the PLA had cyber capabilities and the PLA made no mention of wanting or possessing attribution or testing capabilities. China's choice of a brinkmanship posture supports all three theoretical explanations for its cyber force posture until about 2010 but all three theories have difficulty explaining elements of China's cyber force posture after 2010. The theory of strategic substitution cannot explain why China persisted with a brinkmanship posture after it became roughly as exposed to cyber attacks as the United States after 2010. Emulation theory cannot explain why China did not establish a centralized cyber force and became more transparent about its military cyber capabilities after the United States established a cyber command in 2009. Organization theory would not be able to explain those texts indicating that the PLA's strategic cyber attack capabilities were under strict command and control arrangements. All of these theories offer different explanations for China's choice of a brinkmanship posture, which I examine in the following section.

Doctrine

PLA texts outlining China's cyber doctrine between 2001 and 2014 envisaged that cyber weapons would be used either in a crisis to deter an adversary from initiating a war or early in a conflict as part of a preemptive "information warfare campaign." China's cyber doctrine is

consistent with a brinkmanship posture as the PLA envisaged using cyber attacks for both deterrence and to achieve military objectives in a war and to gain strategic leverage over the United States. But the PLA did not intend to control escalation from cyber attacks. Earlier descriptions of the PLA's brinkmanship posture mentioned cyber weapons as a tool for carrying out information deterrence and information warfare, alongside conventional weaponry, electronic warfare, and psychological warfare.[4] Later descriptions of the posture referred specifically to cyber deterrence and operations.[5]

China's cyber doctrine was intended to coerce an adversary not to initiate or continue fighting a limited war. According to the 2004 *Science of Second Artillery Campaigns*, which likely drew on the PLA's official doctrine for information warfare at the campaign level, information warfare would "accomplish a great task with little effort by clever maneuvers (*siliang bo qianjin*)." The book articulated that cyber attacks could change adversary calculations about initiating or fighting a limited war because attacks on civilian and military command and control computer systems would allow China to "disrupt the will of the enemy's military and the people, disrupt their morale, destroy their hostile will, to achieve the goal of winning without fighting."[6] These optimistic views of the operational effects of cyber attacks were repeated a decade later in the 2013 *Science of Military Strategy*, "many civilian and military resources are becoming increasingly networked, meaning that the deterrence capability of cyber war is no weaker than conventional destructive strategic weapons. Once cyber war

[4] Xue Xinglin, *Zhanyi Lilun Xuexi Zhinan [Campaign Theory Study Guide]* (Beijing: Guofang Daxue Chubanshe, 2001), 52–53.
[5] Shou Xiaosong, ed., *Zhanlue Xue [The Science of Military Strategy]* (Beijing: Junshi Kexue Yuan Chubanshe, 2013), 192–94.
[6] Yu Jixun, *Di'er Paobing Zhanyi Xue [The Science of Second Artillery Campaigns]* (Beijing: Jiefangjun Chubanshe, 2004), 352.

succeeds, it can cause economic collapse and combat system paralysis."[7] The 2004 *Science of Second Artillery Campaigns* indicated that cyber attacks could be carried out in crises, "when we perceive enemy intentions, crises occur, and when there are open signs of hostile action," to "prevent the conflict from erupting, to win without fighting."[8] 2013 teaching materials from the Academy of Military Sciences (AMS) indicate that "strategic" cyber attacks in wartime would target an enemy's "military and civilian, political, economic and national security networks."[9]

PLA cyber weapons could also be used in a war to achieve military objectives through a joint information warfare campaign, which would also give China strategic leverage over the United States. The campaign aimed to disrupt an adversary's operational military networks to gain control of the air, space and sea battle spaces.[10] The PLA would then be able to conduct a quick, successful, conventional campaign in a limited war such as an island landing or firepower attack.[11] The 2001 *Guide to the Study of Campaign Theory* indicated that "computer attacks" (*jisuanji gongji*) were a means of carrying out an information warfare campaign.[12] The 2013 *Science of Military Strategy* observed that "the side with superiority in cyber hostilities can, through cyber warfare, put the other side's military command systems out of

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[7] Shou, *Zhanlue Xue*, 191.
[8] Yu, *Di'er Paobing Zhanyi Xue*, 340.
[9] Ye Zheng, ed., *Xinxi Zuozhan Xue Jiaocheng [Study Guide to Information Warfare]* (Junshi Kexue Yuan Chubanshe, 2013), 109. Quoting this book, McReynolds notes that attacking enemy military and homeland civilian networks could allow China to "win without fighting." Joe McReynolds, "China's Military Strategy for Network Warfare," in *China's Evolving Military Strategy*, ed. Joe McReynolds (Washington, D.C.: Jamestown Foundation, 2016), 227.
[10] Zhang Yuliang, *Zhanyi Xue [The Science of Military Campaigns]* (Beijing: Guofang Daxue Chubanshe, 2006), 151–2, 153–4; Dean Cheng, "PLA Views on Informationized Warfare, Information Warfare and Information Operations," in *Chinese Cybersecurity and Defense*, ed. Daniel Ventre (Hoboken, N.J.: John Wiley & Sons, Inc, 2014), 61–2.
[11] Zhang *Zhanyi Xue*, 151.
[12] Xue, *Zhanyi Lilun Xuexi Zhinan*, 52, 636.

order, [cause them to] lose control of combat forces or maneuvers, lose the functions and effectiveness of armaments, thereby seizing the initiative in military hostilities, and create the most favorable circumstances to effectively achieve its military goals, and win the war."[13]

The targets of Chinese cyber attacks appear to have initially focused on an adversary's military computer networks, but later expanded to include its civilian strategic networks as well. The 2001 edition of the *Science of Strategy* stated that "as a pattern of operations, cyber warfare does not involve civilian cyber networks that are not used for military purposes."[14] A 2002 *PLA Daily* article suggested that China should first target an adversary's strategic command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) computer networks that were "the strategic resources and lifeblood of national defense," but still "forge links with tactical level cyber warfare hostilities."[15] By the late 2000s, however, PLA writings suggested that civilian networks could be the targets of PLA cyber warfare operations. AMS teaching materials note that non-kinetic means of paralyzing an enemy's combat systems could include attacking "important enemy civilian use cyber systems."[16]

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[13] Shou, *Zhanlue Xue*, 189.
[14] Peng Guangqian and Yao Youzhi, eds., *The Science of Military Strategy* (Beijing: Military Science Publishing House, 2005), 343.
[15] Yu Weidong and Zhong Yonglong, "Wangluo Duikang Manyi [Informal Thoughts on Cyber Hostilities]," *Jiefangjun Bao [PLA Daily]*, September 10, 2002.
[16] Zhou Xinsheng, ed., *Junzhong Zhanlue Jiaocheng [Study Guide to Military Service Strategy]* (Beijing: Junshi Kexue Yuan Chubanshe, 2013), 126. See also Ye, *Xinxi Zuozhan Xue Jiaocheng [Study Guide to Information Warfare]*, 109.

Capabilities

The PLA had the tactical and strategic offensive cyber capabilities necessary for a brinkmanship posture, although China's cyber weapons may have initially been quite rudimentary. PLA writings between 2005 and 2013 list various cyber surveillance, offense and defense capabilities, although they do not indicate which of these capabilities China possessed. Those lists may be taken as a rough indication of how China's cyber capabilities priorities have evolved over time. It initially emphasized viruses, password breaking, physical means of network destruction, and passive defenses such as intrusion detection and firewalls.[17] One description of the PLA's weaknesses in cyber capabilities from 2013 indicated that its offensive capabilities were not very sophisticated: "information 'disruption' weapons types are few, their quality is lacking; computer virus weapons research also leaves much to be desired: attacking and damaging adversary computer network security protection facilities, and technological means for entering their networks are immature."[18] The PLA pursued cyber defenses and even prioritized them over offensive weapons in the 2013 *Science of Military Strategy.*[19] The ability

[17] The 2005 *Guide to the Study of Informationized Warfare* listed the main offensive cyber methods as malicious code (viruses, Trojan horses, logic bombs), weapons for breaking passwords and entering backdoors, and "information bombs." Defensive cyber means included anti-virus tools, firewalls, and systems for data encryption, intrusion detection, and backup and recovery. Junshi Kexueyuan Zuozhan Lilun He Tiaoling Yanjiu Bu Xinxi Zuozhan Lilun Yanjiushi [Information Warfare Theory Research Office, Department of Combat Theory and Regulations Research, Academy of Military Science], ed. *Xinxihua Zuozhan Lilun Xuexi Zhinan [Guide to the Study of Informationized Warfare]* (Beijing: Junshi Kexue Yuan Chubanshe, 2005), 238–9. A 2007 AMS study lists the following types of offensive computer network weapons: viruses, traps, bugged chips, and non-nuclear electromagnetic pulse weapons, as well as surveillance and defensive weapons. Ye Zheng, *Xinxi Hua Zuozhan Gailun [Theory of Information Warfare]* (Junshi Kexue Yuan Chubanshe, 2014), 393. The 2013 *Science of Military Strategy* list added false information, overloading systems (possibly referring to denial of service attacks), and nano-bombs to the offensive weapons list, and identity verification, prevention of intrusion, and automatic countermeasures to the defensive list. Shou, *Zhanlue Xue*, 196.

[18] Xu Guoxing, *Wo Jun Xinxi Zuozhan Liliang Jianshe Yanjiu [Research on Developing Our Military's Information Warfare Capabilities]* (Beijing: Junshi Kexue Yuan Chubanshe, 2013), 113. Xu Guoxing's dissertation was jointly supervised by the National Defense University and PLA Engineering Institute.

[19] Shou, *Zhanlue Xue*, 189, 259.

to attribute adversary cyber attacks or test cyber weapons for precision, both of which are necessary for a calibrated escalation posture, were absent from the lists of capabilities priorities in PLA texts before 2014.

PLA cyber espionage behavior and reports of military exercises in the *PLA Daily* also indicates that China developed capabilities to conduct offensive cyber operations against tactical and strategic U.S. targets between 2002 and 2013. PLA units were reportedly able to implement integrated electronic and cyber warfare (*wangdian yiti zhan*),[20] during military exercises around 2009.[21] The PLA even established its first cyber "blue team" in the Guangzhou Military Region in May 2011 to "increase military cybersecurity protection levels" in the region, indicating that the PLA had the ability to hack its own units.[22] The cyber espionage activities of PLA units indicated the types of strategic targets China might attack, which included Pentagon and State Department systems, the corporate networks of defense contractors, and the networks of U.S. utility companies such as the electricity grid.[23]

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[20] Integrated electronic and cyber warfare involves the use of electronic warfare to disrupt information acquisition and transfer, while cyber warfare would disrupt information processing and use. See James Mulvenon, "PLA Computer Network Operations: Scenarios, Doctrine, Organizations, and Capability," in *Beyond the Strait: PLA Missions Other than Taiwan*, ed. Roy Kamphausen, David Lai, and Andrew Scobell (Carlisle, P.A.: Strategic Studies Institute and Army War College Press, 2009), 261.

[21] A 2009 exercise, Iron Fist, demonstrated that units were able to suppress the command and control network of an armored and infantry ground assault using both electronic and cyber attacks. Following a major PLA exercise, Mission Action 2010, the GSD Assistant Chief of Staff was quoted as saying that "for the first time, communications and electronic countermeasures as well as network confrontation were carried out throughout the exercise in all stages and all actions." In 2011, the Guangzhou Military Region also reported that a conventional artillery unit had integrated cyber and electronic warfare capabilities into its fire support mission. See Bryan Krekel, Patton Adams, and George Bakos, "Occupying the Information High Ground: Chinese Capabilities for Computer Network Operations and Cyber Espionage" (Washington, D.C.: Northrop Grumman Corp for the U.S.-China Economic and Security Review Commission, March 7, 2012), 21, 23–24.

[22] Wang Yi, ed., *Wangluo Kongjian Anquan Zhanlue Yanjiu: Zhongguo Junshi Kexue Xuehui Jundui Zhihui Fenhui 2012 Nian Youxiu Wenxuan Jibian [Cyyberspace Security Strategy Research: China Association for Military Science Military Command Division 2012 Selected Best Works]* (Beijing: Guofang Daxue Chubanshe, 2013), 399.

[23] Shane Harris, "China's Cyber-Militia," *National Journal*, May 31, 2008, https://www.nationaljournal.com/s/636724/chinas-cyber-militia?mref=search-result; James Andrew Lewis and Laura Saporito, "Cyber Incidents Attributed to China" (Center for Strategic and International Studies, March 11,

Command and Control

Different PLA cyber units were subject to different command and control arrangements, but those arrangements included delegated command and control arrangements for tactical attacks and possibly also for strategic attacks. These command and control arrangements allowed China to maximize leverage over an adversary because the PLA was more likely to carry out cyber attacks in a crisis or conflict as its leaders could not withhold those attacks. Delegated command and control arrangements are consistent with a brinkmanship posture as well as a cyber force posture selected to emulate the United States or serve the organizational interests of the PLA. The PLA organizational hierarchy, cyber unit behavior, and PLA writings provide evidence of these varied and delegated cyber command and control arrangements.

A brief description of the PLA organizational structure prior to the 2016 PLA reforms is necessary to provide context for China's cyber command and control arrangements. At the apex of the PLA command and control system is the Central Military Commission (CMC), an organ of the Communist Party chaired by the Communist Party General Secretary, who is the only civilian member. The CMC and Politburo alone have the authority to order the use of China's nuclear weapons. Before the 2016 military reform package, four central departments were directly subordinate to the CMC: the General Staff Department (GSD), General Political Department (GPD), General Logistics Department (GLD), and General Armaments Department (GAD). Only the GSD, which is responsible for operations, intelligence, strategic planning and operational requirements, training, and mobilization, had the capacity to

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2013), http://csis.org/publication/cyber-incidents-attributed-china; David E. Sanger, David Barboza, and Nicole Perlroth, "China's Army Is Seen as Tied to Hacking Against U.S.," *The New York Times*, February 18, 2013.

command military operations at this tier of the PLA hierarchy. Weapons operated by the four central departments are generally under strict command and control arrangements as their use can only be authorized by the GSD, and in some cases only by China's top military leaders, the CMC Vice-Chairmen. Importantly, however, their use may not require the authorization of civilian leaders. The GSD was the Army headquarters and commanded seven subordinate Military Regions, which would function as theater commands in wartime.[24] If theater commanders had the authority to decide whether to use of a weapon when given a general order to use force, the PLA's command and control arrangements were delegated.

China's cyber units from 2002 and 2015 were dispersed across the PLA, resulting in varied command and control arrangements.[25] At least 14 PLA organizational units were capable of conducting cyber espionage or attacks: the Third and Fourth Departments subordinate to the GSD, the GAD,[26] the seven Military Regions,[27] the Second Artillery missile force, the navy, the air force, and PLA educational institutions.[28] Within the GSD, cyber units would have been subject to strict command and control arrangements. Cyber intelligence gathering was likely

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[24] Kenneth W. Allen, "Introduction to the PLA's Organizational Reforms: 2000-2012," in *The PLA as Organization v2.0*, ed. Kevin Pollpeter and Kenneth W. Allen (Vienna, V.A.: Defense Group, Inc., 2015), 14.

[25] Western analysts also noted that the PLA has drawn extensively on cyber capabilities from other government departments and civilians to form as many as 50 "cyber militias," by 2014. Those units were probably tasked with network defense rather than carrying out offensive operations. Robert Sheldon and Joe McReynolds, "Civil-Military Integration and Cybersecurity: A Study of Chinese Information Warfare Militias," in *China and Cybersecurity: Espionage, Strategy, and Politics in the Digital Domain*, ed. Jon R. Lindsay, Tai Ming Cheung, and Derek S. Reveron (New York, N.Y: Oxford University Press, 2015), 208.

[26] The GAD commanded a "blue force" to emulate adversary electronic tactics to assist regular PLA units with training and development of electronic countermeasures. Krekel, Adams, and Bakos, "Occupying the Information High Ground," 56.

[27] Some military regions established blue forces training. purposes. See Krekel, Adams, and Bakos, 23. See also Wang, *Wangluo Kongjian Anquan Zhanlue Yanjiu*. Each of the Joint Campaign Command Headquarters of the seven Military Regions had an information countermeasures center, which included cyber warfare among its responsibilities. Mulvenon, "PLA Computer Network Operations," 274.

[28] Mark A. Stokes, "The Chinese People's Liberation Army and Computer Network Operations Infrastructure," in *China and Cybersecurity: Espionage, Strategy, and Politics in the Digital Domain*, ed. Jon R. Lindsay, Tai Ming Cheung, and Derek S. Reveron (New York, N.Y: Oxford University Press, 2015), 164–65.

carried out by the Third Department responsible for military intelligence, offensive operations by the Fourth Department responsible for electronic warfare,[29] and defense of PLA networks by the Informationization Department.[30] The PLA Information Support Base (*Jiefangjun Xinxi Baozhang Jidi*) under the Informationization Department was established in 2010 and most likely was tasked with defending PLA cyber networks.[31] Approximately 12 of the Third Department's 28 signals intelligence units, known as Technical Reconnaissance Bureaus (TRBs), were under its direct authority. The other 16 TRBs were under delegated command and control arrangements as they supported the Military Regions and other services.[32]

China's strategic offensive cyber units in the Fourth Department and cyber espionage units in the Third Department were formally under strict command and control arrangements, but in practice the ability to authorize cyber attacks may have been delegated to unit commanders, at least in the Third Department. TRBs would have been capable of carrying out offensive cyber operations despite being tasked with espionage because the means and methods of intruding into adversary networks for cyber attack and espionage are the same.[33] Those units would have exploited an adversary's strategic networks to gather intelligence, giving the Third Department a "beachhead" from which to carry out strategic cyber attacks. Command and control arrangements for Third Department units appeared to be either delegated to unit commanders

[29] The most likely Fourth Department units with specific cyber offensive capabilities are its two electronic countermeasures brigades in Beijing and Hebei, and/or its one or two satellite jamming regiments. Ibid., 174–75.
[30] Mulvenon, "PLA Computer Network Operations," 272–4.
[31] The Support Base was tasked with providing defense and maintaining the PLA's satellite communications network, and the CMC's terrestrial command and control communications network. "Wo Shouzhi Zhanlue Xinxi Zhuyuan Baozhang Liliang Jiancheng [Our First Strategic Information Support and Maintenance Force Is Established]," *Jiefangjun Bao [PLA Daily]*, July 20, 2010. Experts indicated that it did not have a cyber intelligence or offensive role. Author's interviews, Beijing, 2016.
[32] Another 16 TRBs directly supported PLA Military Regions and the services.
[33] Shou, *Zhanlue Xue*, 192.See also Ye, *Xinxi Zuozhan Xue Jiaocheng*, 70.

or, if operations needed to be authorized higher up the chain of command, not enforced. Some TRBs were involved in industrial espionage of U.S. firms, that were either unauthorized, authorized but which top leaders were unaware of and would have disapproved of, or which top leaders authorized and approved of, but then denied responsibility for.[34] These activities are outlined in the section on China's 2014 posture change. The behavior of Third Department TRBs suggests that top leaders either intentionally or inadvertently lacked the mechanisms to oversee PLA cyber operations.

PLA writings indicate that tactical cyber attacks in an information warfare campaign were subject to delegated command and control arrangements, while strategic attacks could require top military leaders' authorization for their use. According to the 2002 *Campaign Theory Study Guide*, "campaign group army (corps) are the main forces for carrying out campaign information warfare."[35] No central PLA commander, such as the GSD Chief of General Staff, would vet use of computer attacks in this campaign, "campaign information warfare is planned, coordinated and controlled by the corps commander and unified command structure."[36] The 2004 *Science of Second Artillery Campaigns* also indicates that the Second Artillery intended to add a cyber offensive capability to its electronic countermeasures units. These units would be commanded by Military Region wartime theater commands.[37] The nature of information warfare required campaign commanders to be able to make quick decisions, "using the shortest time, most simple and direct method."[38] PLA training reports also suggest that units capable

[34] Author's interviews, Beijing and Shanghai, 2016.
[35] Although the guide noted that there would also be "support for campaign warfare from strategic forces and relevant civilian forces," it is not clear that out-of-theater strategic and civilian units would have provided cyber attack capabilities. Xue, *Zhanyi Lilun Xuexi Zhinan*, 52.
[36] Ibid., 52.
[37] Yu, *Di'er Paobing Zhanyi Xue*, 78, 148.
[38] Ibid., 345.

of carrying out cyber attacks were integrated with regular conventional units.[39] On the other hand, 2013 AMS teaching materials state that strategic-level cyber attacks would be carried out "under the direct control of the highest supreme command (*tongshuai bu*),"[40] the CMC.

Transparency

China made no effort to clarify its cyber doctrine or command and control arrangements to an adversary, one of the hallmarks of a brinkmanship posture. China not only lacked a cyber declaratory policy articulating how it would use its cyber weapons in a crisis or conflict, but it actively denied that the PLA had an offensive cyber capability at all.[41] The former head of the Ministry of Defense foreign affairs office denied the existence of the PLA's infamous Unit 61398 TRB, located in Shanghai, when it was exposed in a forensic report by the U.S. private cybersecurity firm, Mandiant, in 2013.[42] PLA writings offered some clues as to China's cyber doctrine, but Chinese experts often questioned their authoritativeness.[43] Reports of PLA exercises involving cyber attacks in official newspapers such as the *PLA Daily* indicated that China had tactical-level cyber offensive capabilities. Cyber intrusions conducted by PLA units as early as 2003 would have also signaled to an adversary the types of strategic targets China might attack in a crisis or conflict. In 2014, the Commander of U.S. Cyber Command, Admiral

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[39] Krekel, Adams, and Bakos, "Occupying the Information High Ground," 21, 23–24.
[40] Ye, *Xinxi Zuozhan Xue Jiaocheng*, 109. An NDU text from 2008 also indicated that a future strategic level integrated electronic and cyber warfare unit should be "under the direct control of the highest supreme command." See Guo Shengwei, *Xinxi Hua Zhanzheng Yu Wangdian Budui [Informationized Warfare and a Cyber-Electronic Force]* (Beijing: Guofang Daxue Chubanshe, 2008), 124.
[41] William C. Hannas, James Mulvenon, and Anna B. Puglisi, *Chinese Industrial Espionage: Technology Acquisition and Military Modernization* (New York, N.Y: Routledge, 2013), 225–26.
[42] "Former Defense Official Denies Chinese Hacking," *Xinhua News Agency*, March 3, 2013, http://news.xinhuanet.com/english/china/2013-03/03/c_132205035.htm.
[43] Author's interviews, Beijing and Shanghai, 2016 and 2017.

Michael Rogers, testified before Congress that China had been "probing Americans' critical infrastructure and in some cases have gained access to those control systems."[44] The ambiguity over command and control arrangements for Chinese strategic cyber attacks created by the Third Department's intrusions created uncertainty within the United States that China's top leaders were willing and able to control the use of strategic cyber attacks in a conflict or crisis.

III. China's Decision to Pursue Cyber Weapons and Adopt a Brinkmanship Posture

To determine whether strategic substitution, emulation or organization theory best explains why China pursued a coercive cyber weapons capability and why it adopted a brinkmanship posture, I examine evidence from China's decision to develop a cyber force between 1999 and 2001, and its adoption and implementation of a brinkmanship posture after 2001. Below I briefly outline the different observable implications of the theory of strategic substitution and the alternative explanations for the timing and process of China's decision to establish a cyber force posture.

Observable Implications

An observable implication of the theory of strategic substitution is that China is likely to pursue a coercive capability for a non-nuclear strategic weapon if has a need for strategic leverage

[44] Admiral Michael S. Rogers, "Transcript of Admiral Michael S. Rogers at the Hearing of the House (Select) Intelligence Committee," § House (Select) Intelligence Committee (2014), https://www.nsa.gov/news-features/speeches-testimonies/testimonies/adm-rogers-testimony-20nov2014.shtml; Jamie Crawford, "The U.S. Government Thinks China Could Take down the Power Grid," *CNN*, November 21, 2014, http://www.cnn.com/2014/11/20/politics/nsa-china-power-grid/.

following a change for the worse in its threat environment. China would therefore develop a coercive posture for its cyber weapons following the Taiwan Straits crisis in 1995-6, the U.S. bombing of China's embassy in Belgrade in 1999 or the Obama Administration's announcement of its Pivot to Asia in 2011. China did not have the technology to adopt a coercive cyber posture for its non-nuclear strategic weapons when its main conflict scenario shifted from a total to a limited war in 1988.[45] The theory of strategic substitution would expect China to change its force posture when its expected cost of retaliation changed from low to high around 2010, and from high to moderate around 2014. By contrast, both organization theory and emulation theory would expect the PLA to establish for a cyber posture as soon as it became aware of the military applications of cyber attacks when it became aware of U.S. research into "computer virus weapons" in the early 1990s. Emulation theory would expect China to adopt a calibrated escalation posture after 2009, when the United States began to adopt that posture, beginning with its establishment of a Cyber Command.

If Chinese decision-makers pursued a cyber weapons capability to gain strategic leverage over the United States in a limited war, their decision-making process would look quite different to a posture motivated by organizational interests or emulation. An observable implication of the theory of strategic substitution is that leaders would view cyber weapons as satisfying a need for strategic leverage triggered by a deterioration in China's threat environment. They would acknowledge that cyber weapons allowed them to make more credible threats than nuclear

[45] China joined the worldwide internet in 1991. China's computer capabilities research and development began with the 1986 High Technology Research and Development Plan (Project 863). Cui Guangyao, "Xinxi Anquan Shijie de Zhengce Chunqiu - Guojia Anquan Keji Xiangmu Tanyuan [History of the Policies of the Information Security World - Investigation of National Information Security Science and Technology Programs]," *Zhongguo Xinxi Anquan [China Information Security]*, no. 10 (2010): 26–31. Krekel, Adams, and Bakos, "Occupying the Information High Ground," 60.

weapons and could compensate for their conventional inferiority more expeditiously than building up conventional capabilities. They would recognize their low expected cost of retaliation allowed them to exploit an adversary's fears of unrestrained cyber conflict using a brinkmanship posture. In a decision-making process driven by emulation of the U.S. military, Chinese leaders would express a fear of falling behind Washington in advanced military technology. Organization theory would expect advocates of a cyber force posture to be PLA officers opportunistically expanding their budgets, autonomy or missions by expanding into the cyber domain.

The Decision to Develop a Cyber Posture

China's decision to pursue a cyber weapons capability and adopt a brinkmanship posture for those weapons was prompted by the NATO bombing of the Chinese Embassy in Belgrade on May 8, 1999, during the Kosovo War. The incident gave Beijing a need for strategic leverage to ensure it could coerce the United States if Washington intervened in a limited conventional war to prevent formal Taiwanese independence. The bombing accentuated the fact that China could not rely on its inferior conventional capabilities for leverage in that conflict. The incident sparked a PLA-wide effort to improve China's short-term military readiness and long-term modernization. Those efforts included improvements to China's conventional missile force, its decision to develop a space force posture, and a debate over the adequacy of its nuclear posture. Military leaders aimed to immediately increase China's ability to "defeat a superior adversary from a position of weakness" (*yilie kangyou*) by finding and attacking U.S. vulnerabilities. U.S.

dependence on computer networks for warfighting and as a society was one of those vulnerabilities.

The decision-making process and timing provide strong support for the theory of strategic substitution. The PLA had some nascent cyber warfare capabilities before 1999 but prioritized their development after the embassy bombing incident. Top PLA leaders had the authority to decide to establish a cyber force, as the instructions to prioritize information warfare capabilities were given by top Party leader Jiang Zemin on the advice of the CMC at a 2002 CMC meeting. But military leaders' justifications for both developing a cyber force posture and selecting a brinkmanship posture accord with the observable implications of the theory of strategic substitution, not emulation theory or organization theory.

Developing Cyber Capabilities

The PLA engaged in research and development of "computer virus warfare" (*jisuanji bingdu zhan*) capabilities during the 1990s but made no high-level decision to focus on cyber capabilities as a means of warfighting or coercion until 1999.[46] PLA researchers were aware that cyber attacks could have strategic effects since at least 1992, when one PLA publication reported that the U.S. military was researching "computer virus weapons" that could be used

[46] Niu Li, ed., *Jundui Xinixihua Jianshe Zhanlue Gailun [Overview of the Military Informationization Development Strategy]* (Beijing: Jiefangjun Chubanshe, 2008), 51. The book was written to provide a theoretical basis and practical guidance for PLA informationization strategy for high-level design senior officers (*dingceng shouji de shouzhang*), principally by the All-Military Informationization Work Office. The book was endorsed by a seven-person specialist group composed of representatives from the All-Military Informationization Specialist Consultative Committee, All-Military Informationization Work Office, Academy of Military Sciences, National Defense University and GSD Communications Department. Ibid., 263–64.

to attack civilian and military targets, to "make chaos."[47] By 1995, leading PLA information warfare theorist Wang Baocun and Li Fei predicted that "actions targeting military computers will become an important style (*yangshi*) of information warfare." Wang and Li observed that cyber attacks "can be used to cause a lot of damage to informationized weapons and war potential."[48] Militias carrying out cyber defense and supporting the PLA's newly automated command and control systems were established by at least 1998.[49]

Towards the end of the 1990s the PLA took inspiration from the U.S. concept of using information to enhance conventional military operations during the Gulf War.[50] CMC Chairman and Party General Secretary Jiang Zemin emphasized the need for the PLA to win wars "under informationized conditions" at annual CMC meetings between 1996 and 1998.[51] Contrary to the expectations of emulation theory and organization theory, the PLA did not consider cyber attacks an important part of information warfare during the 1990s. In January 1999, CMC Vice-Chairman Zhang Wannian mentioned that future conflicts would involve the space and electronic battlefields,[52] but made no mention of a cyber battlefield.

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[47] Shao Pingfan, "Meijun Zhongshi Jisuan Ji Bingdu de Junshi Yingyong Yanjiu [The U.S. Military Attaches Importance to Researching the Military Use of Computer Viruses]," *Waiguo Junshi Xueshu [Foreign Military Arts]*, no. 10 (1992): 22.

[48] War potential refers to civilian assets supporting a war effort, including on the enemy homeland. Wang Baocun and Li Fei, "Manhua Xinxi Zhan [An Informal Discussion of Information Warfare]," *Jiefangjun Bao [PLA Daily]*, June 13, 1995.

[49] Tai Demin and Tong Zhongpu, "Junmin Wangluo Fenbu Datong Jun Fenqu Wangluo Fanghu Jishu Quebao Xinxi Anquan [Datong Military Sub-Region Cyber Militia Unit Protects Information Security with Cyber Defense Technology]," *Jiefangjun Bao [PLA Daily]*, July 21, 2003.

[50] M. Taylor Fravel, *Active Defense: China's Military Strategy Since 1949* (Princeton, N.J., 2019).

[51] Jiang Zemin, *Lun Zhongguo Xinxihua Jishu Chanye Fazhan [On the Development of China's Informationization Technology Industry]* (Beijing: Zhongyang Wenxian Chubanshe, 2007), 258–59; Guo Xiangjie, *Zhang Wannian Zhuan [The Biography of Zhang Wannian]* (Beijing: Jiefangjun Chubanshe, 2011), 164; Tai Ming Cheung, "The Riddle in the Middle: China's Central Military Commission in the Twenty-First Century," in *PLA Influence on China's National Security Policymaking*, ed. Phillip C. Saunders and Andrew Scobell (Palo Alto, C.A.: Stanford University Press, 2015), 97.

[52] Zhang Wannian, *Zhang Wannian Junshi Wenxuan [Selected Military Works of Zhang Wannian]* (Beijing: Jiefangjun Chubanshe, 2008), 732–35.

The Need for Strategic Leverage

In the aftermath of the Belgrade Embassy bombing on May 8, 1999, China's top civilian leader and General Secretary of the Communist Party, Jiang Zemin, instructed the CMC to strengthen the military to prevent future attacks on China. In an emergency Politburo meeting the day after the bombing, Jiang Zemin said, "we must speed up our own good work, and greatly strengthen our economic power, military power and the cohesion of the people." Jiang implied that China needed to follow the example of Mao Zedong and Zhou Enlai's leadership in China's pursuit of nuclear and thermonuclear weapons, despite the country's extremely difficult circumstances at that time. Without Mao and Zhou's foresight, China might have already been attacked. At the very least, it would currently face a much more hostile security environment.[53]

Following the emergency Politburo meeting, CMC Vice-Chairman Zhang Wannian called an emergency meeting of China's top military decision-making body, the CMC, to implement the Politburo's response to the bombing. Zhang ordered the PLA to ensure its political stability and war preparedness, strengthen targeted training, speed up the development of "shashoujian" equipment,[54] and boost morale by studying the government's criticism of the United States.[55] Jiang Zemin instructed the PLA to "advance and seize the development of national defense," and to study the Kosovo war on May 11, 1999. The war served as a specimen of a local high technology war to guide long-term PLA modernization and training. But Jiang's instructions

[53] Jiang Zemin, *Jiang Zemin Wenxuan (Er Juan) [Selected Works of Jiang Zemin (Volume 2)]* (Beijing: Zhongyang Wenxian Chubanshe, 2006), 323, 326.
[54] The term "shashoujian" was not applied to cyber weapons until around 2008. See Ye, *Xinxi Zuozhan Xue Jiaocheng*, 55.
[55] Guo, *Zhang Wannian Zhuan*, 416.

also prompted Zhang to take immediate steps to improve PLA war preparedness and chances of success in a conflict if one occurred in the short-term. The PLA therefore studied Kosovo as a guide to both its own modernization and to identify U.S. weaknesses.[56] The idea of using computer viruses to counter a stronger, technologically advanced but dependent adversary emerged from PLA efforts to study the lessons of Kosovo. Contrary to the expectations of emulation theory, the PLA did not try to catch up with the U.S. military. Rather, it studied the successes and failures of the Serbian forces attacking the United States.

Zhang's instructions prompted a PLA-wide response to the increased U.S. threat involving changes to PLA doctrine, operations and training, and equipment, for which the AMS, GSD and GAD respectively took the lead. Among those organizations, the GSD's response emphasized cyber weapons. The GSD Chief of General Staff, Fu Quanyou, organized a number of meetings after the embassy bombing to formulate and implement a response to the incident. Fu coordinated a military technology small group of nine experts from across the PLA, including the GSD, GAD, Air Force, Second Artillery, and space experts, to study the embassy attack. The group formulated recommendations for China's response, which Fu submitted to Zhang Wannian on May 31, 1999. Zhang was pleased with the report and requested Fu to report back to the CMC with more concrete recommendations. In October, on the CMC's instruction, the GSD, AMS and the CMC General Office formed a small group to research the Serbian militias' attacks on NATO forces.[57]

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[56] Ibid., 417–18.

[57] Wang Xuedong, *Fu Quanyou Zhuan [Biography of Fu Quanyou]* (Beijing: Jiefangjun Chubanshe, 2015), 208.

The GSD also formulated its own response to the intensified U.S. threat. As the theory of strategic substitution would expect, in a March 26 GSD meeting, Fu identified a need to maximize strategic leverage to defeat the United States, given that China could not catch up in its conventional military forces anytime soon, "now and for a relatively long period into the future, the overall military strength situation in which 'the enemy is strong and we are weak' will fundamentally not change." Instead, China would have to find U.S. weaknesses and attack them with its current capabilities to "win from a position of inferiority."[58] Fu received CMC Vice-Chairman Zhang's approval to "strengthen information warfare training and improve information confrontation capabilities."[59] The GSD sent a report to the whole military requiring the PLA to borrow from Serbian forces' example of attacking a stronger adversary.[60] In December 1999, an enlarged CMC meeting decided to "actively promote a New Military Transformation with Chinese characteristics," to build an informationized PLA.

Sources describing these high-level decision-making processes rarely refer specifically to cyber capabilities. One unconfirmed source indicates that, in 1999, Jiang Zemin observed that "computer network warfare is highly destructive, it displayed these abilities for the first time in the Kosovo War" and instructed the PLA to "accelerate the development of information technology and on the other hand we must diligently innovate information warfare theory with the characteristics of our military."[61] Regardless, the PLA researchers and publications informing those decisions explicitly recommended that China pursue a cyber weapons

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[58] Ibid., 302.
[59] Ibid., 307.
[60] Ibid., 209.
[61] Jiang's remarks are quoted in Zhang Tianping, *Zhanlue Xinxi Zhan Yanjiu [On Strategic Information Operations* (Beijing: Guofang Daxue Chubanshe, 2001), 1–2. but could not be confirmed using authoritative sources of Jiang's speeches or writings.

capability. A report on the Kosovo conflict, authored by researchers at the National Defense University (NDU) offers strong evidence that the PLA saw cyber weapons as an ideal capability to gain strategic leverage over a technologically superior adversary in an informationized conflict because of what they observed in Kosovo.[62] As the theory of strategic substitution would expect, the report identified that cyber weapons could give China the strategic leverage it needed more quickly than modernizing its conventional military forces, "In a situation where our information warfare capabilities cannot completely close the gap with developed countries within a short period of time, concentrating our efforts on researching computer virus weapons, using computer virus weapons against the advanced information systems of an enemy, is undoubtedly an extremely effective method." In other words, cyber attacks would allow China to defeat the strong from a position of weakness (*yilie keyou*) by taking aim at the adversary's weak points.[63]

The Expected Cost of Retaliation

The NDU report recognized that China faced a low expected cost of retaliation for cyber attacks and recommended that China adopt a brinkmanship posture to exploit the asymmetry in U.S. and Chinese dependence on cyberspace. The authors explained that China could take advantage of the high U.S. exposure to cyber attack, "the United States constructed the world's most developed and complex information network, but it also has the largest number of points that are easy to attack, its vulnerability is also the greatest."[64] China could also exploit the difficulty of cyber attack detection and attribution: "the U.S. Department of Defense uses more

[62] Bin Huang, ed., *Kesuowo Zhanzheng Yanjiu [Research on the Kosovo War]* (Beijing: Jiefang Jun Chubanshe, 2000), 2–3. The GSD Training Department distributed the report throughout all military units and schools.
[63] Ibid., 161.
[64] Ibid., 161–62. The report gives no source for these figures.

than two million computers, every year they are subject to 250,000 disruptions (*saorao*), the success rate [of those attacks] is more than 60 per cent, but fewer than five per cent are discovered." The PLA could gain strategic leverage from targeting military networks, but the report did not mention. Attacks on U.S. civilian networks: "in combat guidance, we must perfect [the ability to] take advantage of the uncertainty of informationized war, increase the confusion of the adversary, create a battlefield and combat style that is favorable to us but not our adversary, to grasp the initiative in war."[65] The report also emphasized that China needed to protect itself from cyber attacks by defending its strategic networks and reducing its reliance on foreign technology.[66] To implement a cyber force posture, China needed not only specialists in network hostilities, but also commanders with an understanding of information warfare theory and practice, technology, and military affairs.[67]

The Decision to Develop a Cyber Posture

At the end of 2000, General Secretary Jiang Zemin acknowledged the decisions of top PLA leaders to include cyber weapons in China's information warfare campaign as a way of augmenting China's strategic leverage over the United States in a limited war. At the annual enlarged CMC meeting in December 2000, Jiang Zemin mentioned cyber attacks for the first time in his remarks, "information warfare has started to ascend on to the arena of warfare, with electronic warfare and computer network warfare as its principal means."[68] The PLA may have demonstrated its cyber defenses and intelligence gathering capabilities to President Jiang

[65] Ibid., 162.
[66] Ibid., 159–60.
[67] Ibid., 161.
[68] Jiang Zemin, *Jiang Zemin Wenxuan (San Juan) [Selected Works of Jiang Zemin (Volume 3)]* (Beijing: Zhongyang Wenxian Chubanshe, 2006), 163.

during a major military exercise in October 2000, Lijian-2000. "Large-scale networked hostilities" (*da guimo wanshang duikang*), were among the new technologies demonstrated during the exercise.[69] The CMC likely drafted Jiang Zemin's speech for him, suggesting that top military leaders on the CMC had the authority to establish China's cyber units.

The writings of the GSD Chief of General Staff just before Jiang's speech describes how PLA leaders intended to pursue a cyber weapons capability in more detail. In September 2000 Fu Quanyou wrote in the AMS *Campaign Theory Research Newsletter* that China needed to make the leap from only developing electronic warfare to developing information warfare, by integrating electronic warfare, cyber warfare and artillery. Fu also indicated that China needed to follow Jiang Zemin's instructions to "innovate information warfare theory possessing our military's characteristics (*wojun de xinxi zhan lilun*)." He emphasized that "it is especially necessary to research effective tactics for defeating the enemy such as electronic warfare and cyber warfare in joint operations." Fu indicated that China needed to "promptly organize information operations units and subunits," while strengthening its electronic warfare crack troops, "according to the development of science and technology and the development and change in information warfare methods." He also called for a mobilization system to "completely take advantage of the rich information capabilities and resources of civilians."[70] Although PLA officers proposed cyber force posture and PLA leaders decided to develop one,

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[69] Wang, *Fu Quanyou Zhuan*, 316. "Networked hostilities" likely means battlefield command and control information networks, cyber intelligence collection and defensive cyber capabilities, based on reports of cyber militia training exercises in the *PLA Daily* in 2003. See Tai and Tong, "Junmin Wangluo Fenbu Datong Jun Fenqu Wangluo Fanghu Jishu Quebao Xinxi Anquan."

[70] Fu Quanyou, *Fu Quanyou Wenxuan [Selected Works of Fu Quanyou]* (Beijing: Jiefangjun Chubanshe, 2015), 744, 746–47.

as organization theory would expect, their speech evidence indicates that they pursued strategic leverage rather than organizational interests in their decision.

Implementing a Brinkmanship Cyber Force Posture

It is possible that China amended its official doctrine to incorporate cyber attacks between 1999 and 2001, which indicates that it also decided to adopt a brinkmanship posture by 2001. Fu Quanyou pointed out in his newsletter article in 2000 that China's existing doctrine on informationization was a start, but insufficient, "not long ago, the CMC approved and promulgated a Joint Operations Outline (*lianhe zuozhan gangyao*), an ad hoc chapter imposed standards on campaign information warfare, advancing the depth of research on this topic and transmission of results, gradually permeating the operations and training areas, advancing the quality of force building." But Fu observed that China's "shortcomings in the area of military informationization building are quite large" compared to developed countries, which restricted the PLA's combat effectiveness.[71]

The Joint Campaign Outline (*Lianhe Zhanyi Gangyao*) Fu was referring to was part of the PLA's fourth generation of operational regulations, which were completed in 1999 after two years of drafting.[72] One chapter in the Joint Campaign Outline referred to "campaign information operations" (*zhanyi xinxi zuozhan*), defined as "a series of combat actions to seize and maintain campaign information superiority, principally using electronic warfare."[73] The

[71] Ibid., 742.
[72] Fravel, *Active Defense*, chap. 5.
[73] Cui Yonggui, *Zhanyi Xinxi Zuozhan Yanjiu [On Campaign Information Operations]* (Beijing: Guofang Daxue Chubanshe, 2000), 5.

campaign outline or its regulations may have been altered to include cyber warfare alongside electronic warfare after 1999. The *Guide to Campaign Theory*, which was based on the 1999 combat regulations but published in 2001, might have reflected those changes. It described computer virus attacks and "'hacker' intrusions" as two means of computer network warfare to carry out campaign information warfare (*zhanyi xinxi zhan*).[74] A book on campaign information warfare for PLA training purposes was also published in 2001. The PLA established its first cyber military units in approximately 2002.[75] Concepts for the use of cyber offensive capabilities and "computer network warfare" were under development and had been "introduced" (*yinjin*) into new combat units before 2002, although they were independent of other "informationized" weapons systems under development.[76]

The PLA began to draft a new set of campaign outlines and combat regulations in 2004, which included a Joint Campaign Information Operations Outline (*lianhe zhanyi xinxi zuozhan gangyao*). Drafting of the outlines and regulations were completed by 2009, but the PLA's entire fifth generation combat regulations were never issued.[77] Nevertheless, is possible that PLA writings from around 2013 describing China's brinkmanship cyber doctrine reflect elements of these combat regulations because "their basic operational thinking, principles, main styles, and missions and methods (*xingdong fangfa*) all entered into training outlines and teaching materials, objectively demonstrating the role of current regulations (*yidai tiaoling*)."[78]

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[74] Xue, *Zhanyi Lilun Xuexi Zhinan*, 53. The *Science of Military Strategy*, published in 2001, does not mention a PLA offensive cyber capability. The book probably reflects PLA thinking around 1998. Peng and Yao, *The Science of Military Strategy*, 220–1, 435–6, 464–5; Guo, *Zhang Wannian Zhuan*, 169.
[75] Author's interviews, Beijing 2015.
[76] Niu, *Jundui Xinxihua Jianshe Zhanlue Gailun*, 52.
[77] Fravel, *Active Defense*, chap. 7.
[78] Ren Jian, ed., *Zuozhan Tiaoling Gailun [An Introduction to Operations Regulations]* (Beijing: Junshi Kexue Yuan Chubanshe, 2016), 52.

The PLA's cyber capabilities may have received more funding and priority across the PLA after 2002, when the military established a number of organizations to accelerate its use of information technology. President Jiang instructed the PLA to invest heavily in information warfare capabilities at an enlarged annual CMC meeting in December 2002.[79] After Jiang's speech, the PLA implemented organizational changes to unify and coordinate the existing, fragmented efforts towards informationization within different parts of the PLA.[80] For example, the PLA established an All-Military Informationization Leading Small Group with a work office and advisory committee to support it and issued a unified all-military informationization development series of plan outlines (*jihua gangyao*) and regulatory standards. It increased the pace of informationized weapons research and development.[81] By 2004, the PLA's infamous Shanghai-based TRB, Unit 61398, was publicly recruiting computer science graduates from a top civilian university.[82]

PLA campaign manuals written in the early 2000s confirm that its brinkmanship cyber force posture was intended to maximize China's strategic leverage, compensate for its conventional military inferiority, and exploit China's lower exposure to cyber attack, compared to the United States. The *Science of Second Artillery Campaigns*, states that "The more developed the country, the easier it is for them to suffer from information attacks, against technologically strong and economically capable countries or militaries, there are more targets to use information weapons to attack." If China's nascent information warfare capabilities were

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[79] Jiang Zemin, *Jiang Zemin Wenxuan (San Juan)*, 587–88.
[80] Niu, *Jundui Xinixihua Jianshe Zhanlue Gailun*, 51.
[81] Ibid., 52.
[82] "PLA Unit 61398 Recruitment Notice Found," *China Digital Times* (blog), February 20, 2013, http://chinadigitaltimes.net/2013/02/pla-unit-61398-recruitment-notice-found/.

concentrated in a key direction and coordinated at the same time to achieve local superiority, they could achieve Jiang Zemin's goal "of stopping the strong from a position of inferiority (*yilie zhiyou*), the weak achieving victory over the strong (*yiruo shengqiang*)."[83]

IV. China's Calibrated Escalation Force Posture

In 2014 General Secretary Xi Jinping and China's top military leaders changed its brinkmanship cyber force posture to a calibrated escalation posture. The change allowed them to exercise much more strict and direct authority over the PLA's use of offensive cyber capabilities in a crisis or conflict. With a calibrated escalation cyber posture, China could continue to credibly threaten to use cyber attacks to gain strategic leverage, despite its more equal exposure to cyber attacks, compared to the United States. It hoped to avoid both disproportionate U.S. retaliation for its cyber attacks or triggering an uncontrollable spiral of tit-for-tat strategic cyber attacks. Below I outline the components of China's calibrated escalation force posture. I then outline how China's expected cost of retaliation changed between 2010 and 2014, and the decision-making process that led Chinese leaders to change its cyber force posture in late 2014.

China's current cyber posture has many of the features of a calibrated escalation posture, which demonstrate a sharp departure from its initial brinkmanship posture. Its doctrine indicates that the PLA intends to control cyber escalation. China has separated its units capable of carrying out tactical and strategic cyber attacks to implement strict command and control arrangements

[83] Yu, *Di'er Paobing Zhanyi Xue*, 343.

for strategic cyber attacks. China lacks the extent of transparency of an ideal-type calibrated escalation posture, but it has become more transparent about its cyber posture in the past few years. The theory of strategic substitution best explains the features of China's current cyber posture, which are optimized to control escalation. Organization theory would not expect the PLA to select strict command and control arrangements for any cyber capabilities, while emulation theory would expect China to be more transparent about its posture, while its cyber force organizational structure would closely resemble U.S. cyber organizations, especially its Cyber Command. structure.

Doctrine

Chinese documents published in 2015 officially and publicly stated that the PLA intended to control cyber escalation. The May 2015 White Paper on China's Military Strategy officially recognized the existence of China's military cyber forces for the first time and outlined China's national security goals in cyberspace, "to support national cyberspace struggles and participate in international cooperation, to contain and control serious cyberspace crises, protect national cyber and information security, safeguarding national security and societal stability."[84] The PLA was not assigned responsibility for achieving all of those goals, such as ensuring societal stability in cyberspace and protecting national critical infrastructure.

The writings of PLA researchers after 2014 indicate that these goals address concerns that cyber weapons may be used to incite societal instability in China before a conventional conflict

[84] State Council Information Office of the People's Republic of China, *China's Military Strategy* (Beijing: Renmin Chubanshe, 2015), 15.

began,[85] and concerns about cyber attacks triggering a conventional conflict. Societal reliance on cyberspace "gives national security an unprecedented strategic weakness." Wang Kebin, the Director of the PLA Informationization Department explained that "the mobility and spread of cyberspace covers every domain including penetrating national critical infrastructure facilities and relates to the national economy and people's livelihoods, there is the possibility of new types of cyber weapons systems skipping over space and time to attack national strategic targets," including China's air, space and border defense systems.[86] Reacting to U.S. threats to use conventional military force to respond to peacetime or crisis cyber attacks, Major General Hao advised that, "at will reducing the threshold for the use of force in cyberspace ... can heighten the risk of conflict escalation." She advocated for the peaceful resolution of disputes in cyberspace.[87]

China's cyber posture is still intended to deter an adversary from initiating a limited war and compel it to stop fighting the war. In fact, PLA researchers recognized that the growing strategic significance of cyberspace enabled China to gain even more strategic leverage over the United States using cyber threats. By 2014 PLA officers viewed cyberspace as occupying a strategic position in great power competition on its own, rather than in conjunction with other means of information warfare. Major General Hao called cyber war the "'atomic bomb' of the information age."[88] According to Wang Kebin, cyberspace was one of the "great power game

[85] Xiao Tianliang, ed., *Zhanlue Xue [The Science of Military Strategy]* (Beijing: Guofang Daxue Chubanshe, 2015), 196–97.
[86] Wang Kebin, "Jiangding Bu Yi Zou Zhongguo Tese Xinxi Qiangjun Zhi Lu [Resolutely Take the Path of Strengthening the Military by Informationization with Chinese Characteristics]," *Zhongguo Junshi Kexue [China Military Science]* 2 (2015): 2.
[87] Hao Yeli, "Dui Meiguo Jiakuai Wangluo Zhan Fazhan de Jidian Sikao [Some Thoughts on the U.S. Rapid Development of Cyber Warfare]," *Waiguo Junshi Xueshu [Foreign Military Arts]*, no. 8 (2015): 5.
[88] Ibid., 2.

strategic focal points and informationized warfare strategic high points," alongside space.[89] Cyber weapons continued to compensate for China's conventional military weakness compared to the United States. The PLA continued to conceive of deterrence and combat under "informationized conditions" as "an asymmetric game, [to] take aim at the adversary's soft underbelly" that would allow China to defeat a stronger adversary.[90] As PLA researchers observed in 2014, U.S. reliance on information technology superiority remained an enduring U.S. weakness. Further, the benefits of cyber attacks still vastly exceeded their risks.[91] No authoritative doctrinal writings have appeared to update China's large-scale, preemptive information warfare campaign since it changed its cyber posture in 2014, so it is not clear whether and how the PLA has reconciled cyber escalation control with incentives to use large-scale cyber attacks early in a conflict to support its conventional operations.

The PLA also appears to be adjusting the targets of its cyber attacks to reduce the risk of uncontrolled escalation if China had to carry out a threat to use a cyber weapon. In particular, the PLA may no longer consider using strategic cyber attacks on civilian targets in peacetime or in a crisis to deter the outbreak of war, as might have under its brinkmanship posture. The 2015 NDU *Science of Military Strategy* suggested that China could conduct cyber attacks against critical infrastructure in a crisis as part of a series of strategic deterrence actions: "depending on the situation, [China could] organize cyber war forces and implement attacks against enemy war potential."[92] But one expert pointed out that this issue had not been decided

[89] Wang, "Jiangding Bu Yi Zou Zhongguo Tese Xinxi Qiangjun Zhi Lu," 2.
[90] Ibid., 4, 6.
[91] Li Zhaorui, ed., *Wangluo Zhan Jichu Yu Fazhan Qushi [The Foundations and Development Trends of Cyber War]* (Beijing: Jiefang Jun Chubanshe, 2015), 19.
[92] Xiao, *Zhanlue Xue*, 215.

when the book was written, and that strategic cyber attacks to deter the outbreak of conflict are not part of China's current cyber doctrine.[93] In 2016, many Chinese experts viewed critical infrastructure cyber attacks as an act of war.[94]

Capabilities

The PLA is pursuing the necessary cyber capabilities to control escalation from the first-use of cyber weapons. The PLA has four main priorities for its cyber capabilities: to improve the precision and effectiveness of its offensive capabilities, improve attribution capabilities, reduce its reliance on foreign technology, and develop a more skilled cyber workforce. In a major 2016 speech that set out the framework for China's national cybersecurity policy, General Secretary Xi Jinping gave the PLA general guidance for its capabilities development. Xi instructed China's military, government and private industry "to speed up the development of critical information infrastructure security and support systems, and a cybersecurity situational awareness posture at all times and in all locations,"[95] to meet the requirement that China "strengthen its cyber defense and deterrence capabilities."[96] For deterrence, China needed equivalent technology to its adversaries, and its own offensive and defensive capabilities to be balanced, to defend and deter cyber attacks. Xi instructed that "If others use aircraft firepower (*feiji dapao*) and we are still using swords and spears, that is unacceptable, offense and defense

[93] Author's interview, Beijing, 2016.
[94] Author's interviews, Beijing and Shanghai, 2015-6.
[95] "Xi Jinping: Rang Hulian Wang Genghao Zaofu Guojia He Renmin [Xi Jinping: Making the Internet Better Benefit the State and the People]," *Xinhua News Agency*, April 19, 2016, http://news.xinhuanet.com/finance/2016-04/19/c_1118672059.htm.
[96] Xi Jinping, *Zai Wangluo Anquan He Xinxihua Gongzuo Jiangtan Hui Shang de Jiangzuo [Speech at the Discussion Meeting of the Cybersecurity and Informationization Discussion Meeting]* (Beijing: Renmin chubanshe, 2016), 18.

capabilities must be symmetrical."[97] China needed to have both offensive and defensive capabilities of equal strength.[98]

The PLA aims to improve the sophistication and precision of its tactical and strategic offensive cyber weapons through cyber weapons testing.[99] Testing would allow the PLA to better control cyber escalation since "cyber attacks can easily entangle innocent parties or cause rapid escalation (*tiaoshi shengji*), requiring precise control of the attack scope and strength, reducing 'collateral harm,' achieving the ability to execute and stop an attack at will."[100] Better resilience and training, including simulations and a cyber testing range, are expected to increase the skills of China's cyber forces, and the "targeted nature and effectiveness" of cyber offense and defense.[101]

China is developing its attribution capabilities as part of its investment in cyber "situational awareness." In 2016, many Chinese analysts continued to view the difficulty of cyber attack attribution as a major obstacle to deterring cyber attacks using threats of retaliation. Nevertheless, the NDU Commandant wrote that China needed to establish a comprehensive cyber surveillance and warning system that would allow it to "determine the nature, intensity, scope, and source of all attacks [on China]."[102] Chinese experts claimed they were not able to attribute cyber attacks to their perpetrators in early 2016,[103] but by late 2017 some recognized

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[97] Ibid., 19.
[98] Some experts interpreted this phrase to mean balanced capabilities compared to the adversary. Author's interviews, Beijing, 2016.
[99] Xiao, *Zhanlue Xue*, 387.
[100] Zhang Shibo, *Zhanzheng Xin Gaodi [The New High Ground of Warfare]* (Beijing: Guofang Daxue Chubanshe, 2016), 91.
[101] Ibid., 94; Xiao, *Zhanlue Xue*, 390–91.
[102] Zhang, *Zhanzheng Xin Gaodi*, 89.
[103] Author's interviews, Beijing, 2016.

that China had a basic attribution capability. China is investing in capabilities to ensure the functioning, protection and recovery of computer systems. [104] Curiously, China's State Informationization Plan also does not assign responsibility for developing China's cyber situational awareness capabilities to a PLA organization.[105]

China is seeking to reduce reliance on foreign network infrastructure, hardware and software to reduce its exposure to cyber attack. As the NDU Commandant quipped, "cybersecurity cannot be bought."[106] Xi Jinping diagnosed China's vulnerability due to its dependence on foreign technology in 2013: "we are controlled by someone else (*shouzhi yuren*) in some critical [computer and informationization] technologies and facilities."[107] The PLA recognized this problem as early as 2000. But the Chinese government did not make it a priority until the risks were underscored by the Edward Snowden revelations about the extent of U.S. Government surveillance in 2013.[108] In early 2015, as part of China's efforts to pursue an informationized force, the head of the GSD Informationization Department wrote that, "it is necessary to accelerate and broaden the strong control and employment of indigenously controlled products, even if their effectiveness is a bit lower and is lacking."[109] China's pursuit

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[104] Xiao, *Zhanlue Xue*, 387. See also Wang Xi and Wang Yang, "Ying Dui Wangluo Kongjian Zhongda Anquan Wenti Chuyi [Some Suggestions on Responding to Serious Security Incidents in Cyber Space]," *Zhongguo Junshi Kexue [China Military Science]* 2 (2014): 99–104; Zhang Yang, ed., *Jiakuai Tuijin Guofang He Jundui Xiandaihua [Accelerating and Pushing Forward Defense and Military Modernization]* (Beijing: Dangjian Duwu Chubanshe, 2015), 118.

[105] State Council, "'Shi San Wu Guojia Xinxi Hua Guihua' Fabu (Fu Quan Wen) ['National Informationization Plan of the 13th Five Year Plan' Announcement (Attachment Full Text)]," China News Online, December 27, 2016, http://news.china.com.cn/txt/2016-12/27/content_39994503_10.htm.

[106] Zhang, *Zhanzheng Xin Gaodi*, 91.

[107] Zhonggong Zhongyang Wenxian Yanjiu Shi [Central Party Documents Research Office], *Xi Jinping Guanyu Keji Chuangxin Lunshu Zhaibian [Extracts from Xi Jinping's Discussions of Science and Technology Innovation]* (Beijing: Zhongyang Wenxian Chubanshe, 2016), 45. See also Zhang, *Jiakuai Tuijin Guofang He Jundui Xiandaihua*, 22.

[108] Author's interview, Shanghai, 2017.

[109] Wang, "Jiangding Bu Yi Zou Zhongguo Tese Xinxi Qiangjun Zhi Lu," 6.

of information technology innovation became a focus of official policy in the 13th Five Year Plan, released in late 2015.[110] Official media reported in 2016 that China is implementing an "indigenously-controlled production substitution plan,"[111] while China's "Made in China 2025" plan to achieve information technology self-reliance was adopted in May 2015.

The PLA needs to diversify the skills of its cyber personnel to carry out new cyber roles. Its existing workforce lacks the capacity to carry out the full suite of cyber offensive, defensive and intelligence-gathering roles. Correcting the information skills shortage across the PLA was given priority by Xi Jinping and the CMC.[112] PLA researchers note that China's cyber military units require personnel to establish cyberwar strategies and tactics, command forces and make war plans, staff to execute missions at each level, and personnel responsible for everyday network management.[113] One problem identified by a PLA commander was that personnel who "understand technology do not understand warfare, but [people who] understand military tactics do not have technological abilities," leading to difficulties in translating scientific and technological progress into warfighting capabilities.[114] Improving the human capital of PLA cyber forces also involves improving the way the force draws on civilian expertise through

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[110] "'Shi San Wu' Guihua Gangyao: Shishi Wangluo Qiangguo Zhanlue, Jiakuai Jianshe Shuzi Hua Zhongguo ['13th Five Year Plan' Planning Regulation: Implementing the Strategy of an Internet Great Power, Increasing the Pace of Establishing a Digital China]," Cyberspace Administration of China, March 18, 2016, http://www.cac.gov.cn/2016-03/18/c_1118372649.htm.

[111] "Xi Jinping: Jiakuai Tuijin Wangluo Xinxi Jishu Zizhu Chuangxin Chanzhe Jianshe Wangluo Qiangguo Mubiao Buxie Nuli [Xi Jinping: Accelerate the Promotion of Cyber and Information Technology Indigenous Innovation, Extend the Persistent Efforts towards the Development of the Goal of Becoming an Internet Strong Country]," *Xinhua News Agency*, October 9, 2016, http://news.xinhuanet.com/politics/2016-10/09/c_1119682204.htm.

[112] Chen Zhaohai, "Guanyu Xinxi Hua Junshi Rencai Peiyang de Zhanlue Sikao [Strategic Thinking on the Training of Informationized Military Personnel]," *Zhongguo Junshi Kexue [China Military Science]* 1 (2015): 84.

[113] Xiao, *Zhanlue Xue*, 391–93; Zhang, *Zhanzheng Xin Gaodi*, 95.

[114] An Weiping, "Zhuoyan Wangluo Quangguo Tuijin Wangxin Junmin Shendu Ronghe [Advancing Cyber and Information Deep Civilian and Military Integration from the Angle of an Internet Strong Country]," *Junmin Ronghe [Civil-Military Integration]* 4 (2015): 59–62.

civil-military integration (*junmin ronghe*), which to date has largely involved the PLA taking advantage of civilian expertise, for example in engineering.[115] The Chinese government elevated the policy priority of civil-military integration in its 13th Five Year Plan[116] and through a Central Civil-Military Integration Development Committee, established in January 2017 and chaired by Xi Jinping.[117]

Command and Control

Strict control of the authority to carry out strategic cyber attacks is a key requirement of a calibrated escalation posture. Following major military reforms at the end of 2015, the PLA is likely to have the strict command and control arrangements for its strategic cyber weapons and intelligence gathering, although some tactical weapons may remain under delegated command and control to ensure their operational effectiveness. Implementing stricter command and control arrangements would help China control escalation within and outside of cyberspace from a cyber attack: "[a cyber attack] once implemented, implies the escalation of warfare and must be controlled from a high strategic level."[118] Establishing an "authoritative cyber force unified leadership command structure" would also help China's cyber forces to fight more effectively and avoid wasting resources.[119]

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[115] Author's interview, Shanghai, 2017.
[116] State Council, "'Shi San Wu Guojia Xinxi Hua Guihua' Fabu (Fu Quan Wen) ['National Informationization Plan of the 13th Five Year Plan' Announcement (Attachment Full Text)."
[117] Huang Panyue, "Xi to Head Civil-Military Integration Body - China Military," *Global Times*, January 23, 2017, http://eng.chinamil.com.cn/view/2017-01/23/content_7462990.htm.
[118] Xiao, *Zhanlue Xue*, 2154.
[119] Zhang, *Zhanzheng Xin Gaodi*, 88.

The PLA Strategic Support Force (SSF), established on December 31, 2015, is expected to centralize the cyber units previously under the authority of the GSD Third Department, Fourth Department,[120] and some cyber espionage units previously commanded by the services and Military Regions.[121] The SSF includes a Network Systems Department[122] and its cyber role is officially described as "network defense."[123] The consolidation of China's cyber forces to ensure stricter command and control arrangements followed the change in PLA cyber posture, rather than vice versa. Months before the final PLA reform plan was approved, in July 2015,[124] PLA officers were already writing about a new organization like the SSF, a "new type of strategic service exhibiting the characteristics of the era." Its "main battle force" would be information support and maintenance, "integrating information acquisition, transmission, management and security" to take advantage of pooled resources.[125] Rumors that China had stood up a Cyber Command were reported in foreign media in October 2015.[126]

The emerging command and control structure for Chinese cyber forces divides the missions of strategic and tactical cyber attack, and civilian critical infrastructure defense, across different

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[120] There is some ambiguity as to whether Fourth Department cyber units have been subordinated to the SSF, given that a CMC Joint Staff Department Network/Electronic Bureau was also established after the reforms.
[121] John Costello, "The Strategic Support Force: China's Information Warfare Service," *China Brief* 16, no. 3 (February 8, 2016).
[122] "Zhongguo Renmin Jiefang Jun Zhanlue Zhiyuan Budui Wangluo Xitong Bu Di Wushi Liu Yanjiu Suo [56th Research Institute of the People's Liberation Army Strategic Support Force Network Systems Department]," *Yuanxiao Xinxi [University Information],* 2016, http://yz.chsi.com.cn/sch/schoolInfo--schId-368175.dhtml.
[123] "Zhuanjia: Zhanlue Zhiyuan Budui Jiang Guichuan Zuozhan Quan Guocheng Shi Zhisheng Guanjian [Expert: Strategic Support Force Is the Key to Victory throughout the Complete Process of War," *Renmin Wang [People Online]*, January 5, 2016, http://military.people.com.cn/n1/2016/0105/c1011-28011251.html.
[124] Zhonggong Zhongyang Wenxian Yanjiu Shi [Central Party Documents Research Office], *Xi Jinping Guofang He Jundui Jianshe Zhongyao Lunshu Xuanbian (San) [Edited Selection of Chairman Xi's Important Treatises on National Defense and Military Development (Volume 3)]* (Beijing: Zhongyang Wenxian Chubanshe, 2016), 49.
[125] Wang, "Jiangding Bu Yi Zou Zhongguo Tese Xinxi Qiangjun Zhi Lu," 4.
[126] Bloomberg News, "China Military Seeks to Bring Cyber Warfare Units Under One Roof," Bloomberg.com, October 23, 2015, http://www.bloomberg.com/news/articles/2015-10-22/china-military-chiefs-seek-to-unify-cyber-warfare-operations.

units in the PLA and with other government bodies. Although the SSF will likely include both intelligence and strategic cyber attack units, both are under strict command and control. These organizational arrangements may help to signal to an adversary that China is willing and able to control the use of its most disruptive cyber weapons, if an adversary discovers an intrusion into one of its strategic networks originating from the SSF. The command and control arrangements for the SSF are likely to be similar to those of China's nuclear missile force before the re-structure, which remained outside of the regular PLA chain of command, to ensure that only the CMC can order the use of its offensive capabilities and strategic intelligence. To enable centralized control, the task of securing the CMC's terrestrial communications networks was kept outside of the SSF.[127] The PLA's new Theater Commands, which replaced the PLA's pre-reform Military Regions, are likely to retain some operational cyber offense, defense and intelligence capabilities under delegated command and control arrangements. [128] 2016 PLA research texts indicate that TRBs supporting the Theater Commands would need to coordinate with out-of-theatre intelligence support from the SSF.[129] Defense of civilian critical infrastructure networks is the responsibility of civilian institutions as stipulated in Article 25 of China's Cybersecurity Law, passed in November 2016. It is not clear which military unit has responsibility for PLA cyber defenses.[130]

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[127] Zhang Nenghua and Liang Pengfei, "Chuangxin Waqian Shixian 'jianliang Fazhan' [Tapping the Latent Power of Innovation to Realize 'Development under Force Reductions]," *Jiefangiun Bao [PLA Daily]*, June 12, 2016. Excluding terrestrial communications from the SSF ensures that the CMC can "break the circuit" of all decisions to use of the SSF's offensive capabilities, and the sharing of its intelligence products with the rest of the PLA.

[128] One PLA researcher explained that China needed both national cyberspace capabilities and an operational cyber force with units under every combat theater. An, "Zhuoyan Wangluo Quangguo Tuijin Wangxin Junmin Shendu Ronghe," 61.

[129] Liu Wei, ed., *Zhanqu Lianhe Zuozhan Zhihui* (Beijing: Guofang Daxue Chubanshe, 2016), 158.

[130] The Cybersecurity Law only mentions the PLA's responsibilities once, stipulating that, "the methods of protecting military networks and information security are set by the Central Military Commission." "Zhonghua Renmin Gonghe Guo Wangluo Anquan Fa [Cybersecurity Law of the People's Republic of China]," Guanchazhe [The Observer], November 7, 2016, http://www.guancha.cn/FaZhi/2016_11_07_379773_1.shtml.

Transparency

Although China's transparency over its military cyber posture has increased, it is probably not yet sufficient to reinforce a tacit bargain between the United States and China to avoid the worst-case scenario of large-scale strategic cyber attacks on both countries. The PLA has no official cyber declaratory policy to clarify how it would use its offensive cyber capabilities in a crisis or conflict, without which it is unlikely that Washington will treat China's statements that it wishes to control cyber escalation as sincere. China would also need to be transparent about its attribution, defense, resilience and precision attack capability to make its calibrated escalation posture credible. So far, the PRC has officially acknowledged that the PLA had cyber forces in the May 2015 Defense White Paper. In December 2016 and March 2017, respectively, China released domestic and international cyber strategy documents. The National Cyberspace Security Strategy states that China intends to avoid cyber conflict and clarifies some of its cyber red lines. One of the Strategy's objectives is peace in cyberspace, to be achieved by "effectively guard[ing] against cyberspace conflicts."[131] The Strategy also provides a non-exclusive definition of critical infrastructure facilities, which may offer some insights into China's red lines in cyberspace.[132]

At the time of writing, one obstacle to a clearer PLA cyber declaratory policy is an unresolved internal debate over whether to publicly state that China has a "cyber deterrence" doctrine. Xi

[131] Guojia Hulian Wang Xinxi Bangong Shi [Cybersecurity Administration of China], "Guojia Wangluo Kongjian Anquan Zhanlue [National Cyberspace Security Strategy]," Xinhua News Agency, December 27, 2016, http://news.xinhuanet.com/politics/2016-12/27/c_1120196479.htm.

[132] According to the Strategy, critical infrastructure facilities "include but are not limited to government information systems, important internet systems, and the areas of public communications, television broadcast networks, energy, finance, transport, education, science and technology, water, industrial manufacturing, medical care and sanitation, societal support (*shehui baozheng*), public facilities." Ibid..

Jinping used the term in a 2016 speech and the PLA has embraced doctrines of "information deterrence" or "cyber deterrence" since it first established cyber forces in the early 2000s. But opposition to a "cyber deterrence" declaratory policy reportedly comes from the Foreign Ministry, which views the term as sanctioning the militarization of cyberspace. It is also inconsistent with China's opposition to the militarization of outer space.[133] Some influential PLA experts have acknowledged that "it is not possible to say that deterrence and armed force have no effect in solving problems," but they warn that "they cannot do everything."[134] The International Strategy of Cooperation on Cyberspace, released in March 2017 for an international audience, walks the fine line between opposing the militarization of cyberspace while recognizing that China has offensive cyber military forces, warning that "the tendency of militarization and deterrence buildup in cyberspace is not conducive to international security and strategic mutual trust" without explicitly opposing the arming of cyberspace.[135]

Outside of the PLA, China has also taken some diplomatic steps to help control escalation in cyberspace by clarifying conflict thresholds. Most importantly, China has also demonstrated tacit approval for a norm against cyber attacks on peacetime critical infrastructure since 2014 by consenting to the 2014-5 U.S. Group of Governmental Experts (GGE) report, which included a norm against peacetime cyber attacks.[136] Xi Jinping and Barack Obama also

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[133] Author's interview, Shanghai, 2017. China's White Paper on Space Activities in 2016 took a clear stance opposing weaponization than the language in the International Strategy quoted above: "China ... opposes the weaponization of or an arms race in outer space." State Council Information Office of the People's Republic of China, "China's Space Activities in 2016" (Beijing, December 2016), http://english.gov.cn/archive/white_paper/2016/12/28/content_281475527159496.htm.
[134] Hao, "Dui Meiguo Jiakuai Wangluo Zhan Fazhan de Jidian Sikao," 5.
[135] "Full Text: International Strategy of Cooperation on Cyberspace," *Xinhua News Agency*, March 1, 2017, http://news.xinhuanet.com/english/china/2017-03/01/c_136094371_2.htm.
[136] Author's interviews, Beijing, 2016.

endorsed the 2014-5 GGE report during Xi's visit to the United States in September 2015.[137] By consenting to the report, China also reversed its previous diplomatic opposition to the application of the law of armed conflict to cyberspace, although Chinese analysts still see the law of armed conflict as insufficient to regulate cyber conflict.[138]

V. Changes in the Expected Cost of Cyber Retaliation

Around 2010 China's expected cost of retaliation for attacking the United States to gain strategic leverage increased because its exposure to cyber attacks, and therefore to a U.S. counter-attack increased. Chinese analysts were pessimistic that escalation from an initial cyber attack could be controlled. China therefore faced a high expected cost of retaliation between 2010 and 2014. Its maintenance of a brinkmanship cyber force posture in those years is difficult to explain with the theory of strategic substitution. The theory would not expect China to use strategic cyber weapons to coerce the United States because its threats to use cyber weapons would not be credible to Washington given its high expected cost of retaliation. PLA assessments of the feasibility of attributing cyber attacks to their perpetrators changed in 2014, which set the stage for China's adoption of a calibrated escalation posture. As this change made it feasible to control escalation in cyber conflict, the theory of strategic substitution can account for China's choice of cyber force posture after 2014. China's persistence with a

[137] "FACT SHEET: President Xi Jinping's State Visit to the United States," whitehouse.gov, September 25, 2015, https://obamawhitehouse.archives.gov/the-press-office/2015/09/25/fact-sheet-president-xi-jinpings-state-visit-united-states.
[138] Yu Saisai and Du Yucong, "Wangluo Zhan Dui Xiandai Zhanzheng Fa Tixi de Yingxiang," *Waiguo Junshi Xueshu [Foreign Military Arts]* 5 (2015): 70–72.

brinkmanship posture is best explained by organizational inertia to updating China's cyber force posture to adapt to its evolving cyber threat landscape.

China's Increasing Exposure to Attack

During the mid-2000s, China's assessment of its exposure to cyber attacks increased dramatically as its dependence on computer networks increased and it observed other states' destructive use of cyber capabilities. Events in other countries demonstrated to Chinese leaders that they faced an increasing range and magnitude of cyber threats. Social movements like the Color Revolutions in the early 2000s and Arab Spring, beginning in late 2010, demonstrated the potential for the internet to stoke societal unrest.[139] China's leaders decided not to allow Facebook and Twitter to return to China, after blocking both platforms in 2008, due to suspicions that the United States government used them to encourage regime change in the Middle East.[140] As Major General Hao argued, "Social media websites like Twitter and Facebook have become strategic weapons for intervening in the internal politics of other countries."[141] The U.S.-Israeli Olympic Games attacks on the Iranian nuclear program that came to light in early 2012,[142] and Russian cyber attacks on Georgian infrastructure in 2008 offered proof that cyber attacks could cause physical effects of strategic significance.[143] The revelations of Edward Snowden about the extent of U.S. surveillance programs accentuated the risk of relying on foreign hardware, software and internet infrastructure.[144] The

[139] Author's interviews, Beijing and Shanghai, 2015 and 2016; Xiao, *Zhanlue Xue*, 143–44.
[140] Author's interview, Shanghai, 2017.
[141] Hao, "Dui Meiguo Jiakuai Wangluo Zhan Fazhan de Jidian Sikao," 3.
[142] Xiao, *Zhanlue Xue*, 145.
[143] Ye, *Xinxi Zuozhan Xue Jiaocheng*, 55.
[144] Author's interview, Shanghai, 2017.

establishment of the U.S. Cyber Command in 2009 and the release of increasingly detailed U.S. government cyber strategies highlighted the increasing prominence of military cyber capabilities in warfare.[145]

Within China, the number of internet users and its dependence on information networks for critical infrastructure operations, the digital economy, and military operations also increased. China's rapid move online increased the number and value of Chinese cyber targets for a foreign state to attack. As the chart below shows, in 1999, when China established its cyber posture, only 0.7 per cent of Chinese citizens had access to the internet. That percentage had grown to 30 per cent by 2010, and over 50 per cent by 2016. PLA efforts to increase its use of information networks also created a multitude of valuable military cyber targets for an adversary. China's lack of indigenous information technology software and hardware created huge vulnerabilities, as PLA operating systems depended on foreign hardware and software. One 2008 report called military informationization "a double-edged sword" that allowed others to control China, given that it was ten years behind the technology levels of the most advanced states.[146]

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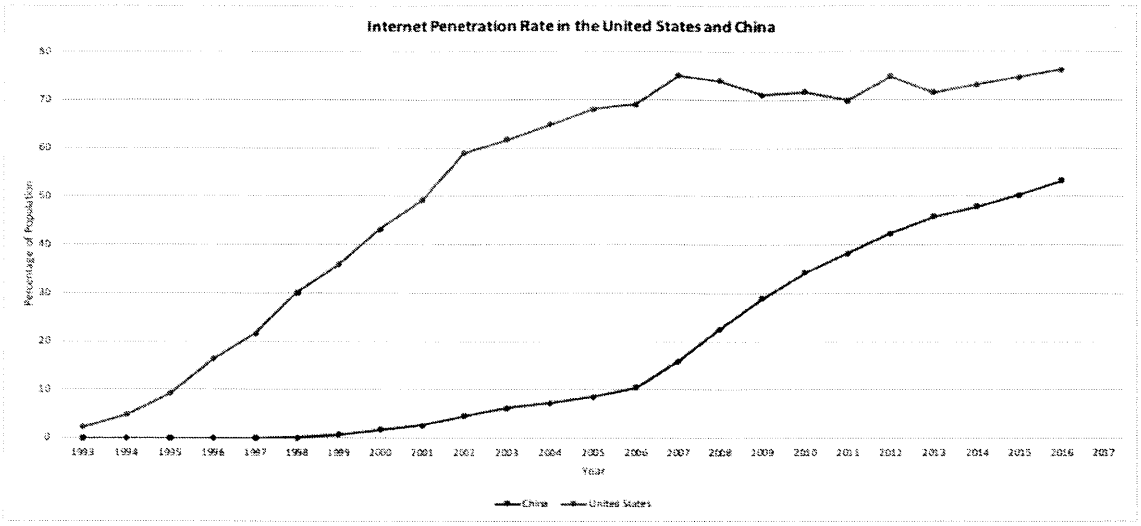
[145] Author's interviews, Beijing and Shanghai, 2015 and 2016; Xiao, *Zhanlue Xue*; Lü Jinghua, *Meiguo Wangluo Kongjian Zhan Sixiang Yanjiu [A Study of U.S. Thought on Cyber Warfare]* (Beijing: Junshi Kexue Yuan Chubanshe, 2014), 232–39; Lü Jinghua and Gou Huanlei Gou, "Cong Meiguo Fangbu Xinpian 'Wangluo Kongjian Zhanlue' Kan Meijun Wangluo Zuozhan Fazhan Qushi [Viewing the U.S. Military's Development Trend of Cyberwar from Its 'Cyberspace Strategy']," *Waiguo Junshi Xueshu [Foreign Military Arts]*, no. 7 (2015): 39–43; Lü Jinghua, "Wangluo Kongjian Zhiquan - Meiguo Wangluo Kongjian Zhan Mudi Fenxi [Cyberspace Dominance - Analysis of the United States' Cyberspace Warfare Goal]," *Waiguo Junshi Xueshu [Foreign Military Arts]*, no. 2 (2015): 22–25.

[146] Niu, *Jundui Xinixihua Jianshe Zhanlue Gailun*, 58.



Source: World Bank World Development Indicators https://datacatalog.worldbank.org/dataset/world-development-indicators

Figure 1: Internet Penetration Rate in China and the United States

Chinese civilian leaders began to recognize cyber threats and devise policies to manage them around 2008 but the PLA was slower to recognize the problems with its cyber posture. Civilian leaders took both domestic and diplomatic actions to address cyber threats. In January 2007, Hu Jintao gave a speech to a Politburo study session on the need to manage online public opinion.[147] China established the internet filtering infrastructure known as the "Great Firewall" to stop Chinese citizens from accessing undesirable content online in approximately 2000. By 2010, China began to actively promote an alternative to the U.S.-led multi-stakeholder internet governance model through the concept of "internet sovereignty."[148] It proposed a state-based internet governance model that allowed states to control online content as well as ensure the functioning of the internet.

[147] Jintao Hu, *Hu Jintao Wenxuan (Di Er Juan) [Selected Works of Hu Jintao (Volume 2)]* (Beijing: Zhongyang Wenxian Chubanshe, 2016), 559–62.
[148] State Council Information Office of the People's Republic of China, "The Internet in China" (Beijing, June 8, 2010), section v, http://www.china.org.cn/government/whitepaper/node_7093508.htm.

Problems with China's Brinkmanship Posture

The PLA may have needed civilian encouragement to systematically diagnose and address the discord between its brinkmanship posture and China's increasingly complex cyber threat landscape. Hu Jintao called on the PLA to further develop China's cyber strategy in his November 2012 work report to the 18th Party Congress, as he stepped down as China's top leader. A month later, on December 15, the PLA's China Association for Military Sciences hosted the "Cyber and Information Security Strategy Research Meeting," with participants from civilian departments and the People's Armed Police. In his welcoming address, the Vice-Commandant of the NDU Wang Chaotian noted that the meeting "actively responded to the strategic requirements of the '18th Party Congress' mentioning 'the need to emphasize far seas, space and cyberspace security at a high level.'"[149] The PLA had either recognized it needed to reform its cyber posture or had received instructions from top leaders to do so by September 2012, when the conference call for abstracts was issued.

The PLA identified a multitude of threats to its national security coming from cyberspace. At the 2012 conference, NDU Professor Huang emphasized that China faced four kinds of online threats: "being controlled by others" due to foreign technology dependence, China's weak position in international political, economic and diplomatic international competition online, everyday threats from crime and hackers, and the "militarization" threat.[150] Deputy head of the GSD Fourth Department in 2012, Major General Hao Yeli, wrote that China needed a system of "national cyber defense" (*wangluo guofang*) against varied threats, which included "cyber

[149] Wang, *Wangluo Kongjian Anquan Zhanlue Yanjiu*, 1. Wang was also the President of the China Association for Military Studies Military Command Division, the host organization of the meeting.
[150] Ibid., 9.

invasion," cyber terrorism and "the subversion of ideology."[151] In a later article, she remarked that "the principal battlefield of cyberspace is the open internet, not closed, tactical networks."[152] Around 2014, PLA researchers also began to worry about cyber threats to China's critical infrastructure.[153]

PLA researchers also worried about the military's vulnerability to cyber attacks due to its increased reliance on computer networks. Researchers worried about backdoors in the Windows software, which was still widely used for operations and research in 2012.[154] They admitted that the PLA had "possibly over-emphasized the benefits and ignored the hidden dangers" of using information technology in its initial phase of informationization in the early 2000s.[155] In the words of one AMS cyber researcher, "In the past decades, our achievements in informationization are remarkable, but in the area of cybersecurity defense, the gap with the United States and other developed countries has increased rather than decreased."[156] At the 2012 conference, NDU authors offered a vivid illustration of the PLA's inadequate cyber defenses, "some work units fundamentally do not have a person responsible for cyber and information security, they immediately install one when they are inspected by superiors, each kind of regulation system performs practically no function."[157]

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[151] Hao Yeli, "Lun Wangluo Guofang Jianshe Zhanlue Guanli Wenti Jiqi Zongti Sheji [On the Issue of Strategic Management of Establishing National Cyber Defense]," in *Zhanlue Yanjiu [Research on Strategy]*, Guofang Daxue Xuebao Lunwen Jingxuan Congshu [Selected Articles from the National Defense University Journal] (Beijing: Guofang Daxue Chubanshe, 2014), 251.
[152] Hao, "Dui Meiguo Jiakuai Wangluo Zhan Fazhan de Jidian Sikao," 3.
[153] Zhou Dewang, Fu Xiaodong, and Li Rui, "On Cyberspace Confrontation [Lun Wangkong Duikang]," *China Military Science [Zhongguo Jushi Kexue]*, no. 4 (2014): 189; Wang and Wang, "Ying Dui Wangluo Kongjian Zhongda Anquan Wenti Chuyi."
[154] Xu, *Wo Jun Xinxi Zuozhan Liliang Jianshe Yanjiu*, 114.
[155] Niu, *Jundui Xinixihua Jianshe Zhanlue Gailun*, 58.
[156] Lü, *Meiguo Wangluo Kongjian Zhan Sixiang Yanjiu*, 242.
[157] Wang, *Wangluo Kongjian Anquan Zhanlue Yanjiu*, 82.

A comparison of the guidance top civilian leader Hu Jintao gave to the PLA at the beginning and end of his time in office highlights the changing requirements for PLA's cyber posture. In December 2004, Hu gave the PLA guidance to carry out a "new historic mission," which included defending China's expanding national interests in the electromagnetic and space domains.[158] Hu remarked that "following the expansion in the role of information technology; the electromagnetic domain is gradually starting to be viewed as an important physical domain, in military affairs it is the 'fifth battlefield' following after the land, maritime, air and space battlefields."[159] Information warfare capabilities were one of the sets of capabilities the PLA would need to carry out the New Historic Mission, and information hostilities was one of the new styles of military action it would need to adopt.[160] In 2012, in his work report to the 18th Party Congress as he left office, Hu reiterated the PLA's New Historic Mission. But he replaced the "electromagnetic domain" with the "cyber domain."[161] According to NDU professor, Huang Yi, the Party's decision to mention cybersecurity at the 18th Party Congress meant that "cyber and information security problems have become an important part of national building and strategy planning, requiring that we must quickly establish a cyber and information security strategy system."[162]

The biggest change was that the PLA needed to take account of China's exposure to cyber attacks in civilian cyberspace when using cyber weapons to maximize strategic leverage over the United States. China's existing brinkmanship cyber posture was sub-optimal in light of

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[158] Hu, *Hu Jintao Wenxuan (Di Er Juan)*, 256–62.
[159] Ibid., 259.
[160] Niu, *Jundui Xinixihua Jianshe Zhanlue Gailun*, 47.
[161] "Hu Jintao Qiangdiao Gaodu Guanzhu Haiyang, Taikong, Wangluo Kongjian Anquan [Hu Jintao Emphasizes Paying a High Level of Attention to Maritime, Space, and Cyber Space Security]," *Haijun Wang*, November 8, 2012, http://mil.jschina.com.cn/system/2012/11/08/015164898.shtml.
[162] Wang, *Wangluo Kongjian Anquan Zhanlue Yanjiu*, 4.

these changes. At the conference, Professor Huang recognized that China needed to coordinate military cyber strategy with the rest of the government and private industry, and embrace civil-military integration.[163] He explained that, "our foundation is weak, starting point late, our overall capability is on the weak side; and our principal adversary's starting point was early, steps are many, methods plentiful, capability is constantly increasing." The PLA was not fulfilling its task of protecting Chinese interests in cyberspace, "this kind of state of affairs is clearly inappropriate to current world cyber and space security development trends, inappropriate for our country's expanding strategic interests, and inappropriate for the fundamental requirements of winning a local war under informationized conditions."[164]

PLA officers singled out its delegated cyber command and control arrangements as one of the main problems with its brinkmanship posture. These arrangements not only increased escalation risks but also created inefficiencies in cyber operations. One officer from the Jinan Military Region headquarters remarked that "there is no clear distinction between peace and war in cyberspace, its political nature and sensitivity is increasing each day, once our management is unsuitable, at the very least it reveals our moves and intentions, at its most serious it influences our national political and diplomatic situation."[165] An officer from the Beijing Military Region headquarters observed that "currently, our military cyberspace operations building still has competition and not cooperation, resources [but] not sharing, capabilities [but] not complementing each other."[166] Units were specialized but they did not coordinate or share resources with each other, leading to the problem of "build yourself, use

[163] Ibid., 9.
[164] Ibid., 9.
[165] Ibid., 87.
[166] Ibid., 66.

yourself." In overall joint maneuvers (*zhengti liandong*), intelligence sharing, and incident response, cyber capabilities could not be used together in a complementary way.[167] Another PLA scholar warned that the force structure was hampering its development because "the period for researching and developing soft kill information weapons is short, few people are entering [this field], they are omitted from budgets, they are rarely seen."[168] The officer from Jinan concluded that "each cyber warfare force is fighting its own war (*gezi weizhan*)."[169]

A Calibrated Escalation Solution

To address some of these problems, PLA researchers recommended organizational arrangements characteristic of a calibrated escalation posture: a more centralized, comprehensive, regular cyber force with a stronger command and control structure. Around 2008 PLA writings described cyber units as similar to a special forces unit.[170] Cyber conflict was a contest of skill between hackers, "no matter the size of a state's national power, or the size of its armed forces, in the area of computer network war, everyone is equal (*renren pingdeng*). You only need to have a high level of computer network war skills (*rencai*), no matter how tiny your numbers are, even if you only have one person and one computer, that can be enough to somewhat achieve an aim in the computer network warfare area."[171] By 2012, this concept of a cyber force's structure was not only leading to the operational problems outlined above, but was out of step with the trend among militaries worldwide who were transforming specialist cyber warfare units into "cyber armies."[172]

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[167] Ibid., 63.
[168] Xu, *Wo Jun Xinxi Zuozhan Liliang Jianshe Yanjiu*, 113–14.
[169] Wang, *Wangluo Kongjian Anquan Zhanlue Yanjiu*, 87.
[170] Guo, *Xinxi Hua Zhanzheng Yu Wangdian Budui.*
[171] Liu Kejian and Wang Xiubai, *Di Yi Chang Yi Kong Zhisheng de Zhanzheng -- Kesuowo Zhanzheng [The First War Won from the Air: The Kosovo War]* (Beijing: Junshi Kexue Yuan Chubanshe, 2008), 262.
[172] Xiao, *Zhanlue Xue*, 382–83.

Although PLA materials published around 2012-3 indicate that China would soon establish a "cyber army," there is no evidence that the PLA had decided what a more centralized cyber force would look like at that time. The officer from the Beijing Military Region headquarters recommended a "three-level cyberspace operations command system made up of the CMC joint command, information operations groups, and cyber operations groups."[173] The meeting conference papers indicate that the PLA examined the force structures of other countries at length in 2012, including the U.S. Cyber Command structure. But they did not recommend that China simply copy the U.S. Cyber Command structure or the structure of any other country. Contrary to the expectations of emulation theory, they scrutinized the U.S. example to understand their adversary rather than copy it.[174] PLA texts published in 2013 anticipated that an independent "cyber army"[175] would soon be established. One researcher perspicaciously recommended an independent service for information warfare within the PLA, similar to the Second Artillery, the PLA's strategic missile force.[176]

Attribution and the Feasibility of Controlling Escalation

The theory of strategic substitution would expect the PLA to recognize the challenges of attributing cyber attacks as a major problem in reforming its posture, once China was more equally exposed to cyber attack, compared to the United States. Using cyber force could be more damaging to China than the stakes of a limited conflict, given its high expected cost of retaliation, leading the United States to dismiss its cyber threats as bluff. According to the 2013

[173] Wang, *Wangluo Kongjian Anquan Zhanlue Yanjiu*, 65.
[174] Ibid., 28.
[175] Zhou, *Junzhong Zhanlue Jiaocheng*, 52, 105.
[176] Xu, *Wo Jun Xinxi Zuozhan Liliang Jianshe Yanjiu*, 98.

Science of Military Strategy cyber escalation could not be controlled because of the difficulty of attribution and uncertainty of effects, including third party effects: "Ambiguity and uncertainty affects the effectiveness of cyber domain offensive and defensive hostilities. Overall, this influences and restricts the development of cyber military struggles and is an important factor restricting the outbreak of large-scale cyber war."[177] The book states that, "the terrible consequences and uncertainty of receiving an enemy cyberattack deters all countries from lightly starting a cyberwar."[178]

While there is some evidence that China saw attribution as an obstacle to controlling escalation, there is no evidence to suggest that China saw the difficulty of attribution as an obstacle to its use of cyber attacks to coerce the United States. The theory of strategic substitution cannot explain why Chinese leaders and strategists retained a brinkmanship posture after 2010. At the 2012 meeting, PLA officers recommended the use of cyber weapons as "assassin's mace" weapons similar to conventional missiles, for "offensive and defensive deterrence," and as a part of China's "multi-domain deterrence" posture.[179] Most likely, the PLA's organizational interest in retaining and expanding its cyber mission led it to ignore the fact that threatening to use cyber attacks to coerce the United States would be both increasingly costly for China and less and less credible to Washington.

In mid-2014, a solution emerged to the discord between China's cyber brinkmanship posture and its expected cost of retaliation when the United States demonstrated that it was possible to

[177] Shou, *Zhanlue Xue*, 190.
[178] Ibid., 196.
[179] Wang, *Wangluo Kongjian Anquan Zhanlue Yanjiu*, 6, 48, 426.

attribute cyber attacks. Thereafter, it would be feasible to control escalation from cyber attacks. Once it was feasible to control cyber escalation, China would be able to retain a credible, coercive cyber posture despite its more equal exposure to cyber attack, relative to the United States, by shifting to a calibrated escalation posture. No PLA writings make the connection between its calibrated escalation posture and the feasibility of attribution. It is therefore difficult to judge whether changes in the feasibility of controlling escalation was a decisive factor in China's 2014 posture change, as the theory of strategic substitution would expect.

The United States provided proof of concept of cyber attribution when it publicly attributed cyber intrusions into the networks of U.S. corporations to PLA officers in a Department of Justice indictment of five officers for intellectual property theft in May 2014. This incident persuaded China's cybersecurity policy community that cyber attacks could be attributed sufficiently accurately to justify retaliation.[180] The United States again demonstrated its attribution capabilities following North Korea's attack on Sony Pictures in late 2014. The speed with which the Obama Administration attributed the attack to North Korea demonstrated to Chinese analysts that the United States was surveilling computer networks on Chinese territory, where North Korean hackers were operating from a hotel. Major General Hao Yeli cited the Sony incident as "a classic example" of the risks of mis-attributing cyber attacks to China, "internet facilities within China's borders were used as 'chicken meat,' and 'diving boards,'

[180] Author's interviews, Beijing and Shanghai, 2016. Two legal scholars writing in the *China Military Science* journal criticized the indictment not on the grounds of poor attribution, but rather a lack of U.S. jurisdiction. Xie Dan and Hu Zhipeng, "Junren Shewai Xingshi Sifa Guanjia Wenti Yanjiu," *Zhongguo Junshi Kexue [China Military Science]* 4 (2015): 143–51.

China was an innocent victim."[181] After 2014, some PLA writings also acknowledged that it was possible to attribute cyber attacks to their perpetrators.[182]

VI. The Decision to Adopt a Calibrated Escalation Cyber Posture

Chinese leaders changed its cyber force posture in 2014 both to increase the credibility of its posture, as the theory of strategic substitution would expect, and for organizational reasons. On the one hand, a calibrated escalation force posture was China's optimal strategic choice because it allowed the PLA to make credible threats to use cyber weapons to alter U.S. calculations in a Taiwan crisis or conflict, given its exposure to cyber attack. On the other hand, a calibrated escalation force posture allowed the top civilian leadership to end the delegated command and control arrangements of its brinkmanship posture, which had resulted in poor discipline and corruption. A more tightly controlled cyber force accorded with Xi Jinping's domestic priorities of fighting corruption in the Communist Party and increasing the loyalty of the PLA to the Party.

Beginning in 2014, China simultaneously reformed both PLA and civilian cyber policy, to better address its complex cyber threat environment. China's increasing vulnerability to cyber attacks led to a re-organization of civilian agencies for cybersecurity policy in early 2014. The PLA participated in a number of new, domestically-focused, high-level cybersecurity

[181] Hao, "Dui Meiguo Jiakuai Wangluo Zhan Fazhan de Jidian Sikao," 4.
[182] For example, one PLA author remarked that during the Russia-Ukraine conflict, "although there is no proof that the Russian and Ukrainian governments are linked to both sides' websites suffering frequent attacks, but evidently, behind the scenes their operators are both governments, this has become an open secret." Ban Wentao, "Wukelan Weiji Zhong E-Wu Wangluo Zuozhan Xingdong Tedian [Characteristics of Russian and Ukrainian Actions in Cyberspace during the Ukraine Crisis]," *Waiguo Junshi Xueshu [Foreign Military Arts]* 11 (2015): 47.

institutions, including the Central Cybersecurity and Informationization Leading Small Group (LSG), which met for the first time in February 2014.[183] The PLA established its own All-Military Cybersecurity and Informationization LSG by mid-2015.[184] In March 2014, a CMC Leading Small Group for military reform met for the first time to draw up organizational reforms, which were not approved by the Politburo Standing Committee until July 29, 2015.[185] The reforms offered the PLA the opportunity to re-organize its cyber forces.

The PLA was instructed to consider strategic rather than domestic factors in formulating a new cyber posture. A PLA-authored guide to Xi Jinping's military thought called for innovation in military strategy, especially in the space and cyber domains, and the far seas, which it referred to as "the new commanding heights of military competition." The PLA was instructed to innovate its military strategy with the goal of winning a local war under "informationized conditions," based on the kinds of wars China could actually face in the future.[186] In a speech to the CMC in December 2013, Xi instructed the PLA to organize "corrections to content in combat regulations and training outlines that do not fulfill the requirements of actual war,"[187] which was an apt description of its brinkmanship cyber posture.

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[183] The LSG is believed to have one PLA representative. Author's discussions, Boston and Washington, D.C., 2016, and interview, Shanghai, 2017.

[184] The All-Military Cybersecurity and Informationization LSG was only mentioned in the official Chinese press once, in May 2015. Liang Pengfei and Zhang Yanzhong, "Quanjun Wangluo Anquan He Xinxihua Zhuanjia Zixun Weiyuan Hui Zhaokai Quanti Huiyi [All-Military Cybersecurity and Informationization Expert Advisory Committee Convenes Plenary Meeting]," *China Military Online*, May 20, 2015, http://www.81.cn/jwgz/2015-05/20/content_6499978.htm.

[185] Zhonggong Zhongyang Wenxian Yanjiu Shi [Central party documents research office], *Xi Jinping Guofang He Jundui Jianshe Zhongyao Lunshu Xuanbian (San)*, 49.

[186] Renmin Jiefang Jun Zong Zhengzhi Bu [People's Liberation Army General Political Department], *Xi Jinping Guofang He Jundui Jianshe Zhongyao Lunshu Xuanbian (Yi) [Selection of Chairman Xi's Important Treatises on National Defense and Military Development (Volume 1)]* (Beijing: Jiefangjun Chubanshe, 2014), 185–86.

[187] Ibid., 218.

The PLA may have been working on a new cyber force posture throughout 2014, but a CMC Opinion issued in early October and a speech given by Xi Jinping in November that year provide clear evidence that China was abandoning its brinkmanship posture. The CMC issued an "Opinion on Strengthening Military Information Security Work" on October 7, 2014, which ordered a change in posture and gave guiding principles for the PLA's future cyber strategy. The steps to implement the Opinion included establishing a more comprehensive cyber defense and information protection system, developing PLA-wide rules for information security, adopting domestically-produced information security systems and products, increasing information defense capabilities, and punishing illegal PLA activity online.[188] At an All-Military Political Work Conference (the Gutian Conference) in early November 2014, a "blueprint for the development of military political thought in the 'Internet Plus' era, designed and planned by the highest military command,"[189] was unveiled. The *PLA Daily* reported that Xi gave a speech on November 4, 2016 changing PLA cyber force posture to improve its ability to win local wars with a strong "informationized" force.[190] Xi Jinping criticized the PLA's existing cyber posture for its lack of theoretical guidance, negative effects, and inappropriateness to the current state of the internet.[191]

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[188] "Jing Xi Jinping Zhuxi Pizhun Zhongyang Junwei Yinfa 'Guanyu Jin Yi Bu Jiaqiang Jundui Xinxi Anquan Gongzuo Yijian' [Following Xi Jinping's Approval, the CMC Publishes an 'Opinion on Improving the Strengthening of Military Information Security Work']," *Renmin Wang [People Online]*, October 7, 2014, http://military.people.com.cn/n/2014/1007/c1011-25783981.html.

[189] "Jundui 'Hulian Wang Jia' Shidai Zhi Quewen [The Military Examines Shortcomings in the 'Internet Plus' Era]," *Jiefangjun Bao [PLA Daily]*, January 15, 2015, http://www.cac.gov.cn/2016-01/15/c_1117783124.htm.

[190] "Jundui 'Hulian Wang Jia' Shidai Zhi Quewen."

[191] Cheng Jian, "Luoshi Gutian Zhenggong Hui Jingshen de Renshi Yu Sikao [Understanding and Reflections on Implementing the Spirit of the Gutian Political Work Conference]," *Zhongguo Junshi Kexue [China Military Science]*, no. 6 (2015): 104–10.

China's calibrated escalation posture is not clearly articulated in the sources summarizing either Xi's remarks at the Gutian Conference or the CMC Opinion. But the content of both Xi's remarks and Opinion mirror the PLA's threat perceptions and concerns with China's existing cyber force outlined in the previous section. A summary of the CMC 2014 Opinion, published in the *PLA Daily* on October 11, 2014,[192] indicated that the CMC was changing PLA cyber force posture because its existing posture was harming the national interest. China was facing enormous pressure in cyberspace due to the "increasingly intense competition over the rights to cyberspace development leadership and control" among all countries. PLA cyber force posture needed to be coordinated with Xi's civilian cybersecurity agenda to meet this threat. The Opinion was "an important move implementing the Central Party and Chairman Xi's series of important strategic policies on information security, actively facing security threats in cyberspace, making progress in the regulation and guidance of military information security work."[193] According to Xi's remarks at the Gutian Conference, cyber conflict had become "the principal direction of attack" and one of the main forms of military contestation the PLA would have to face.[194]

Both the Opinion and remarks hinted that the organizational arrangements for the PLA's cyber forces were harming China's domestic and foreign policy interests. Xi's remarks at the Gutian conference, summarized in the journal *China Military Science*, indicated that, "Currently some work is not at all suitable for the requirements of the cyber era, and it is already increasingly

[192] CMC opinions are highly authoritative and may follow special work conferences dedicated to the policy issue, indicating the high-level attention to the issue of cybersecurity. The fact that the Opinion was summarized and published also indicates its importance.
[193] "Jing Xi Jinping Zhuxi Pizhun Zhongyang Junwei Yinfa 'Guanyu Jin Yi Bu Jiaqiang Jundui Xinxi Anquan Gongzuo Yijian'."
[194] Cheng, "Luoshi Gutian Zhenggong Hui Jingshen de Renshi Yu Sikao," 109.

clear that thoughts and concepts, and work methods are lacking in this age (*shidai cha*)." The PLA needed to overcome its "'ostrich' attitude, traditional ways of doing things, and rigidity of thought."[195]

The PLA's online behavior was also creating problems for military discipline. One of the principles guiding cyber strategy outlined in the Opinion was to take "strong measures against illegal, criminal acts on the internet involving the military."[196] Cyber force posture was likely mentioned during the Gutian conference, which was a meeting about Party loyalty rather than operations and strategy, because of concerns that online content, especially content manipulated by an enemy, would undermine military loyalty to the Party.[197] Some PLA officers viewed infiltrations into China's "cyber sovereignty," and efforts to split the Party and the people, as a new form of imperial interventionism, similar to U.S. military interventions in Iraq and Kosovo.[198] Even if the meeting and Opinion did not directly address how China should use cyber attacks for strategic leverage, they do indicate the need for stricter control of PLA online behavior, with clear implications for command and control arrangements for cyber military units.

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[195] Ibid., 109.
[196] "Jing Xi Jinping Zhuxi Pizhun Zhongyang Junwei Yinfa 'Guanyu Jin Yi Bu Jiaqiang Jundui Xinxi Anquan Gongzuo Yijian'."
[197] Renmin Jiefang Jun Zong Zhengzhi Bu [People's Liberation Army General Political Department], *Xi Zhuxi Guofang He Jundui Jianshe Zhongyao Lunshu Duben [Reader on Chairman Xi's Important Treatises on National Defense and Military Development]* (Beijing: Jiefangjun Chubanshe, 2014), 56–58; Renmin Jiefang Jun Zong Zhengzhi Bu [People's Liberation Army General Political Department], *Xi Jinping Guofang He Jundui Jianshe Zhongyao Lunshu Xuanbian (Yi) [Selection of Chairman Xi's Important Treatises on National Defense and Military Development (Volume 1)]*, 185–86. See also Zhang Lizhong, "Lun Xinxi Wangluo Shidai Budui Sixiang Zhengzhi Gongzuo [On the Ideological and Political Work of the Armed Forces in the Mobile Internet Era]," *Zhongguo Junshi Kexue [China Military Science]* 4 (2016): 96.
[198] Hao, "Dui Meiguo Jiakuai Wangluo Zhan Fazhan de Jidian Sikao," 3.

U.S. Pressure?

An alternative explanation for China's cyber posture change in 2014 is U.S. pressure.[199] Western sources claimed that a summit meeting agreement between Xi Jinping and Barack Obama in September 2015 to refrain from state-sponsored industrial cyber espionage led to a reduction in Chinese cyber espionage.[200] Before October 2014, cyber espionage units from the PLA's Third Department TRBs were conducting cyber espionage against a variety of private enterprises, and providing their trade secrets to Chinese companies. [201] Many of these actions could have involved the PLA hackers "moonlighting" at the direction of their unit commanders, rather than acting on the orders of top PLA commanders. The United States had threatened economic sanctions unless PLA industrial espionage ceased. The analysis in this chapter strongly suggests, however, that the change in PLA cyber force posture was an important reason for any observed reduction in PLA cyber espionage in 2015 rather than vice versa. The activity of teams of hackers conducting sustained espionage operations dropped dramatically in mid-October 2014 and mid-July 2015, according to data published by the U.S. cyber security firm, Fireeye.[202] These dates correspond with the CMC Opinion and the Politburo's approval of the PLA reform plan, not Xi-Obama summit which took place in September 2015.

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[199] Scott Warren Harold, Martin C. Libicki, and Astrid Stuth Cevallos, *Getting to Yes with China in Cyberspace* (Santa Monica, C.A.: RAND Corporation, 2016).
[200] Dustin Volz, "Chinese Economic Cyber-Espionage Is Diminishing, Says U.S. Official," *Reuters*, June 28, 2016, http://www.reuters.com/article/us-cyber-china-idUSKCN0ZE1S8.
[201] "Red Line Drawn: China Recalculates Its Use of Cyber Espionage" (Milpitas, C.A.: Fireye, June 2016); Mandiant, "APT1: Exposing One of China's Cyber Espionage Units," February 18, 2013, http://intelreport.mandiant.com/Mandiant_APT1_Report.pdf.
[202] "Red Line Drawn: China Recalculates Its Use of Cyber Espionage," 11.

VII. Evaluating Theoretical Explanations for China's Cyber Force Postures

China's changing cyber force posture offers a unique opportunity to test the explanatory power of the theory of strategic substitution because Chinese leaders made a clear decision to change its posture to a calibrated escalation posture a decade after adopting a brinkmanship posture. Although China's conventional missile posture changed in a similar manner, there is no evidence available of a point at which Chinese leaders decided to change that posture. The theory of strategic substitution explains both the timing and decision-making process of China's cyber force posture decisions in both 1999-2000 and 2014. China's decision to pursue a cyber weapons capability satisfied to a need for strategic leverage against the United States. Developing a cyber force posture would be more credible than threatening to use nuclear weapons and more expedient than building up China's conventional military capabilities, following the deterioration in China's threat environment after the 1999 bombing of the Chinese embassy in Belgrade.

The theory of strategic substitution explains China's choice of a brinkmanship force posture around 2001 and a calibrated escalation posture after 2014. Once China's exposure to cyber attack increased by 2010 and it became feasible to control escalation from cyber attacks in 2014, a calibrated escalation posture was China's optimal choice to maximize strategic leverage over an adversary. The theory of strategic substitution does not, however, explain why China persisted with a brinkmanship posture that could have provoked punishing U.S. retaliation between 2010 and 2014. China should not have threatened to use its strategic cyber weapons to gain leverage over the United States during those years.

The alternative explanations of organization theory and emulation theory do not provide as complete an explanation of China's cyber force posture decisions. Both alternative explanations would have expected the PLA to adopt a brinkmanship force posture much earlier, either copying the U.S. use of "computer network viruses" in the 1991 Gulf War, or establishing a force posture once the PLA began to develop cyber capabilities in the late 1990s. Both emulation of the United States and organizational factors can also explain China's to adoption of a calibrated escalation posture by 2014. Nevertheless, emulation theory would have expected China to do so earlier, after the United States established a Cyber Command in 2009. Further, China's organizational structure for centralizing its cyber force, the SSF, does not resemble the U.S. Cyber Command, even if the PLA extensively studied U.S. cyber force posture before changing its own posture. China took inspiration from foreign militaries but adapted those lessons to suit its own strategic and domestic environment. The PLA's justifications for adopting these two force postures also offer little support for an emulation explanation.

Organization theory explains the timing and provides one reason for China's 2014 decision to adopt a calibrated escalation posture. Although PLA researchers recognized the sub-optimal nature of China's brinkmanship posture by 2012, a lack of policy coordination between civilian organizations worried about growing cyber threats and PLA organizational inertia explain the persistence of China's brinkmanship posture until 2014. Organizational factors made China's brinkmanship force posture sticky, even if its high expected cost of retaliation between 2010 and 2014 made the posture sub-optimal for gaining strategic leverage. In 2014, the combination

of General Secretary Xi Jinping's assertion of Party authority over the PLA, and the better coordination of civilian cyber organizations was able to overcome that organizational resistance to change. Nevertheless, the PLA retained the authority to determine its cyber posture, despite the increased influence of the General Secretary and civilian organizations on its decisions after 2014.

Conclusion

China pursued a coercive cyber weapons capability, after the U.S. bombing of the Chinese embassy in Belgrade in May 1999 worsened China's threat environment, in order to maximize strategic leverage over the United States in case the two countries fought a limited war over Taiwanese independence. The PLA initially adopted a brinkmanship posture to exploit the severe asymmetry in U.S. dependence on cyberspace, compared to China's modest dependence on computer networks. As Chinese society, the economy, and the PLA became more dependent on computer networks for their vital functions after 2010, China's brinkmanship posture became sub-optimal. Nevertheless, 2014 China retained a brinkmanship posture until for organizational reasons, despite the possibility that Chinese leaders could not control PLA cyber operators from triggering very costly retaliation. In 2014, U.S. actions demonstrated to China that attribution for cyber attacks was possible, and therefore it was possible to control escalation following a low-intensity cyber attack. Chinese leaders changed China's cyber force posture in 2014 to a calibrated escalation posture, which the PLA has implemented since then.

Chapter 6: China's Space Force Posture

Introduction

Chinese leaders decided to pursue a space weapons capability to maximize its strategic leverage against the United States in a limited war after the Chinese embassy in Belgrade was bombed by U.S. forces during the Kosovo War on May 8, 1999. Chinese leaders interpreted that bombing as a clear sign of U.S. hostility and the inadequacy of their existing sources of strategic leverage. China was able to build on decades of space weapons research and technology to pursue a counter-space capability. Around 2004, People's Liberation Army (PLA) researchers indicated that China should adopt a calibrated escalation space posture because it had valuable assets in space that would be vulnerable to U.S. retaliation or any debris caused by China's own anti-satellite (ASAT) weapons. But other PLA researchers suggested that space weapons could be used preemptively in a conflict to facilitate conventional military operations. Chinese leaders likely adopted a calibrated escalation posture by 2009 but did not fully implement it until they reviewed China's space posture between 2013 and 2015. After that review, Chinese leaders rejected PLA proposals for space weapons doctrine and organizational arrangements that would be inconsistent with a calibrated escalation posture. At the time of writing, the PLA has still not deployed many of the space weapons it is developing.

The theory of strategic substitution explains China's decision to pursue a coercive space weapons capability between around 2002 and its subsequent decision to adopt a calibrated escalation force posture. China pursued a coercive space capability to respond to a need for

strategic leverage after the Belgrade embassy bombing worsened its threat environment. Chinese strategists viewed threats to use space weapons first as more credible than nuclear threats in a limited war. Space weapons could also effectively compensate for China's conventional inferiority in a Taiwan contingency. Nevertheless, China faced a moderate expected cost of retaliation for using space weapons because China had extensive, valuable space assets. China adopted a calibrated escalation posture to balance its need to maximize strategic leverage over the United States with a desire to minimize the damage to Chinese space assets from a U.S. retaliatory attack in space.

The theory of strategic substitution cannot explain two aspects of China's space force posture: its lack of transparency and the decision to review space force posture after 2012. China's space posture is not as transparent as an ideal-type calibrated escalation space posture. There are a number of possible reasons why China's space force posture lacks transparency, ranging from its diplomatic stance opposing the weaponization of outer space in the United Nations to using ambiguity to gain leverage, a characteristic of a brinkmanship posture. The theory of strategic substitution also does not provide a complete explanation for China's review of its force posture after 2012. China's need for strategic leverage may have increased after the United States announced its Pivot to Asia policy, which worsened China's threat environment, albeit not as rapidly or unexpectedly as the 1999 Belgrade embassy bombing or 1995-6 Taiwan straits crisis. Alternatively, China's growing reliance on space, combined with the imminent deployment of its first strategic space weapons around 2012, may have prompted the review. The review may also have been a by-product of the planning process for adjustments to China's military strategy and PLA organizational reforms in 2014-5.

This chapter unfolds as follows. The first section describes ideal-type brinkmanship and calibrated escalation force postures for space weapons. The second section demonstrates that China adopted a calibrated escalation posture and highlights the characteristics of China's space posture that diverge from an ideal-type calibrated escalation posture. The third section analyzes China's decision to pursue a coercive space weapons capability following the Belgrade embassy bombing, its expected cost of retaliation at that time, and its initial steps to pursue a space force. The fourth section examines the adjustments that China made to its space force posture after 2012 and analyzes the reasons why Chinese leaders ordered a review of space posture at that time. I conclude with an evaluation of theoretical explanations for China's space force posture.

I. Categorizing Space Postures

What do ideal-type brinkmanship and calibrated escalation space postures look like? Below I describe the components of each posture in detail. I use the term "space weapon" to refer to any technique or weapon that a state can use to disrupt or destroy another state's ability to use outer space. "Strategic" space weapons are anti-satellite (ASAT) weapons either launched from Earth (direct-ascent ASAT weapons) or deployed to the same orbit as the target space asset (co-orbital ASAT weapons). The most serious strategic attacks would produce debris that could make an entire orbit unusable because debris can collide with and damage any satellite in orbit. "Tactical" space weapons include jammers and other non-kinetic means of disrupting an adversary's ability to use its satellites for communications, weather information, positioning, intelligence, surveillance and reconnaissance (ISR) in conventional military operations.

Tactical space weapons can also be used to conduct low-intensity and non-kinetic attacks, or reversible disruptions of an adversary's satellites, such as the ability to temporarily dazzle a satellite's optical sensors with lasers.

Brinkmanship Space Postures

Brinkmanship postures optimize a state's space capabilities, doctrine, command and control arrangements, and transparency to accelerate the pace of escalation once space weapons are used. The posture gives the adversary the last clear chance to avoid the unrestrained use of space weapons by meeting the threatening state's political demands.

To implement a brinkmanship space posture, a state must have a strategic space weapons capability. At a minimum, it must have a missile capable of hitting a satellite in low earth orbit (LEO) with a direct-ascent ASAT weapon and the space tracking capabilities to target an adversary satellite. A brinkmanship doctrine will specify that the use of space weapons is conditional on an adversary's unacceptable crisis or conflict actions and is intended to have a coercive effect on its decision to fight (or continue fighting) a limited conventional war. The posture envisages the early use of space weapons in a crisis or conflict, which could range from the large-scale use of tactical weapons to disrupt an adversary's use of space-based assets to support conventional military operations, to the use of many direct-ascent ASAT weapons. A brinkmanship doctrine aims to attack the satellites or ground-based space infrastructure that would have the greatest effect on an adversary's calculations about fighting the limited war

regardless of their collateral damage. Collateral damage may include civilian or military casualties from attacks on terrestrial space facilities and space debris from ASAT weapons.

Command and control arrangements for space weapons under a brinkmanship posture may be either strict or delegated. Theater commanders or top military or civilian leaders could have the authority to launch strategic space attacks. To increase the credibility of threats to use space weapons, a military may organize its forces to ensure that they cannot withhold the use of space weapons once a conflict begins. For example, it could deploy tactical space weapons to the same units as other conventional weapons such that an order to that unit engage in conventional combat at the outset of a conflict would also initiate space attacks. A brinkmanship posture lacks transparency, beyond demonstrating the state's space weapons capabilities to an adversary. The opacity of the posture is intended to create uncertainty in the adversary's mind about the willingness and ability of leaders to control the use of strategic space weapons.

Calibrated Escalation Space Postures

Calibrated escalation space postures optimize the four components of force posture to control escalation. The posture is premised on a tacit agreement between two states to avoid rapid and uncontrolled escalation to the unrestrained use of space attacks by both parties. The posture aims to balance threats to use force with assurances to use the most destructive strategic space weapons only as weapons of last resort.

A calibrated escalation space posture requires a variety of capabilities. The state must have both tactical weapons with low-intensity or reversible effects, strategic weapons that do not produce debris, and strategic weapons that are survivable so that the state cannot be disarmed with a preemptive strike. The state needs to have space situational awareness capabilities to verify the effects of its attacks and to determine the nature of any attack on its satellites so that it can respond proportionately.

The state's space doctrine will indicate that its use of space weapons is both conditional on an adversary's unacceptable crisis or conflict actions, and that it intends to control the escalation of space warfare. A calibrated escalation posture envisages the limited use of tactical space weapons either in a crisis or at the outset of a conflict. Initially, the state would attack targets that have local effects e.g. jamming satellite receivers in a theater of conflict, or are symbolic e.g. burning a small spot in a satellite's optical sensor without impeding its sensing functions. The use of strategic space weapons is contingent on an adversary's retaliation for those initial, low-intensity strikes.

Only top military or civilian leaders could authorize the use of strategic weapons under calibrated escalation posture command and control arrangements, but authority to use tactical weapons may be delegated to theater commanders. If authority to use tactical weapons is delegated, the state would deploy tactical and strategic space weapons to separate units to make it easier for leaders to exercise strict authority over the use of strategic weapons. Calibrated escalation postures need to be transparent if a state is to have any hope of striking a tacit agreement with an adversary to avoid the worst-case scenario of unrestrained space attacks. In

addition to demonstrating its space weapons capability, the state may have a declaratory policy stating its intention to use space weapons for controlled coercive bargaining. It may even engage in arms control or confidence building measures with its adversary to clarify its thresholds for using tactical and strategic space weapons.

Observable Implications for Posture Choice

How can these two postures be distinguished from each other and what posture would the theory of strategic substitution expect China to adopt?

In the section that follows, I look for the following features of space posture to classify China's choice. The two distinguishing features of a brinkmanship space posture are (1) a disregard for creating space debris, and (2) a lack of transparency about all aspects of space posture except the state's possession of space weapons. The four distinguishing features of a calibrated escalation space posture are: (1) the state's doctrine is explicit about its intent to both coerce an adversary and control escalation, (2) authority to use strategic space weapons is restricted to top military or civilian leaders, (3) tactical space weapons and strategic space weapons are deployed to different units if there are differences in their command and control arrangements, and (4) the state is transparent about most features of its space posture.

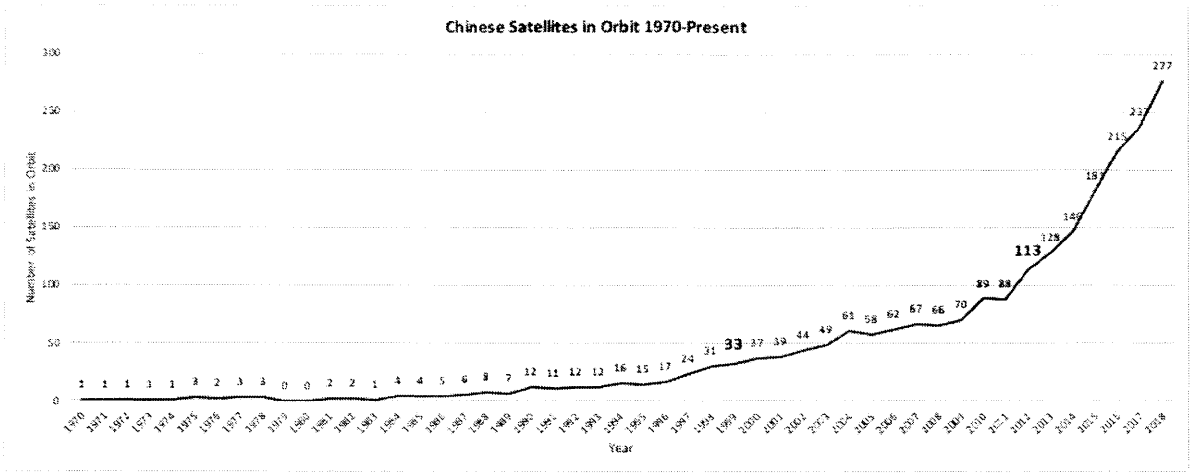
States estimate their expected cost of retaliation for space attacks to determine which posture will maximize leverage against an adversary. The two factors that determine a state's expected cost of retaliation are its exposure to space attacks compared to an adversary and whether it is

feasible to control escalation once a space weapon is used. The theory of strategic substitution would expect China to adopt a calibrated escalation space posture because it faces a moderate expected cost of retaliation from the United States. It has valuable assets in space that are vulnerable to a U.S. attack and it is feasible to control escalation from the use of low-intensity space weapons. China's exposure to retaliation and the feasibility of controlling escalation have not changed since it decided to pursue a coercive space weapons capability around 2002, so the theory of strategic substitution would not expect a change in China's space posture.

China is roughly equally exposed to space attacks compared to the United States. Although the United States has by far the most satellites in orbit, approximately 800 by the end of August 2017, China had over 200 satellites in orbit by that time, while Russia only had approximately 140.[1] China also has a manned space program and a thriving commercial space launch business. Furthermore, the PLA has invested heavily in satellites to support its conventional warfighting capabilities in the past three decades. The relative dependence of the PLA and U.S. militaries on space depends on where a conflict between the two militaries would occur. When operating close to China's shores, for example in a Taiwan contingency, China could depend on ground-based radars rather than space to support conventional military operations. When operating in the southern South China Sea or in the seas east of Japan, Taiwan and the Philippines, China would be more dependent than the United States on space for ISR, communications, and other support functions. The United States could rely on space as well as aircraft for these support

[1] "UCS Satellite Database," Union of Concerned Scientists, accessed June 23, 2018, https://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database.

functions when operating away from Chinese shores, while China does not have an air-based alternative to its space-based ISR assets.[2]



Source: Payload launch and decay data retrieved from U.S. Air Force, "Space-Track.Org," June 23, 2018, www.space-track.org.

Figure 2: Chinese Satellites in Orbit 1970-present

China's expected cost of space retaliation from the United States is moderate because it is feasible to control escalation from a space attack. It is feasible to control escalation once a space weapon is used if three conditions are satisfied: (1) low-intensity space weapons or attack options exist; (2) it is feasible to attribute attacks to their perpetrators, and (3) both space weapons and their command and control systems could survive in a protracted space conflict. Space weaponry has satisfied these conditions since the early 1990s. U.S. investments in non-kinetic space weapons in the 1980s demonstrated the feasibility of low-intensity space weapons such as lasers and microwaves. As the number of states with space weapons is relatively small, attributing space attacks would not pose the same challenges as attributing

[2] Owen R. Coté Jr., "Assessing the Undersea Balance Between the U.S. and China," SSP Working Paper (Cambridge, M.A.: Security Studies Program, Massachusetts Institute of Technology, February 2011), 9, 25–26; Jaganath Sankaran, "Limits of the Chinese Antisatellite Threat to the United States," *Strategic Studies Quarterly* 8, no. 4 (Winter 2014): 19–46.

cyber attacks, where the number of potential attackers is much greater. If a state loses its space situational awareness capabilities, it could still command its ground-based space weapons. Direct-ascent ASAT weapons can be mounted on trucks or ships to make them survivable. A state may not be able to target an adversary's space assets, however, if its terrestrial space tracking capabilities are attacked.

Organization theory would expect China to adopt a brinkmanship posture that delegated authority to use space weapons to PLA theater commanders, if the PLA, rather than civilians, had the authority to determine China's space weapons posture. A brinkmanship posture with delegated authority to use space weapons would give the military autonomy over how it uses space weapons. The low transparency of a brinkmanship posture would also suit a military organization's desire to maximize surprise to gain operational advantages in a conflict. The PLA could conduct a large-scale preemptive strike on U.S. space assets under a brinkmanship posture but not a calibrated escalation posture. Destroying U.S. space assets supporting its conventional military operations could reduce the effectiveness of the U.S. military in a conventional conflict over Taiwan, but it would still not allow the PLA to win a military victory over U.S. or Taiwanese forces.

Emulation theory would expect China to copy the U.S. space force posture by mixing elements of calibrated escalation and brinkmanship postures. Washington has developed space weapons but has not necessarily deployed them. The U.S. ballistic missile defense capability provides it with an operational direct-ascent ASAT weapon, while it has experimental satellites and

space planes in orbit that could interfere with an adversary's satellites.[3] In 2011, an unclassified summary of U.S. space policy articulated two objectives, to "prevent and deter aggression against space infrastructure that supports U.S. national security; and prepare to defeat attacks and to operate in a degraded environment."[4] China would have to assume the worst, however, that Washington deployed its space weapons as part of a brinkmanship posture. Space assets within the U.S. military are under the centralized command and control of Strategic Command, but are manned, trained and equipped by the U.S. Air Force. After 2015, debate over whether the United States should adopt a calibrated escalation posture increased.[5] In 2018 the Trump Administration indicated that it would establish a separate branch for U.S. space forces.[6]

Unable to distinguish between U.S. restraint and the opacity of a brinkmanship posture, emulating the United States would have led China to adopt a brinkmanship doctrine. The PLA Air Force would be responsible for its space forces, although they would be under centralized command and control. China would have acquired the capabilities for a calibrated escalation posture such as space situational awareness capabilities, and redundant information support systems outside of space to reduce military dependence on satellites.

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[3] David Axe, "When It Comes to War in Space, U.S. Has the Edge," *Reuters Blogs* (blog), August 10, 2015, http://blogs.reuters.com/great-debate/2015/08/09/the-u-s-military-is-preparing-for-the-real-star-wars/.
[4] U.S. Department of Defense, "National Security Space Strategy: Unclassified Summary," January 2011, 5.
[5] See, for example, Elbridge Colby, "From Sanctuary to Battlefield: A Framework for a U.S. Defense and Deterrence Strategy for Space" (Washington, D.C.: Center for a New American Security, January 2016); Sydney J. Freedberg, "2018 Forecast: Air Force, Space Force Or Multi-Domain Force?" *Breaking Defense* (blog), January 5, 2018, https://breakingdefense.com/2018/01/2018-forecast-air-force-space-force-or-multi-domain-force/.
[6] Helene Cooper, "A Space Force? The Idea May Have Merit, Some Say," *The New York Times*, June 23, 2018.

II. China's Calibrated Escalation Space Force Posture

China has slowly adopted almost all aspects of a calibrated escalation space force posture since 2002. This section describes the components of Chinese space force posture until 2012, when its leaders ordered a review of space force posture, while section IV describes China's posture thereafter. PLA writings indicated that the use of space weapons is contingent on an adversary's behavior on a conventional battlefield or in space and that any space conflict should be limited. Texts describing China's information warfare campaign do, however, envisage a preemptive, large-scale attack on adversary information systems and do not indicate that attacks on its space systems in that campaign would be limited. China has developed and tested a variety of tactical and strategic space weapons and space situational awareness capabilities. Its strategic space weapons include weapons that do not create space debris and weapons that are survivable. Before organizational reforms in 2015 enabled the PLA to centralize its space command and control arrangements, the PLA planned to deploy its direct-ascent ASAT weapons to its missile force, which would have separated those weapons from tactical space weapons and restricted authority to order their use to top military leaders, outside of the normal chain of command. The PLA has, however, not been transparent about its space force posture.

The theory of strategic substitution can explain all aspects of China's space force posture, except its lack of transparency. There are a number of possible reasons for China's lack of transparency, which I consider below. Organization theory cannot explain the strict command and control arrangements for China's space weapons or its intent to keep any space war limited. The use of space weapons as part of an information warfare campaign would fit the

expectations of organization theory in which space capabilities would be used without restraint to facilitate conventional military campaigns. Both emulation and organization theory could explain China's lack of transparency over its space force posture, as a result of the military's preference for surprise and the lack of U.S. transparency about its development and deployment of space weapons, respectively.

Doctrine

In 2016 Chinese experts claimed that China had not made any decisions as to how it would employ its counterspace capabilities,[7] but PLA research and teaching texts published before 2014 provide a fairly consistent picture of China's space weapons doctrine. Their writings likely reflect official PLA doctrine for space operations, which existed in draft form in 2009. These writings envisage the use of space weapons in the same way as a calibrated escalation doctrine, to compel an adversary in a conventional conflict, deter an adversary from starting a conventional war in a crisis or from attacking China's space assets, while controlling escalation.

Space weapons complement the PLA's nuclear weapons as a tool for strategic deterrence. The 2007 *Science of Service Strategy* described China's space forces (but not its cyber weapons or conventional missiles) as "together with nuclear forces, constituting our country's strategic combat and deterrence forces."[8] One of the principles for China's missile force, which was scheduled to receive China's direct-ascent ASAT weapons, was to "prevent dangerous crises

[7] Author's interviews, Beijing, 2015, 2016.
[8] Huo Xiaoyong, ed., *Junzhong Zhanlue Xue [The Science of Service Strategy]*, 2nd ed. (Beijing: Guofang Daxue Chubanshe, 2007), 275.

and war" using nuclear, conventional, and "new type" capabilities. "New type" capabilities likely refer to direct-ascent ASAT weapons.[9]

PLA research texts describe the use of space attacks of increasing intensity to deter an adversary, which is characteristic of a calibrated escalation posture. The series of actions China could take to implement "space deterrence" would begin in peacetime and increase in intensity during crises or wars. The deterrence actions include displaying capabilities during peacetime or in a crisis, including "carrying out tests of new types of strategic weapons;" space capabilities exercises during a crisis; space force deployments during an intense crisis e.g. moving ground support assets into place; and deterrence attacks when all other means have failed, to prevent an adversary's large-scale military action or space threats.[10] The most serious deterrence action involves attacks that would impose "punishment to teach a lesson" (*chengjie daji*),[11] to coerce an adversary to change its behavior.[12]

PLA texts are not consistent in their description of what adversary actions "space deterrence" actions are intended to deter. Some texts specify that an adversary's large-scale military actions

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[9] Zhou Xinsheng, ed., *Junzhong Zhanlue Jiaocheng [Study Guide to Military Service Strategy]* (Beijing: Junshi Kexue Yuan Chubanshe, 2013), 205.

[10] Chang Xianqi et al., *Junshi Hangtian Xue [Military Astronautics]*, 2nd ed. (Beijing: Guofang Gongye Chubanshe, 2004); Zhou, *Junzhong Zhanlue Jiaocheng*, 206; Jiang Lianju, ed., *Kongjian Zuozhan Xue Jiaocheng [Study Guide to Space Warfare]* (Beijing: Junshi Kexue Yuan Chubanshe, 2013), 127. Experts noted that internal reports on space force posture are more moderate and influential than the AMS *Study Guide to Space Warfare*. Author's interviews, Beijing, 2016.

[11] Chang et al., *Junshi Hangtian Xue*, 304; Jiang, *Kongjian Zuozhan Xue Jiaocheng*, 129.

[12] "Punishment to teach a lesson" attacks (*chengjiexing daji*) differ from retaliatory strikes (*baofuxing daji*) in two ways. First, the means of the adversary action provoking the attack and the attack itself may be different and more escalatory. Second, the purpose of the attack is not revenge. These attacks signal to an adversary that they have done wrong, to punish them, and to warn them that future attacks will be met with an equally if not more severe response. Chinese experts described India's Cold Start doctrine and the Sino-Vietnamese War as examples of "punishment to teach a lesson" attacks. By contrast, neither China's nuclear strategy nor the U.S. nuclear strategy of massive retaliation involved "punishment to teach a lesson" attacks. Author's interviews, Beijing, 2016.

could warrant the use of space attacks.[13] Some texts refer specifically to an adversary's attacks on China's space assets.[14] For example, the *2013 Science of Military Strategy* states that "at the necessary time, we can even carry out limited space warfare activities with the goal of warning and 'punishment to teach a lesson' to prevent the adversary from willfully and recklessly escalating the intensity of space hostilities."[15] Other texts are more ambiguous, stating that space attacks might deter an adversary from "taking risks in combat."[16]

Another important indicator of China's calibrated escalation space posture is that doctrinal writings state that any use of force in space should be limited. The *2013 Science of Military Strategy* notes that space hostilities should remain limited in an engagement with a stronger adversary.[17] Other texts indicate that the PLA must carefully select the timing and calibrate the intensity of space deterrence attacks to avoid triggering an unrestrained reaction from an adversary.[18] When discussing operational principles for China's missile ASAT weapons and conventional missiles, one 2013 text indicated that the missile force needed to "anticipate every combat maneuver's possible bad consequences and countermeasures to deal with them"[19] and "to the greatest extent possible, it is necessary to avoid influencing third parties."[20]

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[13] Chang et al., *Junshi Hangtian Xue*, 301–4; Jiang, *Kongjian Zuozhan Xue Jiaocheng*, 127.
[14] Shou Xiaosong, ed., *Zhanlue Xue [The Science of Military Strategy]* (Beijing: Junshi Kexue Yuan Chubanshe, 2013), 186.
[15] Ibid., 182.
[16] Ibid., 186; Xiao Tianliang, ed., *Zhanlue Xue [The Science of Military Strategy]* (Beijing: Guofang Daxue Chubanshe, 2015), 141.
[17] Shou, *Zhanlue Xue*, 186.
[18] Chang et al., *Junshi Hangtian Xue*, 302.
[19] Zhou, *Junzhong Zhanlue Jiaocheng [Study Guide to Military Service Strategy]*, 207.
[20] Ibid., 206.

There is, however, a tension between descriptions of the limited use of space weapons to coerce an adversary and using them preemptively to attack military satellites that would support U.S. conventional military forces intervening in a Taiwan conflict. PLA researchers identified the U.S. military's dependence on satellites as both one of the key sources of its warfighting effectiveness and one of its greatest vulnerabilities. 2006 PLA teaching materials observed from the Iraq war that "the core of information systems supporting informationized warfare are space-based." China therefore needed to develop space capabilities, including weapons, to restrict "the enemy's space superiority."[21] As a 2013 textbook indicated, space systems are "the glue between the operational capabilities of a country's military and operational effectiveness force multipliers" and, while "space systems are the high ground of strong adversaries' combat systems, they are also their Achilles' heel and soft underbelly."[22]

PLA texts from the mid-2000s describe a joint information campaign to gain command of space at the outset of a conflict, in addition to gaining command of the air and sea. Gaining space, air, and sea superiority would facilitate attacks on U.S. and Taiwanese forces using PLA conventional forces. The enemy's information systems would be targeted using electronic, cyber, and psychological warfare and the destruction of physical assets supporting those systems.[23] One PLA text in 2013 described the overall mission of an "information offensive" as "damaging and paralyzing enemy information systems, interfering with and influencing an adversary's capabilities for information accumulation, transmission, management and use."[24]

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[21] "Zhengduo youxiao zhidi de taikong youshi." Huo, *Junzhong Zhanlue Xue*, 256–57.
[22] Zhou, *Junzhong Zhanlue Jiaocheng*, 204.
[23] Zhang Yuliang, *Zhanyi Xue [The Science of Military Campaigns]* (Beijing: Guofang Daxue Chubanshe, 2006), 151–2, 154–5.
[24] Ye Zheng, ed., *Xinxi Zuozhan Xue Jiaocheng [Study Guide to Information Warfare]* (Junshi Kexue Yuan Chubanshe, 2013), 177.

That mission was expected to "influence an adversary's command decisions, contesting and maintaining local battlefield information superiority, supporting other campaign actions."[25] Some space research texts also mention space attack and space "blockade" combat styles alongside space deterrence. They do not specify whether those space attacks or blockades would be similarly limited to control escalation.[26]

PLA texts envisage space weapons playing a role in a future information warfare campaign. Information warfare attacks would be preemptive (*xianfa zhiren*) and would require a high level of coordination across different types of attacks to achieve their effect.[27] The components of the campaign listed in a 2013 Academy of Military Science (AMS) teaching text included electronic warfare, cyber attacks, psychological warfare and destruction of information facilities. Capabilities for destroying information facilities included space weapons such as lasers, electromagnetic pulse weapons, particle beam weapons.[28] Capabilities for anti-satellite hostilities, including both kinetic and non-kinetic attacks, were described as "strategic information warfare capabilities."[29]

PLA texts do not explain how China would reconcile the temptation to conduct as destructive an attack as possible on U.S. satellites at the outset of a conflict with the goal of controlling escalation from the use of space attacks. The PLA may have resolved this tension by developing and deploying more non-kinetic options for blinding U.S. space capabilities, such

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[25] Ibid., 109.
[26] Jiang, *Kongjian Zuozhan Xue Jiaocheng*, 132–50. Experts warned, however, that these texts may not reflect China's actual approach to using its space capabilities. Author's interview, Beijing, 2016.
[27] Ye, *Xinxi Zuozhan Xue Jiaocheng*, 174–75.
[28] Ibid., 175–81; Zhang, *Zhanyi Xue*, 155.
[29] Ye, *Xinxi Zuozhan Xue Jiaocheng*, 109 (emphasis added).

that it could withhold its debris-producing, direct-ascent ASAT weapons as a weapon of last resort. For example, the 2013 *Science of Military Strategy*, stated that in "special circumstances," rather than a matter of course, direct-ascent anti-satellite weapons may be used as part of a "joint firepower attack on enemy information systems."[30] PLA researchers may have also assumed that top military leaders on the CMC would resolve the tension between using space weapons in a limited manner or on a larger scale, depending on the contingency, given the "strategic" nature of space weapons.

Capabilities

Since 2002, China has developed and tested a variety of space weapons and space situational awareness capabilities, which enable it to implement a calibrated escalation posture. According to the 2013 *Science of Military Strategy*, China's space force structure should be "small but effective and useful" (*jinggan guanyong*). "Small but effective" refers to capabilities that would be effective against but not equivalent in scope to the "great space powers'" capabilities.[31] A "useful" force requires both the highly effective use of enabling space capabilities as well as "a certain space deterrence and counterattack capability" sufficient to stop space great powers from "easily daring" to carry out a space attack on China.[32] Another 2013 AMS teaching text listed strategic information warfare capabilities for "satellite hostilities" as "implementing soft kill using electronic jamming and cyber attacks, and electronic new concept warfare weapons for hard kill attacks."[33] PLA texts did not recognize

[30] Shou, *Zhanlue Xue*, 236.
[31] Ibid., 187.
[32] Ibid., 187.
[33] Ye, *Xinxi Zuozhan Xue Jiaocheng*, 109.

that China needed to have space situational awareness capabilities and to defend its satellites before 2013, but the PLA began testing those capabilities in 2010.

China has tested a variety of space weapons since 2005 that reflect the priorities laid out in PLA writings. China was suspected of using cyber attacks to disrupt the command and control of two U.S. Earth observation satellites in 2007 and on three occasions in 2008.[34] In June 2018 hackers located in China implanted malware into computers controlling satellites that would allow the hackers to change satellite positions and disrupt their data flows.[35] In 2006, the U.S. National Reconnaissance Office confirmed that a Chinese laser had illuminated one of its satellites.[36] The U.S. Department of Defense also reported that China is also researching and possibly developing directed-energy weapons, such as microwave and radio frequency weapons.[37]

China has conducted a series of tests of direct-ascent ASAT weapons, sometimes under the guise of a missile defense program. It destroyed a Chinese weather satellite on January 11, 2007 using a direct-ascent ASAT weapon, causing a large amount of orbital debris. China tested the same weapon without hitting a target on July 7, 2005 and February 6, 2006.[38] The

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[34] Kevin Pollpeter, Jordan Wilson, and Fan Yang, "China Dream, Space Dream: China's Progress in Space Technologies and Implications for the United States," Report Prepared for the U.S.-China Economic and Security Review Commission, March 2, 2015, 86.

[35] Joseph Menn, "China-Based Campaign Breached Satellite, Defense Companies: Symantec," *Reuters*, June 19, 2018, https://www.reuters.com/article/us-china-usa-cyber/china-based-campaign-breached-satellite-defense-companies-symantec-idUSKBN1JF2X0.

[36] "NRO Confirms Chinese Laser Test Illuminated U.S. Spacecraft," *SpaceNews.Com*, October 3, 2006, http://spacenews.com/nro-confirms-chinese-laser-test-illuminated-us-spacecraft/.

[37] Office of the Secretary of Defense, "Annual Report to Congress on the Military Power of the People's Republic of China" (Washington, D.C., 2017), 35.

[38] Michael R. Gordon and David S. Cloud, "U.S. Knew of China's Missile Test, but Kept Silent," *The New York Times*, April 23, 2007.

direct-ascent ASAT weapon, the SC-19, was based on its DF-21 road-mobile, solid-fueled, medium-range ballistic missile. That weapon would be limited to attacking satellites in LEO approximately 1,000 kilometers above Earth. China also conducted missile defense interceptor tests to destroy objects on a ballistic trajectory during their mid-course of flight in 2010, and 2013.[39] Those tests were sub-orbital and did not produce debris.

U.S. officials reported that in 2013 China launched a rocket "nearly" into geosynchronous earth orbit (GEO). Observers suspect China was testing the components of an ASAT weapon rather than a "high-altitude space experiment" as claimed by the Chinese Academy of Social Sciences.[40] The test suggests that China is interested in an ASAT weapon that could reach targets in higher orbits than LEO, such as Global Positioning Satellites (GPS) in Medium Earth Orbit (MEO) or U.S. communications, missile early warning, and intelligence satellites in GEO. China's apparent interest in an ASAT weapon capable of reaching GEO was significant because the U.S. and Soviet/Russian governments have treated that orbit a "sanctuary" for nuclear warning and command and control satellites, while satellites supporting conventional military operations located in orbits closer to Earth were considered "fair game" for ASAT

[39] Pollpeter, Wilson, and Yang, "China Dream, Space Dream," 86.

[40] Brian Weeden and Victoria Samson, "Global Counterspace Capabilities: An Open Source Assessment" (Washington, D.C.: Secure World Foundation, April 2018), 1-15; Andrea Shalal-Esa, "U.S. Sees China Launch as Test of Anti-Satellite Muscle: Source," *Reuters*, May 15, 2013, https://www.reuters.com/article/us-china-launch/china-missile-hit-highest-suborbital-level-since-1976-scientist-idUSBRE94E07D20130515. There is some ambiguity as to whether the rocket approached GEO or fell far short of it. The Chinese Academy of Social Sciences claimed that the test only reached an altitude of 10,000 kilometers, while MEO is 20,000 kilometers above Earth and GEO is 36,000 kilometers above Earth. See Sankaran, "Limits of the Chinese Antisatellite Threat to the United States," 19–20; Shalal-Esa, "U.S. Sees China Launch as Test of Anti-Satellite Muscle"; Weeden and Samson, "Global Counterspace Capabilities," 1-15.

attacks.[41] China does not currently have any satellites for nuclear command and control or early warning at present and it may have less interest in treating GEO as a sanctuary.

China is also developing satellites capable of approach and rendezvous with other satellites that could be used either as co-orbital ASAT weapons or for space situational awareness to implement a calibrated escalation posture. Satellites or spacecraft can be maneuvered to collide with an adversary's satellites, or to approach an adversary satellite to disrupt its functions, for example by jamming its communications or interfering with its sensors. Satellites that are capable of proximity and rendezvous operations could also provide China with space situational awareness and the ability to repair its own satellites. In 2010 China maneuvered a satellite within 300 meters of another one of its satellites.[42] China conducted a similar set of maneuvers with three satellites launched in 2013.[43]

China has space launch facilities at three sites: Jiuquan in the northwest, Xicheng in the southwest, and Hainan in the southeast. It has the ability to launch satellites from road-mobile launchers,[44] which would allow it to continue to launch satellites if its fixed launch sites are attacked. It has a ground tracking network within China and in partnership with countries abroad.[45]

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[41] Ashton B. Carter, "Satellites and Anti-Satellites: The Limits of the Possible," *International Security* 10, no. 4 (1986): 46–98.
[42] Weeden and Samson, "Global Counterspace Capabilities," 1-4.
[43] Ibid., 1-3-1-4.
[44] Zhou, *Junzhong Zhanlue Jiaocheng*, 206.
[45] Pollpeter, Wilson, and Yang, "China Dream, Space Dream," 109.

Command and Control

Before 2015, China's tactical and strategic space weapons were either deployed or scheduled to be deployed to different organizations, as a calibrated escalation posture would expect. By 2013, both the development and operations of China's military space capabilities were dispersed among different organs of the PLA and China's space industry.[46] Command and control of Chinese space forces was divided among the CMC or GSD (*tongshuai bu*) and the seven Military Regions.[47] Responsibility for cyber attacks on satellite communications likely came under the authority of General Staff Department (GSD) Fourth Department's offensive cyber units.[48] The General Armaments Department (GAD) operated Chinese launch centers, satellite control centers, and tracking stations. It also oversaw testing of direct-ascent ASAT weapons. Different departments under the GSD provided the day-to-day tasking for satellites with different functions.[49] China's missile force, the Second Artillery, was scheduled to carry out a space mission some time after 2013,[50] most likely to operate direct-ascent ASAT weapons. A description of the Second Artillery's service strategy from 2013 indicated that, "it is necessary to speed up the process of building a ground-based anti-satellite operations capability, to ensure that a combat capability is formed *on schedule*."[51]

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[46] Shou, *Zhanlue Xue*, 187.
[47] Jiang Lianju, ed., *Weilai Zuozhan Jiang Zai Taikong Daxiang [The First Steps to Winning Future Wars Are in Space]* (Beijing: Junshi Kexue Yuan Chubanshe, 2016), 84.
[48] These units may have been paired with one of its two satellite electronic countermeasures regiments. Mark A. Stokes, "The Chinese People's Liberation Army and Computer Network Operations Infrastructure," in *China and Cybersecurity: Espionage, Strategy, and Politics in the Digital Domain*, ed. Jon R. Lindsay, Tai Ming Cheung, and Derek S. Reveron (New York, N.Y: Oxford University Press, 2015), 174–75.
[49] Pollpeter, Wilson, and Yang, "China Dream, Space Dream," 96.
[50] Sun Mingfu, "Erpao Zhuanjia: Meiguo Pa Shenme Jiu Fazhan Shenme [Second Artillery Expert: We Will Develop What the United States Fears]," *China News Online*, October 10, 2014; Shou, *Zhanlue Xue*, 229–30.
[51] Zhou, *Junzhong Zhanlue Jiaocheng*, 209 (emphasis added).

Transparency

China's space force posture is insufficiently transparent for a calibrated escalation posture. On the one hand, China has no declaratory policy for its space force posture. Numerous space and defense White Papers published since 2000 have not acknowledged China's development of space weapons. There is no evidence to indicate that China has had discussions with the United States to make Washington aware of its thresholds for using tactical or strategic space weapons. On the other hand, China has been transparent about some aspects of its space force posture. The Chinese government did not announce its 2007 direct-ascent ASAT weapon test, but it has announced all mid-course interceptor tests since then. China has officially acknowledged its co-orbital satellite proximity and rendezvous activities, but it characterized its 2013 high-altitude ASAT test as a "science experiment" and likely understated the range of the test.[52] China's planned deployment of its direct-ascent ASAT weapons to the Second Artillery suggests that space weapons would be under strict command and control arrangements. China has, therefore, signaled that its top leaders are willing and able to withhold the use of its strategic weapons as a weapon of last resort.

There are a number of possible reasons for China's lack of transparency over its space force posture. It could indicate that China in fact had a brinkmanship posture and wanted the United States to fear it could use its space weapons at any time, but this explanation is unlikely. It would be at odds with PLA doctrinal writings that space conflict should be limited and the evidence that it intends to deploy its direct-ascent ASAT weapons to a PLA unit under strict

[52] Weeden and Samson, "Global Counterspace Capabilities: An Open Source Assessment," 1–15.

command and control arrangements, both of which contradict the goal of a brinkmanship posture to create uncertainty over the ability of military or civilian leaders to control space weapons use. Alternatively, China may intend to use revelations about those weapons for signaling in peacetime or a crisis, which is contrary to the logic of a calibrated escalation posture. Indeed, an AMS report provided to the CMC recommended developing space capabilities in secret "to strive to attain the [same] strategic effect of amazing the world as the year the [China's] nuclear explosion succeeded."[53] But China's past behavior suggests that this reason is also unlikely. Its decision to test an ASAT weapon in January 2007 revealed that it was developing space weapons but the test was not intended to deter any specific U.S. actions.[54]

A second possibility is that the alternative explanations of organization theory or emulation theory explain China's lack of transparency. The PLA, like most militaries, would want to maximize operational surprise if it used space weapons to degrade U.S. satellites in an information warfare campaign at the outset of a conventional war. It may prefer not to reveal information about its space weapons that would allow an adversary to better prepare for its space attacks. Neither the United States nor Russia, which also have developed space weapons, are very transparent about what capabilities they have deployed and how they would use them in a conflict. China may be following their example, as they are transparent about their organizational arrangements within their militaries for space support capabilities.

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[53] Ge, *Nanwang Lijian Suiyue*, 347. An AMS textbook also describes peacetime testing of space weapons as a method of deterrence: Jiang, *Kongjian Zuozhan Xue Jiaocheng*, 127.
[54] Author's interviews, Beijing, 2015-6.

A third possibility, which is the most likely, is that China's space force posture lacks transparency because its space weapons are immature and it fears damage to its international reputation for acknowledging that it has space weapons. These reasons are unrelated to either the theory of strategic substitution or alternative explanations. At least until 2013, China was still implementing its space force posture and may be reluctant to reveal that its space weapons, deployments, and plans to use them are still under development. Once its posture is mature, international audience costs might still dissuade Chinese leaders from being transparent about their space weapons. China and Russia have spearheaded a treaty banning the deployment of weapons in outer space. The proposed treaty would not ban China's co-orbital satellites that could also be used as weapons, or its ground-based ASAT weapons. Nevertheless, acknowledging that China has a space weapons posture could undermine its advocacy of the treaty and damage its diplomatic image with third-party states. Instead, China may look for ways to signal its restraint to the United States only. For example, it may reveal its space posture through private discussions rather than a public declaratory policy or make its space weapons visible to U.S. spy satellites rather than in the media.

III. China's Decision to Adopt a Calibrated Escalation Space Posture

Chinese leaders decided to pursue a coercive space weapons capability after the United States bombed its embassy in Belgrade during the Kosovo War in 1999. That event worsened China's threat environment because Chinese leaders refused to accept Washington's explanation that the bombing was an accident and viewed the incident as a signal of U.S. hostility towards China. It is not possible to determine exactly when China decided to adopt a calibrated

escalation space force posture. To determine whether strategic substitution, emulation or organization theory best explains China's space force posture decisions, I examine why China did not pursue a coercive space weapons capability when its threat environment deteriorated before 1999, its decision to pursue that capability by 2002, and its decision to review space posture between 2013 and 2015. Below I briefly outline the different observable implications of the theory of strategic substitution and the alternative explanations for the timing and process of China's decisions to pursue a space weapons capability and select a force posture.

Observable Implications

An observable implication of the theory of strategic substitution is that China is likely to pursue a non-nuclear strategic weapons capability when it has a need for strategic leverage. China would therefore pursue a coercive capability for its space weapons following changes for the worse in its threat environment after the Taiwan Straits crisis in 1995-6, after NATO's bombing of China's embassy in Belgrade in 1999, or after the Obama Administration announced its Pivot to Asia in 2011. These events exposed deficiencies in China's existing sources of strategic leverage that it could not address using its conventional or nuclear weapons. Its leaders could have also decided to pursue that capability in 1988 as China's conflict scenario shifted from a total to a limited war, and it satisfied all scope conditions of the theory of strategic substitution. Both emulation theory and organization theory would expect China to develop a space force posture after the United States and Soviet Union tested direct-ascent ASAT weapons in 1963 and 1968, respectively.[55]

[55] Paul B. Stares, *The Militarization of Space: U.S. Policy, 1945-1984* (Ithaca, N.Y.: Cornell University Press, 1985), 21, 76.

Emulation theory would expect China to develop non-kinetic, tactical space weapons in the late 1980s as the United States accelerated research into space weapons as part of the Regan Administration's Strategic Defense Initiative (SDI) for space-based missile defense. Organization theory would expect China's defense industry and the PLA to advocate for the development of space weapons once they became aware of these technologies from the superpowers' actions. A space force posture would allow these organizations to gain resources influence, and missions. Organization theory would expect the PLA to deploy its space weapons quickly after the defense industry developed them. Emulation theory would, however, expect China to copy the United States by deploying space weapons at "hedge capability" numbers.[56]

An observable implication of the theory of strategic substitution for the decision-making process is that Chinese leaders would view a coercive space force posture as satisfying its need for strategic leverage. A space force posture would enable China to respond to a deterioration in threat environment when it could not use nuclear weapons or its conventional military power for strategic leverage. They would also refer to the expected cost of retaliation when deciding which force posture to adopt for space weapons. By contrast, if Chinese leaders were emulating the United States, they would express a fear of falling behind in space weapons. Organization theory would expect advocates of a space force posture to be PLA officers or civilian aerospace

[56] As Moltz notes, "The United States has a long history of experimenting with offensive and defensive space systems. Notably, very few of these technologies have been deployed beyond 'hedge capability' numbers because of cost, concerns about strategic stability, and calculations of their likely limited operational effectiveness." James Clay Moltz, *Crowded Orbits: Conflict and Cooperation in Space* (New York, N.Y: Columbia University Press, 2014), 133.

scientists and engineers from China's defense industry, who may even acknowledge their organizational interest in a space force posture.

Before 1999: Developing Space Capabilities

China had a need for strategic leverage on one occasion before Chinese leaders decided to establish a space force posture in 1999, but did not establish a space force posture, contrary to the expectations of the theory of strategic substitution. Nor did China decide to develop a space force posture once it satisfied all scope conditions for the theory of strategic substitution in 1988, as its conflict scenario shifted from a total to a limited war in which it faced a conventionally superior adversary. At the time, China had the technological capability to pursue a coercive space weapons capability. Chinese leaders may not have developed a space force posture in 1988 because the possibility of using space weapons as a source of strategic leverage was not apparent until the United States demonstrated the utility of satellites as a force multiplier in conventional combat in the 1991 Gulf War. More surprisingly, China did not pursue a coercive space weapons capability after the 1995-6 Taiwan Straits crisis, which exposed deficiencies in its existing sources of strategic leverage that it could not address with its nuclear or conventional weapons.

Space Weapons Technology

China began to explore space weapons technology as early as 1966, which equipped it with the technology to establish a space force posture when it began to prepare for limited wars in 1988. Chinese leaders initiated a missile interceptor program in 1966 but shelved the program

in 1978. Missile interceptors share the hit-to-kill technology to destroy moving targets that is used in ASAT weapons. Missile expert Qian Xuesen recalled that, at a meeting in 1964, "suddenly Chairman Mao asked me if it was possible to shoot down a missile, I replied that it should be possible to shoot down a missile, if you think for a while, in ten or 15 years, to completely make one!"[57] Mao ordered work to begin on an interceptor program and Chinese leaders made a formal decision to develop a missile defense interceptor in 1966.[58] The PLA Air Force was responsible for the program,[59] which was shelved at a meeting on August 1-2, 1978. Deng Xiaoping decided to devote resources to the pursuit of an inter-continental ballistic missile (ICBM), submarine-launched ballistic missile, and communications satellite instead.[60] Although a missile interceptor research base was established in Yunnan, Qian Xuesen commented that "later [it] encountered many difficulties, now that base has already scattered and disappeared (*saxiao*)."[61] At the 1978 meeting Deng instructed defense industry leaders to "make useful, urgently-needed satellites, do not engage in a space race."[62]

Chinese leaders made the decision to research non-kinetic space weapons in 1986, as part of the National High Technology Research and Development Plan. But they did not decide to pursue a space weapons capability when China began to prepare for limited wars instead of

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[57] Mi Zhenyu, ed., *Qian Xuesen Xiandai Junshi Kexue Sixiang [Qian Xuesen's Thinking on the Modernization of Military Science]* (Beijing: Kexue Chubanshe, 2011), 80.
[58] Zhang Xianmin, ed., *Qian Xuesen Nianpu [Chronology of Qian Xuesen]*, vol. 1 (Beijing: Zhongyang Wenxian Chubanshe, 2015), 374.
[59] The CMC formed a leading small group for Project 640 on May 30, 1971, which was directed by Air Force commander Wu Faxian and received logistical support from the Air Force Command. Ibid., 1:370.
[60] Lu Qiming and Fan Ruiruo, *Zhang Aiping Yu Liangdan Yixing [Zhang Aiping and the Two Bombs and Satellite]* (Beijing: Jiefangjun Chubanshe, 2011), 366. For further details of this meeting, see Chapter 2. Top leaders including Zhang Aiping and both Liu Huaqing and Qian Xuesen, who were involved in the development of the counterspace program, were present.
[61] Mi, *Qian Xuesen Xiandai Junshi Kexue Sixiang*, 80.
[62] Song Renqiong, *Song Renqiong Huiyi Lu [Memoirs of Song Renqiong]* (Beijing: Jiefangjun Chubanshe, 2007), 407.

total wars in 1988. Known as Project 863, one of the aims of the plan was to respond to the Regan Administration's missile defense program, SDI. Nuclear scientist Zhu Guangya led China's efforts to understand and respond to SDI through expert meetings and briefings for top leaders and relevant departments.[63] He did so in his capacity as the director of the Science and Technology Committee of China's defense industry body, the Commission on Science, Technology and Industry (COSTIND). On May 14, 1985, China's nuclear and space technology experts concluded that SDI was designed to draw the Soviet Union, Europe and Japan into a high technology competition that favored the United States, given its superiority in space technology.[64] To respond to SDI,[65] Chinese leaders initiated space weapons technology research and development related to missile defense under Project 863.[66] Leading Chinese scientists and engineers at the time recommended that China develop lasers and other technologies that could be used to develop non-kinetic space weapons.[67]

China still did not develop a coercive space weapons capability when it had a need for strategic leverage after the Taiwan straits crisis in 1995-6. It is not clear exactly when Chinese leaders decided to develop a direct-ascent ASAT weapon, which is one of its key strategic space weapons. The decision to develop the direct-ascent ASAT capability likely preceded the decision of Chinese leaders to develop a space force posture between 1999 and 2002, but it did not immediately follow the Taiwan Straits crisis either. The overlap in technologies used for

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[63] Xi Qixin, ed., *Zhu Guangya Zhuan [Biography of Zhu Guangya]* (Beijing: Renmin Chubanshe, 2015), 510.
[64] Ibid., 509.
[65] Ibid., 512.
[66] Authors' Interviews, Beijing, 2015. See also Mark A. Stokes, "China's Evolving Space and Missile Industry: Seeking Innovation in Long-Range Precision Strike," in *Forging China's Military Might: A New Framework for Assessing Innovation*, ed. Tai Ming Cheung (Baltimore, M.D.: Johns Hopkins University Press, 2014), 260.
[67] Deng Zhiping, Peng Jie, and Ge Kangtong, *Deng Jiaxian* (Guiyang: Guizhou Renminbi Chuban She, 2004), 117; Mi, *Qian Xuesen Xiandai Junshi Kexue Sixiang*, 78.

ASAT weapons and China's conventional medium-range ballistic missiles suggests ASAT weapons may have also been part of the PLA's drive to develop "shashoujian" weapons in the late 1990s. "Shashoujian" weapons were a type of weapon intended to compensate for the PLA's overall lagging modernization by "building what the enemy fears," rather than developing an army, navy and air force of comparable strength to the U.S. military.[68] There is no evidence, however, that a direct-ascent ASAT weapon was one of the "shashoujian" weapons that the PLA planned to develop as part of the 9th Five Year Plan between 1996 and 2000. That plan was a direct response to the Taiwan Straits crisis in 1995-6. One PLA officer claimed that U.S. interference with the PLA's use of GPS data during the crisis inspired Chinese leaders to build their own positioning satellite constellation but there is no evidence that the crisis prompted Chinese leaders to develop space weapons.[69] China's defense industry underwent extensive reforms in 1998.[70]

Space Weapons as a Source of Leverage

One reason why Chinese leaders may not have developed a space force posture in 1988 or 1996 is that they did not recognize that space weapons could be a source of strategic leverage. China recognized the role that satellites could play in enhancing the effectiveness of

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[68] Guo Xiangjie, *Zhang Wannian Zhuan [The Biography of Zhang Wannian]* (Beijing: Jiefangjun Chubanshe, 2011), 164–65. See the Chapter on China's conventional missile posture for a discussion of the "Shashoujian" program.

[69] Minnie Chan, "'Unforgettable Humiliation' Led to Development of GPS Equivalent," *South China Morning Post*, November 13, 2009, http://www.scmp.com/article/698161/unforgettable-humiliation-led-development-gps-equivalent.

[70] In April 1998 the top leadership established the PLA General Armaments Department (GAD) which later oversaw China's space weapons development. On April 13, 1999, the China Aerospace Corporation was divided into two organizations, the China Aerospace Science and Technology Commission, and the China Aerospace Science and Industry Corporation. See Mark A. Stokes, "The People's Liberation Army and China's Space and Missile Development: Lessons from the Past and Prospects for the Future," in *The Lessons of History: The Chinese People's Liberation Army at 75*, ed. Laurie Burkitt, Andrew Scobell, and Larry Wortzel (Carlisle, P.A.: Strategic Studies Institute and Army War College Press, 2003), 216–18.

conventional military operations after the 1991 Gulf War.[71] But they did not emphasize space weapons as a source of strategic leverage to neutralize the U.S. advantage in information warfare until after the 1995-6 Taiwan Straits crisis. At a meeting to promote technological awareness within the PLA on February 17, 1997, Chief of General Staff Fu Quanyou acknowledged that "space technology development and employment has become a contest for the high ground of warfare" and acknowledged that the PLA's future local wars would involve, "land, sea, air and *space* unified multi-domain warfare."[72] At the beginning of 1999, CMC Vice-Chairman Zhang Wannian also observed that the future, multi-domain battlefield would include the space domain.[73]

Missile designer Qian Xusen clearly acknowledged that states could use ASAT weapons to gain strategic leverage in 1997 because of the importance of space-based support capabilities to conventional missile operations. Around the time that China began to research its anti-ship ballistic missile, which shares the same guidance and control packages as its direct-ascent ASAT weapon,[74] Qian told Li Jinai, who later became the director of the General Armaments Department,[75] that China needed to build ASAT weapons. Qian argued that China would need

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[71] See, for example, Fan Gaoyue and Wang Baocun, "Gao Jishu Jubu Zhanzheng Zhong Meijun Zuozhan de Zhuyao Qiangdian Yu Ruodian [Main Strengths and Weaknesses of U.S. Operations in Local High Technology Wars]," *Waiguo Junshi Xueshu [Foreign Military Arts]* 7 (1993): 3–6; Yang Shihua and Min Zhenfan, "'Meijun Zai Gao Jishu Xia Zuozhan Wenti Yantao Hui' Guandian Zhaiyao (Summary of Views at the 'Research Meeting on the Topic of the U.S. Military in High Technology Combat')," *Waiguo Junshi Xueshu [Foreign Military Arts]* 12 (1992): 3–4; Zong Canmou Bu Junxun Bu [General Staff Department Training Department] and Zong Zhengzhi Bu Xuanchuan Bu [General Political Department Propaganda Department], *Gao Jishu Zai Junshi Lingyu de Yingyong Ji Dui Zuozhan de Yingxiang [The Role of High Technology in the Military Domain and Its Influence on Warfare]* (Beijing: Bayi Chuban She, 1993), 1.

[72] Fu Quanyou, *Fu Quanyou Wenxuan [Selected Works of Fu Quanyou]* (Beijing: Jiefangjun Chubanshe, 2015), 566 (emphasis added). Fu made similar remarks in early 1999: Ibid., 656.

[73] Zhang Wannian, *Zhang Wannian Junshi Wenxuan [Selected Military Works of Zhang Wannian]* (Beijing: Jiefangjun Chubanshe, 2008), 732–35.

[74] Stokes, "China's Evolving Space and Missile Industry," 260.

[75] Li Jinai was the Political Commissar of COSTIND at the time and became director of the General Armaments Department in 2002, the PLA body that oversaw China's space weapons development.

ASAT weapons to protect its own satellites from the United States, remarking that, "the United States has used its previous ICBM interceptor technology to attack satellites." His reasoning implied that the PLA could also use ASAT weapons first to coerce the United States, "I'm afraid this technology will draw the attention of countries around the world, since a very important part of informationized warfare is satellite sensing (*tance*) of the enemy situation, so anti-satellite technology deserves attention."[76]

Qian's concern about the vulnerability of China's space assets indicates that leaders were made aware of their exposure to space attack and therefore China's expected cost of retaliation. China initiated a satellite program in 1958 and by the end of 1998 it had approximately 30 satellites in orbit. The Politburo initiated a manned spaceflight program in September 1992.[77] The first test spacecraft for its manned program was launched on November 19, 1999 and its first manned mission, Shenzhou 5, launched in 2003.

China did not decide to pursue a space weapons capability before 1999 as the theory of strategic substitution would expect. But emulation theory and organization theory also cannot explain why China waited until 1999 to make that decision. The PLA was aware of the role of space in enhancing the effectiveness of U.S. conventional operations in the Gulf War. The defense industry's research into space weapons technology dated back to the 1960s. But there is little evidence that those organizations advocated for China to develop space weapons before 1999 to increase their resources or gain new missions. Emulation of the United States explains the

[76] Mi, *Qian Xuesen Xiandai Junshi Kexue Sixiang*, 80; Zhang Xianmin, *Qian Xuesen Nianpu [Chronology of Qian Xuesen]*, vol. 2 (Beijing: Zhongyang Wenxian Chubanshe, 2015), 515.
[77] Liu Huaqing, *Liu Huaqing Huiyi Lu [Memoir of Liu Huaqing]* (Beijing: Jiefangjun Chubanshe, 2004), 679, 681.

timing of China's decisions to research space weapons technology, following U.S. investments in ASAT weaponry in the 1960s and non-kinetic space weapons in the late 1980s. But if China were emulating the superpowers' space postures, it would have developed and deployed an ASAT weapon during the Cold War.

China's Decision to Develop a Space Force Posture

In December 2002 China's top leader, Jiang Zemin, implied that the PLA would pursue a space weapons capability because of the importance of space capabilities for conventional operations and strategic deterrence. Chinese leaders decided to develop a space force posture to satisfy a need for strategic leverage. China's threat environment changed for the worse due to the bombing of the Chinese embassy in Belgrade in May 1999. It deteriorated further after pro-independence statements of the Taiwanese President in July 1999 and a crisis over a mid-air collision of U.S. and Chinese military aircraft in early 2001. These events exposed the inadequacy of China's existing sources of strategic leverage, and it invested in all of its non-nuclear strategic weapons capabilities to gain more leverage. China had both strategic credibility and conventional inferiority motivations to develop a space force posture at that time. PLA leaders recognized that China could not quickly close the gap with the superior U.S. conventional military in the aftermath of the Belgrade embassy incident. One solution was to rely on "shashoujian" weapons to scare the United States so that China could at least achieve a political victory of restoring the status quo if a Taiwan war broke out. Chinese strategists also judged that space weapons would provide them with more credible strategic leverage in a limited war than nuclear weapons.

The Need for Strategic Leverage

Immediately after NATO bombed the Chinese Embassy in Belgrade on May 8, 1999, top civilian leader and General Secretary of the Communist Party, Jiang Zemin, instructed the Central Military Commission to strengthen the PLA at an emergency Politburo meeting.[78] CMC Vice-Chairman Zhang Wannian had responsibility for implementing Jiang's instructions within the PLA. He called an emergency CMC meeting immediately after the Politburo's meeting. The CMC initiated an across-the-board effort within the PLA to strengthen its doctrine, operations and equipment to counter a more hostile United States in a Taiwan contingency. In May 1999, the Politburo and State Council also approved a major weapons technology and engineering development program known as Project 995. The project not only signaled a major increase in the defense budget, but also an adjustment in the proportion of the state's budget dedicated to defense. According to media reports, after the Belgrade embassy bombing, "the relationship between national defense building and the civilian economy was adjusted, before national defense building gave way (*ranglu*) to building the economy, which changed into harmonized and coordinated development [of the military and economy]."[79]

PLA leaders immediately recognized that they could not quickly and easily correct the conventional imbalance between the United States and China, and non-nuclear strategic weapons offered China the best chance of deterring the United States and Taiwan from starting

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[78] Jiang Zemin, *Jiang Zemin Wenxuan (Er Juan) [Selected Works of Jiang Zemin (Volume 2)]* (Beijing: Zhongyang Wenxian Chubanshe, 2006), 323, 326.

[79] "Jiefangjun Shenmi '995 Gongcheng' Shi Wuqi Zhuangbei Cheng Jingpen Shi Fazhan [The PLA's Mysterious '995 Project' Caused a Surge in Weapons Equipment Development]," *Huanqiu Shibao [Global Times]*, March 13, 2015, http://news.sina.com.cn/c/2015-03-13/102031602956.shtml. PLA public figure Luo Yuan revealed Project 995 to the Chinese media in 2015. See also Tai Ming Cheung, ed., *Forging China's Military Might: A New Framework for Assessing Innovation* (Baltimore, M.D.: Johns Hopkins University Press, 2014), 276; Stokes, "The People's Liberation Army and China's Space and Missile Development," 216.

a cross-Strait war that China could not win militarily. One of the first orders that Chinese leaders gave to the PLA following the bombing incident was to accelerate the development of "shashoujian" weapons. The emphasis on these weapons demonstrated that China had a need for strategic leverage because of its conventional inferiority. "Shashoujian" weapons were designed to give China the strategic leverage it lacked because of its conventional military inferiority. Zhang Wannian ordered the PLA to speed up the development of "shashoujian" equipment.[80] Project 995 involved a major increase in the PLA's budget to accelerate the pace of key weapons programs, which included the hit-to-kill technology key to China's conventional ballistic missiles and ASAT weapons.[81]

On May 11, 1999, Zhang instructed the PLA to study the Kosovo war, which was an example of the type of war the PLA would need to fight: in long-term like the United States and in the short-term like the Serbian forces. Contrary to the expectations of emulation theory, the PLA did not study the Kosovo War try to catch up with the U.S military's conventional capabilities as an immediate response to the increased U.S. threat. Zhang instructed the PLA to take short-term steps to ensure the PLA's preparedness for a conflict, which included urgent investments in "the leadership of important engineering projects such as forging 'shashoujians.'"[82] At a national science and technology innovation meeting on August 23, 1999, top leader Jiang Zemin also instructed meeting participants to "quickly grasp new 'shashoujians' that protect national sovereignty and security."[83]

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[80] Guo, *Zhang Wannian Zhuan*, 416.
[81] Gregory Kulacki and Jeffrey G. Lewis, "Understanding China's Antisatellite Test," *The Nonproliferation Review* 15, no. 2 (2008): 336.
[82] Guo, *Zhang Wannian Zhuan*, 418. Zhang emphasized the importance of developing "shashoujian" weapons at two meetings about military equipment on June 30 and November 1999, as well as during a meeting with the Commandant of the Academy of Military Sciences in July 1999: Ibid., 170–71, 420.
[83] Jiang Zemin, *Jiang Zemin Wenxuan (Er Juan)*, 394.

Investing in "shashoujian" weapons was also central to the response of PLA organizations responsible for operations, equipment and doctrine who looked for ways to compensate for China's conventional inferiority after the embassy incident. The GSD Chief of General Staff, Fu Quanyou, coordinated a military technology small group of nine experts from across the PLA to study the embassy attack, which included space experts.[84] Fu submitted the group's recommendations to Zhang Wannian on May 31, 1999, who instructed Fu to report back to the CMC with more concrete recommendations.[85] Fu stated that China needed to find U.S. weaknesses and attack them with its current capabilities to "win from a position of inferiority" because "now and for a relatively long period into the future, the overall military strength situation in which 'the enemy is strong and we are weak' will fundamentally not change."[86]

Around May 21, the GSD sent a report to the CMC providing an "Initial Summary of the Situation of NATO's Air Attacks Against Serbia," which included a recommendation to accelerate the "shashoujian" program. Zhang Wannian requested that the GSD develop more concrete recommendations and report back to the CMC.[87] In October 1999, the GSD circulated a report instructing the PLA to "accelerate the development of 'shashoujian' weapons equipment, [to] establish the confidence to defeat the strong from a position of weakness."[88] A report on the Kosovo conflict authored by PLA researchers identified the technological dependence of the U.S. military as a weakness that "trump card" weapons, a term used

[84] Other group members came from the GSD, GAD, Air Force, and Second Artillery.
[85] Wang Xuedong, *Fu Quanyou Zhuan [Biography of Fu Quanyou]* (Beijing: Jiefangjun Chubanshe, 2015), 208.
[86] Ibid., 302.
[87] Ibid., 208.
[88] Ibid., 209.

synonymously with "shashoujian" weapons, could exploit.[89] China needed to develop these weapons in order to "seize local, key superiority for our side in a situation of overall enemy superiority."[90]

The need to compensate for the PLA's conventional inferiority also drove the defense industry's decisions on which weapons systems to develop as a matter of priority. China's space industry corporations met on May 9 and 18, 1999 to decide which research and development programs to prioritize, and mentioned "shashoujian" weapons in their recommendations.[91] On June 1, 1999, the GAD Science and Technology Committee, the top advisory body to the CMC on China's long-term defense technology development,[92] met to develop recommendations on how to "accelerate the pace of our military's weapons equipment building."[93] The meeting may have been part of the process of allocating the injection of funds into the defense industry under Project 995. Participants included both PLA and non-PLA experts. In September 1999, the Committee chairman, Zhu Guangya, held a GAD expert group work meeting at which he instructed China's defense industry experts to focus on fulfilling the military's requirements in future wars. He also warned them to be selective in the technologies they developed as "our

[89] The term "trump card" (*sashoujian*) is often used synonymously with "shashoujian" weapons. The two terms have slightly different meanings in Chinese. A "shashoujian" weapon is hidden and revealed at the last moment to take advantage of surprise. A "trump card" weapon is a weapon of last resort. Chinese experts indicated that the two terms could be used roughly synonymously in the context of Chinese weapons development in the 1990s and 2000s. Author's interviews, Beijing, 2015. There is, however, an important distinction between weapons that were a part of the formal "Shashoujian" program initiated under the 10th Five Year Plan and the common use of either term in PLA research texts to refer to weapons that have a large effect on an adversary's willingness to fight.
[90] Bin Huang, ed., *Kesuowo Zhanzheng Yanjiu [Research on the Kosovo War]* (Beijing: Jiefangjun Chubanshe, 2000), 170.
[91] Stokes, "The People's Liberation Army and China's Space and Missile Development," 216–17.
[92] Stokes, "China's Evolving Space and Missile Industry," 245.
[93] Du Xiangwan, ed., *Zhanlue Kexue Jia Zhu Guangya [Strategist and Scientist Zhu Guangya]* (Mianyang: Yuanzi Neng Chubanshe, 2009), 429. See also Stokes, "The People's Liberation Army and China's Space and Missile Development," 216.

country's comprehensive power is still not strong, the defense science and research budget is not yet flush."[94]

China's decisions to accelerate the development of "shashoujian" weapons would have accelerated the development of one of its strategic space weapons, a direct-ascent ASAT weapon. But these decisions were not decisions to pursue a coercive space weapons capability with dedicated space warfare units and doctrine. Rather, they demonstrate China's choice of non-nuclear strategic weapons to satisfy the need for strategic leverage created by the embassy incident. Chinese leaders decided to pursue a coercive space weapons capability that would include diverse space weapons, doctrine to use them, and a dedicated space force to operate them around 2002.

The Decision to Pursue a Coercive Space Weapons Capability

At some point between mid-1999 and 2002, China's top military and civilian leaders decided to pursue a space weapons capability. Top leader Jiang Zemin gave remarks in 2002 that identified four reasons why China needed to invest in space capabilities: to maximize strategic leverage over the United States in a conventional conflict, to deter it from attacking Chinese space assets, to ensure that China's nuclear retaliatory capability could penetrate U.S. missile defenses, and to keep up with U.S. and Russian investment in space weapons. Jiang's remarks indicate that both a need for strategic leverage and emulation influenced China's decision to pursue a coercive space capability. China's explicit opposition to ground-based ASAT weapons

[94] Xi, *Zhu Guangya Zhuan*, 588–89.

in its 1998 White Paper on National Defense was omitted from its 2000 and 2002 defense White Papers.[95]

A comparison of Jiang Zemin's remarks about space in his speeches to the CMC in December 2000 and December 2002 indicate that China decided to pursue a coercive space weapons capability between those two meetings. In December 2000, Jiang Zemin's remarks indicated that space was an important support domain. The space domain was part of a "land, sea, airspace, electronic multi-domain, joint (*duowei yiti*) battlefield." China would need to contest sea, air and "information superiority" with its adversaries in future wars.[96] By contrast, in his December 2002 speech, Jiang Zemin described space capabilities as a source of strategic leverage as well as a critical enabler of conventional operations. He remarked that "space is starting to become the new strategic high ground of international military competition," one of a handful of trends that would require revolutionary changes to the PLA's building and combat style.[97] Jiang acknowledged that the United States and Russia were developing space weapons systems and that "it is possible to take advantage of anti-satellite weapons and combat spacecraft to interfere, damage, and destroy an enemy's space-based systems, to fight for space control, limiting the adversary's freedom to maneuver in space."[98] Jiang's remarks also implied that space weapons could form part of China's strategic deterrence system combining multiple means, as noted in Chapter 3. He condemned the U.S. pursuit of missile defense, which could

[95] State Council Information Office of the People's Republic of China, "China's National Defense in 1998," 1998, Section V, http://www.china.org.cn/e-white/5/index.htm.
[96] Zemin Jiang, *Jiang Zemin Wenxuan (San Juan) [Selected Works of Jiang Zemin (Volume 3)]* (Beijing: Zhongyang Wenxian Chubanshe, 2006), 162.
[97] Ibid., 581.
[98] Ibid., 582.

involve space weapons and trigger "an arms race around space among the world's major countries [and] could change the structure of international military competition."[99]

Jiang Zemin's successor as CMC Chairman, Hu Jintao, elevated the priority of developing a space weapons capability for the PLA. He gave the same reasons for China to develop a space force: to maximize strategic leverage, deter threats to China's space assets, and emulate the United States. In his first address to the CMC in December 2004, he outlined the PLA's "New Historic Mission," the tasks it would have to carry out to safeguard China's "strategic opportunity period" from threats that included Taiwanese attempts to gain independence.[100] One task was to secure China's interests in space. He explained that, "space is a new domain for current international cooperation, competition and hostilities, space resources open up vast prospects for the future of human society. A few great powers are intensifying the scramble for military superiority in space, the process of space weaponization is accelerating." He also confirmed that China was facing a "five-dimensional battlefield," which required it to "expand our vision of security strategy and military strategy."[101]

Motivations for a Space Force Posture

The recommendations of PLA researchers and leaders on space force posture between 1999 and 2002 offer further evidence that China decided to develop a space force posture because of need for strategic leverage, but also to deter attacks on China's space assets, and ensure the effectiveness of its nuclear arsenal. These recommendations likely informed the content of

[99] Ibid., 585.
[100] Hu Jintao, *Hu Jintao Wenxuan (Di Er Juan) [Selected Works of Hu Jintao (Volume 2)]* (Beijing: Zhongyang Wenxian Chubanshe, 2016), 258.
[101] Ibid., 259.

Jiang Zemin's 2002 speech. As the theory of strategic substitution would expect, the PLA recommended a space weapons capability as a more credible source of leverage than threatening to use nuclear weapons. It was also a faster, asymmetric solution to China's conventional military inferiority in a Taiwan conflict than building up its conventional military.

Space weapons would be a source of strategic leverage for the PLA because of the importance of space-based support to conventional operations. In a speech at a military theory study meeting on February 17, 2000 the Chief of General Staff Fu observed that, "following the development of space weaponry, in future outer space not only can be used for reconnaissance, warning, guidance and positioning support for operations on land, at sea and in the air, it is also becoming important battlefield for the adversary carrying out space-space and space-ground operations." If the PLA was to ensure freedom of operational maneuver, it would need to be able to "seize information dominance" using space.[102]

PLA researchers recognized that space weapons would be a more credible source of leverage than nuclear threats. They pointed out that "space deterrence" had advantages over nuclear deterrence because it was flexible, did not cause loss of life, and took aim at an adversary's military superiority. The 2001 edition of the *Science of Military Strategy* observed that space deterrence had "outstanding" strategic significance, because of its "great effects of shock and awe on the enemy." Further, "the deterrence methods are flexible" because they included interference and disruption as well as destruction.[103] Second Artillery officers and NDU

[102] The text of the speech was published in Volume 1 of the AMS *Operations Theory Research Newsletter* in 2000. Fu, *Fu Quanyou Wenxuan*, 722.
[103] Peng Guangqian and Yao Youzhi, eds., *The Science of Military Strategy* (Beijing: Military Science Publishing House, 2005), 220. The Chinese-language edition of the book was published in 2001.

academics observed that, "in recent years, the limits of nuclear deterrence are becoming increasingly clear."[104] Instead, they wrote, "once a war breaks out, it is possible to threaten to use ASAT weapons and attack an adversary's related facilities to force it to give up its space support against us or allies, to gain space superiority."[105] As noted in Chapter 3, a Second Artillery officer recommended that China could attack U.S. space assets rather than terrestrial targets with nuclear weapons if China was losing a conventional war over Taiwan since space attacks would not cause loss of life.[106]

China's decision to develop a space force posture was also motivated by the challenge U.S. missile defense posed to China's nuclear deterrent. China's 2000 White Paper called for the United States not to abrogate the Anti-Ballistic Missile Treaty, while the 2002 White Paper condemned the abrogation of the Treaty.[107] The AMS sent a report on China's nuclear strategy to the CMC sometime in 2002 or thereafter, which strongly recommended developing space weapons. China needed to "energetically develop anti-satellite, anti-missile new concept weapons, quickly forming a soft attack and hard destruction capability against a strong adversary's space-based targets, unifying nuclear deterrence and space deterrence, nuclear counter-attack and space capability attack."[108] It is not clear whether the report recommended that space weapons be used to ensure the effectiveness of China's nuclear deterrent only, or

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[104] Liu Yanjun et al., *Lun Zhitian Quan [On the Command of Space]* (Beijing: Guofang Daxue Chubanshe, 2003), 82.
[105] Ibid., 82.
[106] Deng Lizhong, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu [Research on the Combat Role of Second Artillery Nuclear Missile Forces under Informationized Conditions]" (Masters Thesis, PLA National Defense University, 2004), 43.
[107] State Council Information Office of the People's Republic of China, "China's National Defense in 2002," 2002, section IV, http://china.org.cn/e-white/20021209/index.htm; State Council Information Office of the People's Republic of China, "China's National Defense in 2000," 2000, section V, http://china.org.cn/e-white/20021209/index.htm.
[108] Ge, *Nanwang Lijian Suiyue*, 345. See Chapter 3 for a detailed description of the content of the report.

also to gain the strategic leverage to "check and balance a strong adversary" to win "an asymmetric informationized local war under conditions of nuclear deterrence"[109] The report offers some support for emulation theory because it recognized that "the trend towards turning space into a battlefield requires us to quickly build our own space army."[110]

Emulating the United States was one factor in China's decision to develop a space force posture, but the PLA's pursuit of a space weapons capability after 2002 did not emulate the United States at all. Defense industry decision-makers clearly rejected the idea of copying U.S. weapons development. Zhu Guangya stated that China's defense technology and arms equipment development needed to have "Chinese characteristics." His remarks would have been very influential. Rather than seeking a global power projection capability like the United States, Zhu argued that China would focus on achieving "local superiority" in line with its national military strategy of "winning local wars under informationized conditions." He emphasized that "we cannot rigidly imitate the development pathway of U.S. weapons equipment, according to the principle of forming local superiority, [we must] independently choose the development trajectory of our weapons equipment platforms and systems."[111] The idea of seizing local superiority, including through attacks on U.S. satellites, was one way that PLA researchers believed a weaker power could defeat a strong power.[112] Zhu gave these remarks at a March 2004 work meeting of the GAD Science and Technology Committee, which advised China's top military leaders on the CMC about weapons development.

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[109] Ibid., 341.
[110] Ibid., p. 347.
[111] Xi, *Zhu Guangya Zhuan*, 600.
[112] Xiao Tianliang, *Xiao Tianliang Jianggao Zixuanji [Selected Lectures of Xiao Tianliang]* (Beijing: Guofang Daxue Chubanshe, 2015), 123, 127.

Developing and Selecting a Space Posture

China's top leaders had strategic credibility and conventional inferiority motivations to develop a space force posture, but there is no clear evidence that they also adopted a calibrated escalation posture in 2002. The PLA followed their instructions to develop the capabilities, doctrine and organizational arrangements to adopt a space force posture, which resembled a calibrated escalation posture in most respects, but for two areas in which PLA organizational interests conflicted with the requirements of that posture. First, as noted in the section outlining China's space doctrine, there was a tension between the limited and controlled use of space weapons to maximize strategic leverage and using space weapons to gain information superiority through a preemptive strike. Second, there was a debate between the missile force and Air Force as to whether China needed to stand up a separate, strictly controlled force to operate its space capabilities, which would have been necessary to control escalation, or to integrate space capabilities into the existing organizational structure of the Air Force.

By 2002, China had more than 40 satellites in orbit and would conduct its first manned space mission at the end of 2003.[113] It therefore had incentives to develop a space force posture that would minimize any damage to its own satellites from an adversary's retaliation. It is not clear exactly when China decided to adopt a calibrated space force posture and therefore to determine whether its moderate expected cost of retaliation influenced that decision. But Chinese leaders did view the protection of China's own satellites as a reason to develop a force posture in the first place, which indicates their awareness of China's exposure to space attacks.

[113] Huo, *Junzhong Zhanlue Xue*, 255.

In 2004 China began to draft its fifth generation of operations regulations, which included a draft Space Operations Outline (*taikong zuozhan gangyao*) by the time the drafting process was completed in 2009. The Outline would have described how the PLA would use space weapons in a conflict and therefore offers fairly strong evidence that Chinese leaders had decided which space force posture to adopt by 2009. The PLA's fifth generation combat regulations were never implemented.[114] Unfortunately there are no sources describing the content of the draft Outline. Nor are many of the PLA research texts on space posture published between 2002 and 2003 available, which could have informed the content of the outline.[115] A common feature of many descriptions of China's space force posture that are available indicate that it would involve "space deterrence, space support and space [combat] operations."[116] "Space capabilities and space operations research" was a priority for the PLA's 10th Five Year Plan from 2001 until 2005.[117] The PLA's space doctrinal research was relatively immature and unauthoritative before 2006.[118]

China's dramatic test of an ASAT weapon on January 11, 2007 raises the question of whether China was actually planning to adopt a brinkmanship posture at that time. China's willingness to conduct a test that created so much orbital debris and its lack of transparency over the test are consistent with two key features of a brinkmanship posture and contrary to a calibrated escalation posture. The Chinese Foreign Ministry's spokesperson also appeared to have been

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[114] Ren Jian, ed., *Zuozhan Tiaoling Gailun [An Introduction to Operations Regulations]* (Beijing: Junshi Kexue Yuan Chubanshe, 2016), 52.
[115] For a list of sources published around 2002-3 with titles such as *Collected Documents on Space Operations and Space Army Building Research Discussions* published by the National Defense University and Second Artillery, see Deng, "Xinxi Tiaojian Xia Di'er Paobing He Daodan Zuozhan Yunyong Lilun Yanjiu," 46–49.
[116] Huo, *Junzhong Zhanlue Xue*, 257. See also Shou, *Zhanlue Xue*.
[117] Chang et al., *Junshi Hangtian Xue*, VI.
[118] See Xiao, *Xiao Tianliang Jianggao Zixuanji*, 130; Huo, *Junzhong Zhanlue Xue*, 257.

unaware that the test occurred when queried about it at a press conference, fueling speculation that the PLA or defense industry organizational interests were driving China's space force posture.[119] But by the time the test took place, PLA research texts already suggested that controlling escalation should be a goal of Chinese space force posture. Since 2007 China has not conducted any interceptor tests since that created debris and has taken care to announce all of its tests. If China had not already adopted a calibrated escalation posture at the time of the test, the international outcry over the debris caused by the test and the suspicions created by China's handling of the aftermath would have made that posture even more attractive.

The available evidence of how and why China decided to conduct the test also does not suggest the delegated authority to use space weapons and disregard for space debris characteristic of a brinkmanship posture. Chinese experts indicated to Western scholars that there was some dispute after the test as to whether the GAD, which was responsible for estimating the orbital debris resulting from the test, accurately estimated the debris effect or clearly communicated those estimates to Chinese leaders.[120] Nor does the test indicate that organizational interests were driving China's development of a space force posture. Chinese experts indicated that the decision to test that ASAT weapon, and earlier tests that did not hit a target, were "carefully vetted, with the full participation of other stakeholders [than the project managers], including representatives of the Foreign Ministry."[121] Other scholars pointed out that interagency

[119] Bates Gill and Martin Kleiber, "China's Space Odyssey: What the Antisatellite Test Reveals about Decision-Making in Beijing," *Foreign Affairs* 86, no. 3 (2007): 2–6.
[120] Kulacki and Lewis, "Understanding China's Antisatellite Test," 338. Phillip C. Saunders and Charles D. Lutes, "China's ASAT Test: Motivations and Implications," *Joint Forces Quarterly*, no. 46 (June 2007): 40.
[121] Kulacki and Lewis, "Understanding China's Antisatellite Test," 337. See also Saunders and Lutes, "China's ASAT Test: Motivations and Implications," 40.

coordination would have been necessary authorize and carry out the destruction of the aging weather satellite, which did not belong to the PLA.[122]

The simplest way to implement the strict command and control arrangements for strategic space weapons required by a calibrated escalation posture would be to establish a separate space force within the PLA. These command and control requirements came under sustained assault from the PLA Air Force (PLAAF), motivated by its organizational interest in growing its missions, until at least 2014.

As of 2013, the PLA intended to deploy direct-ascent ASAT space weapons to the missile force, [123] and non-kinetic space weapons to the GSD and GAD. These organizational arrangements met the requirements of a calibrated escalation posture to deploy strategic and tactical weapons to different organizations if the strictness of command and control arrangements for tactical and strategic space weapons differed. But PLA researchers viewed these arrangements as inadequate in the long-term. At that time, the only operational space weapons China had deployed were the capabilities to conduct cyber attacks on adversary satellite computer networks, likely within the GSD's Fourth Department. PLA researchers argued that China's space capabilities needed to be under unified within one organization.

The organizational arrangements for China's space force posture became an arena for an organizational competition between the Second Artillery and PLAAF. Second Artillery

[122] You Ji, "The PLA and Diplomacy: Unraveling Myths about the Military Role in Foreign Policy Making," *Journal of Contemporary China* 23, no. 86 (2014): 236–54.
[123] Zhou, *Junzhong Zhanlue Jiaocheng*, 209; Sun, "Erpao Zhuanjia: Meiguo Pa Shenme Jiu Fazhan Shenme."

officers advocated for China's space capabilities to be deployed to an independent space force.[124] A text authored by Second Artillery officers in 2005 claimed that developing and using space forces, "without exception require national high level leaders or the highest military supreme command bodies' decisions, space combat command authority is restricted to a high level, concentrated, and unified."[125] Space professionals who rose into the leadership ranks of the GAD in the mid-2000s also supported the establishment of an experimental space warfare unit.[126] On the other hand, the PLAAF argued that space capabilities should be deployed to the Air Force to make up a joint aerospace combat capability.[127] A military education text published in 2013 reflected this organizational competition and confusion. It stated that the PLA was not only planning to establish a space combat force (*taikong zhan budui*),[128] but also that the PLA Air Force would become a "joint air and space, offensive and defensive" service.[129] Had the PLAAF's proposal succeeded, it would have sacrificed the strict command and control arrangements for China's strategic space weapons required under a calibrated escalation posture to the organizational interests of the Air Force.

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[124] Liu et al., *Lun Zhitian Quan*, 266–71; Yang Xuejun and Zhang Wangxin, eds., *Youshi Laizi Kongjian [Superiority Comes from Space]* (Beijing: Guofang Gongye Chubanshe, 2005), 114.
[125] Yang and Zhang, *Youshi Laizi Kongjian*, 111.
[126] Kevin Pollpeter, "The Stars of China's Space Program: The Rise of a 'Space Gang'?" *China Brief* 7, no. 1 (September 19, 2007).
[127] Cai Fengzhen and Tian Anping, *Kongtian Yiti Zuozhan Xue [A Study on Joint Aerospace Operations]* (Beijing: Jiefang Jun Chubanshe, 2006), 135–77; Pan Youmu, "Zhaoyan Kongtian Yiti Hua Tansuo Guojia Kongtian Anquan Zhanlue [Focus on Air-Space Integration and Exploring National Aerospace Security Strategy]," *Zhongguo Junshi Kexue [China Military Science]* 2 (2006): 60–66.
[128] Hu Guangzheng, *Jundui Xinxihua Jianshe Jiaocheng [Study Guide to Military Informationization Building]*, 2nd Edition (Beijing: Junshi Kexue Yuan Chubanshe, 2012), 152; Zhou, *Junzhong Zhanlue Jiaocheng*, 52.
[129] Zhou, *Junzhong Zhanlue Jiaocheng*, 188.

IV. Reviewing China's Space Doctrine: 2013-2015

At the end of 2012 Chinese leaders instructed the PLA to review its space posture. The theory of strategic substitution cannot fully explain why Chinese leaders ordered the review at that time. It would expect a review of China's force posture to take place if its threat environment deteriorated and created a need for strategic leverage. There is no evidence to suggest that the U.S. Pivot to Asia policy, which signaled a more muscular U.S. response to China's military rise triggered the review when U.S. officials announced that policy in 2011. Even though China's expected cost of retaliation remained moderate throughout that decade it is also possible that Chinese leaders reviewed their space force posture because of dramatic growth in the size of China's satellite fleet. China had more than three times the number of satellites in orbit in 2012 compared to 2002. It is most likely that Chinese leaders ordered the review because they still needed to take steps to fully adopt a space calibrated escalation posture in 2012 and would soon deploy space weapons. Until that point leaders may have selected a calibrated escalation posture but not reconciled that decision with competing uses of space weapons driven by PLA organizational interests.

Adjustments to Space Posture

The PLA made three adjustments to its implementation of a calibrated escalation force posture as a result of the posture review after 2012. First, doctrinal research published after 2013 was less sanguine that using space weapons would significantly degrade U.S. conventional operations. These views may indicate that China is more hesitant to use direct-ascent ASAT

weapons in a preemptive information warfare campaign than it would have been a decade ago. Second, China prioritized the development and testing of space weapons that did not cause debris. Third, it resolved the debate over the organization of its space forces by establishing an independent space force within a new PLA branch, the Strategic Support Force (SSF).

Doctrine

In recent years, Chinese analysts, research texts and official documents have highlighted the increasing strategic importance of space but also the risks of using space weapons to maximize strategic leverage against the United States. Space weapons were a more credible source of strategic leverage than nuclear weapons. The NDU Commandant wrote in 2016 that space deterrence has "unique advantages compared to nuclear deterrence and cyber deterrence." While "in current practice, the possibility of using nuclear weapons is relatively low,"[130] he observed that, "its deterrent capability still very much exists, its usability is high, controllability is strong, its effects are good. It can clearly warn an adversary: if you dare to challenge me, you will pay a greater price."[131] One PLA Air Force officer concurred that space deterrence "has a higher degree of credibility and flexibility than nuclear deterrence."[132] Hinting at the inadvertent escalation risks of space attacks, Chinese strategists recognized the links between space, cyber and nuclear deterrence and stability, "If you lack one domain, one's strategic deterrent effects are all limited."[133]

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[130] Zhang Shibo, *Zhanzheng Xin Gaodi [The New High Ground of Warfare]* (Beijing: Guofang Daxue Chubanshe, 2016), 19.
[131] Ibid.
[132] Zhou Bisong, *Haomiao Taikong de Jingxiang Juezhu [The Struggle for Vast Outer Space]* (Beijing: Junshi Kexue Yuan Chubanshe, 2015), 139.
[133] Zhang, *Zhanzheng Xin Gaodi*, 19. See also Chong Jing, "Dui Dangqian Taikong Anquan Xingshi de Jidian Sikao [Some Reflections on the Current Space Security Situation]," *Waiguo Junshi Xueshu [Foreign Military Arts]* 12 (2016): 15–17; Zhou, *Haomiao Taikong de Jingxiang Juezhu*, 140. Some analysts also pointed to a trend of integrated space and cyber deterrence in the United States. See Zhao Weibin, "Meijun Wangkong He Taikong

Despite these advantages of space weapons, PLA doctrinal writings after 2015 recognized the challenges of using them to gain strategic leverage. The NDU Commandant observed that the domain was fragile because of the vulnerability of spacecraft to attack and the nature of outer space as common to all countries. As a result, "all space actions should be evaluated for their potential to create serious political and military consequences."[134] Researchers with the PLA Air Force argued that China needed to begin any space attacks for the purpose of deterrence with small-scale attacks, but would need escalation dominance to succeed in coercing an adversary with space weapons, "without follow-on methods, it is hard to achieve good deterrence effects without making preparations for escalation."[135] Strategists emphasized that "in general circumstances, space warfare activities should be limited," in the words of the 2015 NDU *Science of Military Strategy*.[136]

PLA researchers emphasized the role of space weapons in deterring attacks on China's space assets as much as their utility for gaining strategic leverage after 2013. China's satellites in orbit jumped from approximately 40 in 2002 to approximately 110 in 2012 and over 200 by 2016. One expert observed that not only was China as dependent on satellites as the United States, but, unlike the United States, it lacked the ability to defend its space assets.[137] Other

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Yiti Hua Zuozhan Chutan [A Study of U.S. Integrated Cyber and Space Combat]," *Waiguo Junshi Xueshu [Foreign Military Arts]* 2016, no. 8 (2016): 37–41.

[134] Zhang, *Zhanzheng Xin Gaodi*, 29.

[135] Tian Anping and Zhang Jianye, *Zhongguo Kongtian Anquan Zhanlue Gouxiang [China's Aerospace Security Strategy Concept]* (Beijing: Jiefang Jun Chubanshe, 2016), 258–59.

[136] That book only listed one space combat employment style: "limited space hostilities" to contest space control. Xiao, *Zhanlue Xue*, 141–42. See also Zhang, *Zhanzheng Xin Gaodi*, 44; Zhou, *Haomiao Taikong de Jingxiang Juezhu*, 142.

[137] Author's interview, Beijing, 2016.

experts described China's space security as "still extremely weak."[138] China's increased reliance on space had made it more vulnerable to space attacks, "all aspects of national building and national defense and security are increasingly reliant on spacecraft, but once our space facilities are attacked, the loss would be hard to estimate."[139] Space capabilities would enhance the effectiveness of U.S. and Chinese conventional operations but made both militaries vulnerable to each other's space attacks. In the words of a 2014 guide to Xi Jinping's military thought, "space and cyber offensive and defensive technology have become the commanding high ground of military competition, [but] they can easily become an 'Achilles Heel.'"[140]

Capabilities

China's ambition to develop a diverse arsenal of space weapons did not change after 2013, but it did place more emphasis on tactical space weapons and develop space situational awareness capabilities. China continued sub-orbital testing of missile defense interceptors in 2015 and 2018 and an ASAT weapon in 2014.[141] In 2016, China launched a satellite equipped with a robotic arm, Aolong-1, which could be used as a co-orbital ASAT weapon. That year it also launched two satellites that conducted proximity and rendezvous operations in GEO.[142] PLA texts published after 2013 emphasized the importance of space situational awareness and the resilience of China's fleet of satellites to enemy attacks,[143] as well as the need to deploy non-

[138] Zhang, *Zhanzheng Xin Gaodi*, 37.
[139] Ibid., 38.
[140] Renmin Jiefang Jun Zong Zhengzhi Bu [People's Liberation Army General Political Department], *Xi Zhuxi Guofang He Jundui Jianshe Zhongyao Lunshu Duben [Reader on Chairman Xi's Important Treatises on National Defense and Military Development]* (Beijing: Jiefangjun Chubanshe, 2014), 13.
[141] China officially claimed that the 2014 test was a test of a missile defense technology. Mike Gruss, "Senior U.S. Official Insists China Tested ASAT Weapon," SpaceNews.com, August 25, 2014, http://spacenews.com/41676senior-us-official-insists-china-tested-asat-weapon/; Office of the Secretary of Defense, "Annual Report to Congress on the Military Power of the People's Republic of China," 35.
[142] Weeden and Samson, "Global Counterspace Capabilities," 1-15.
[143] Xiao, *Zhanlue Xue*, 377, 379.

kinetic tactical space weapons. The Director of the GSD Informationization Department Wang Kebin indicated that China needed to "accelerate solving the key problem of actually employing new concept, new mechanisms weapons in combat, accelerate the development of nano, kinetic (*dongneng*), high-powered laser, high powered microwave and-close in [co-orbital] space weapons (*linjin kongjian*), and develop new areas of growth to establish deterrence warfare and control enemy capabilities."[144]

Command and Control

China's space capabilities were centralized in the Space Systems Department of its SSF, which was established on December 31, 2015. The SSF allows top military leaders to strictly and directly control the use of space weapons because the Force is not a part of the regular chain of command for the PLA's ground, air and naval forces. Official reports acknowledge that the SSF manages China's satellite-based information systems to support conventional operations, but does not indicate whether it has a counter-space role.[145] Existing PLA units with space missions have been transferred to the SSF, including China's three launch centers and satellite control centers formerly under the GAD, former mapping and survey units under the GSD and Military Regions, electronic ground station satellite receiving stations and electronic countermeasures brigades formerly under the GSD's Fourth Department, and former GSD research institutes. It is not clear whether China's missile force has retained the direct-ascent ASAT mission. The command and control arrangements for the SSF are likely to be similar to

[144] Wang Kebin, "Jiangding Bu Yi Zou Zhongguo Tese Xinxi Qiangjun Zhi Lu [Resolutely Take the Path of Strengthening the Military by Informationization with Chinese Characteristics]," *Zhongguo Junshi Kexue [China Military Science]* 2 (2015): 3.

[145] "Zhuanjia: Zhanlue Zhiyuan Budui Jiang Guichuan Zuozhan Quan Guocheng Shi Zhisheng Guanjian [Expert: Strategic Support Force Is the Key to Victory throughout the Complete Process of War," *Renmin Wang [People Online]*, January 5, 2016, http://military.people.com.cn/n1/2016/0105/c1011-28011251.html.

those of the missile force before the 2015 PLA reforms. Those arrangements ensure that China's top military leaders alone can order the use of space weapons and can interrupt the flow of targeting information acquired by China's space systems to its combat platforms.[146]

When Xi Jinping unveiled the PLA's reform plan at the 2015 Military Reform work meeting, he described the SSF as an incubator of cutting-edge forces operating military technology, rather than the ideal organizational structure for controlling escalation from the use of strategic weapons. The SSF would allow China to "stand at the strategic commanding high ground of future military competition, playing the role of fully enabling innovation and driving development, cultivating new points of strength in combat forces." Xi's justification of the SSF structure offers more support for emulation theory than the theory of strategic substitution. He remarked that "new-type combat forces represent the development trend of military technology and combat styles. It is inadvisable to delay the development of new type combat forces." China should avoid "letting our adversary widen the gap. Countries like the United States and Russia have all established specialist leading command structures and are energetically developing relevant military technology and forces."[147]

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[146] Management of the CMC's terrestrial communications networks has remained under the CMC's direct control. The CMC can therefore "break the circuit" of all decisions to use of the SSF's offensive capabilities, and the sharing of its intelligence products with the rest of the PLA. John Costello, "The Strategic Support Force: China's Information Warfare Service," *China Brief* 16, no. 3 (February 8, 2016). Zhang Nenghua and Liang Pengfei, "Chuangxin Waqian Shixian 'Jianliang Fazhan' [Tapping the Latent Power of Innovation to Realize 'Development under Force Reductions]," *Jiefangiun Bao [PLA Daily]*, June 12, 2016.

[147] Zhonggong Zhongyang Wenxian Yanjiu Shi [Central Party Documents Research Office], *Xi Jinping Guofang He Jundui Jianshe Zhongyao Lunshu Xuanbian (San) [Edited Selection of Chairman Xi's Important Treatises on National Defense and Military Development (Volume 3)]* (Beijing: Zhongyang Wenxian Chubanshe, 2016), 66–67.

PLA texts published around 2013 did, however, recognize that China needed a unified command and control structure for its space forces to allow it to control escalation in space. A 2015 AMS text emphasized that China's space capabilities needed to be unified under one chain of command at a high rank within the PLA "to ensure that space warfare is smoothly implemented according to the intentions of the CMC and in the correct circumstances."[148] Those authors described two different models for unifying the PLA's space command and control arrangements, and noted that the model adopted by the SSF, in which an independent space army would be under the direct control of the CMC and coordinate with joint commands at lower levels in a similar manner to China's conventional missile units, optimized the use of space for strategic purposes.[149]

The SSF was established as part of the PLA's structural reforms in 2016 and resolved the competition between the missile force's proposal of an independent space army and the Air Force's bid for the space mission. That competition continued as the CMC Leading Small Group deliberated on the military reform plan, between March 2014 and July 2015.[150] On April 14, 2014, Xi Jinping instructed the Air Force to "accelerate the building of a strong people's air force [capable of] integrated air and space, simultaneous offensive and defensive operations." Xi's speech suggested that the Air Force would receive the space mission, although he did not mention any specific space missions for the Air Force.[151] After Xi's speech

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[148] Jiang, *Weilai Zuozhan Jiang Zai Taikong Daxiang*, 77. See also Shou, *Zhanlue Xue*, 187.

[149] The second model, which optimized command and control of space forces for joint operations, would establish a space force integrated into the national-level joint military command, similar to China's army, navy and air force. Jiang, *Weilai Zuozhan Jiang Zai Taikong Daxiang*, 82, 91–92.

[150] Zhonggong Zhongyang Wenxian Yanjiu Shi, *Xi Jinping Guofang He Jundui Jianshe Zhongyao Lunshu Xuanbian (San)*, 49.

[151] Renmin Jiefang Jun Zong Zhengzhi Bu [People's Liberation Army General Political Department], *Xi Jinping Guofang He Jundui Jianshe Zhongyao Lunshu Xuanbian (Er) [Selection of Chairman Xi's Important Treatises on National Defense and Military Development (Volume 2)]* (Beijing: Jiefangjun Chubanshe, 2015), 26.

PLA Air Force Commander Ma Xiaotian wrote an article in March 2015 about advancing the concept of integrated air and space operations to counter the "serious aerospace threat to our country,"[152] from adversaries' integration of the air, space and cyber domains for offensive operations. He did not outline a counter-space mission for the Air Force.[153] A month earlier, however, the same journal published an article by the Director of the GSD Informationization Department, who suggested that the space mission should go to an independent space force. China needed to "develop and realize a new type of strategic force with characteristics of the current era, speeding up the building of a cyber army and space army."[154] In the end, China's strategic interest in a space force optimized for strategic use prevailed over the Air Force's organizational interests.

Transparency

After 2013, China did not increase the transparency of its space posture, the one area of its force posture that is not consistent with a calibrated escalation posture. Chinese media confirmed its tests of missile defense interceptors in 2014, 2015 and 2018, but disputed the U.S. characterization of the 2014 test as an ASAT test.[155] China's 2015 Defense White Paper did not recognize or provide any details of its space weapons force posture, in contrast to its acknowledgment of the PLA's cyber forces for the first time. It declared that "China has all along advocated the peaceful use of outer space, opposed the weaponization of and arms race in outer space." Without stating how China would respond to that trend, it warned that China

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[152] Ma Xiaotian, "Lun Jianshe Kongtian Yiti Hua Gongfang Zhuangbei de Qiangda Renmin Kongjun [On Building a Powerful People's Air Force with Integrated Air-Space Capabilities and Capable of Both Defenses and Offenses]," *Zhongguo Junshi Kexue [China Military Science]* 3 (2015): 2.
[153] Ibid., 4.
[154] Wang, "Jiangding Bu Yi Zou Zhongguo Tese Xinxi Qiangjun Zhi Lu," 5.
[155] "China Responds to the Hype of Its Anti-Satellite Weapons," China Military Online, February 26, 2015, http://english.chinamil.com.cn/news-channels/china-military-news/2015-02/26/content_6368193.htm.

"will keep abreast of the dynamics of outer space, deal with security threats and challenges in that domain, and secure its space assets to serve its national economic and social development, and maintain outer space security."[156] One exception was China's revelation of details about its ballistic missile defense program after the United States deployed a missile defense battery in South Korea 2016.[157]

The Decision to Review China's Space Posture

The order to review China's space posture after 2012 came from its top civilian leaders, but their orders do not suggest that either of the independent variables of the theory of strategic substitution, a need for strategic leverage or a change in the expected cost of retaliation, prompted the review. As General Secretary Hu Jintao left office at the end of 2012, he instructed the PLA to further develop China's space strategy in his work report to the 18th Party Congress. He stated that "we should implement the military strategy of active defense for the new period and enhance military strategic guidance as the times so require. We should attach great importance to maritime, space and cyberspace security."[158] Hu gave similar instructions regarding China's cyber force posture, which eventually led to a change in that posture in 2014. Hu's speech was reportedly written by his successor, Xi Jinping,[159] who reiterated these

[156] State Council Information Office of the People's Republic of China, *China's Military Strategy* (Beijing: Renmin Chubanshe, 2015), 15.
[157] According to those reports, China's development of missile interceptor technology "brought back the strategic balance" and is "the strong shield of strategic defense and an important bargaining chip in the game among major powers." Zhang Tao, "Is China Deploying Its Own Missile Defense System?" China Military Online, August 22, 2016, http://english.chinamil.com.cn/news-channels/pla-daily-commentary/2016-08/22/content_7218923.htm.
[158] Hu Jintao, "Firmly March on the Path of Socialism with Chinese Characteristics and Strive to Complete the Building of a Moderately Prosperous Society in All Respects: Report to the Eighteenth National Congress of the Communist Party of China," China.org.cn, November 8, 2012, http://www.china.org.cn/china/18th_cpc_congress/2012-11/16/content_27137540.htm.
[159] Alice C. Miller, "How Strong Is Xi Jinping?," *China Leadership Monitor*, no. 43 (Spring 2014): 6.

instructions in a speech at the 3rd Plenum of the 18th Party Congress in November 2013. A PLA-authored guide to Xi Jinping's military thought called for innovation in military strategy, especially in the space and cyber domains, and the far seas, which it referred to as "the new commanding heights of military competition."[160]

Xi's instructions to review space posture were given in the context of broader trends in China's military strategy that appeared to emphasize the PLA's ability to control escalation. The PLA adjusted China's national military strategy, its strategic guideline, in mid-2014,[161] likely to facilitate the major PLA reform package implemented at the end of 2015. That guideline emphasized "actively countering threats in the space and cyberspace domains."[162] One PLA researcher explained that the new guideline oriented the PLA's actions towards preventing as well as winning wars. Once a crisis became a war, the PLA would aim to both win and control further escalation, "as soon as control of a crisis is lost the main goal is to stop war, then gain a victory in the first battle and control the war situation, then the goal is strategic counterattack or a war-winning offensive."[163]

Chinese leaders may have ordered the review of China's space posture to resolve the issues relating to space organizational structure and to amend its doctrine to take full account of its moderate expected cost of retaliation. As outlined above, the two biggest adjustments to

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[160] Renmin Jiefang Jun Zong Zhengzhi Bu [People's Liberation Army General Political Department], *Xi Jinping Guofang He Jundui Jianshe Zhongyao Lunshu Xuanbian (Yi) [Selection of Chairman Xi's Important Treatises on National Defense and Military Development (Volume 1)]* (Beijing: Jiefangjun Chubanshe, 2014), 185–86.
[161] M. Taylor Fravel, "China's New Military Strategy: 'Winning Informationized Local Wars,'" *China Brief* 15, no. 13 (June 23, 2015).
[162] Luo Derong, "Jundui Jianshe Yu Junshi Douzheng Zhunbei de Xingdong Gangling [Guidelines for Armed Forces Building and Preparations for Military Struggle - Understanding of the Military Strategic Guideline in the New Situation]," *Zhongguo Junshi Kexue [China Military Science]* 1 (2017): 91, 93.
[163] Ibid., 93.

China's space force posture after 2013 occurred in its organization and doctrine. Inappropriate organizational arrangements for combat forces and doctrinal shortcomings were both specifically identified by Xi as important problems to fix in the reform process. After the 2013 Plenum, Xi Jinping gave a speech to the Jinan Military Region in which he instructed the PLA to "develop new types of combat forces." He explained that the PLA needed to reform its force structure needed to take advantage of new capabilities, "currently, after units receive new equipment, their structure has not kept up."[164] In a speech to the CMC in December 2013, Xi also instructed the PLA to reform doctrine, "it is necessary to pay close attention to organizing corrections to content in combat regulations and training outlines that do not fulfill the requirements of actual war."[165]

Chinese leaders acknowledged the negative influence of the U.S. Pivot to Asia policy on China's threat environment once the space posture review was under way. In a speech to the Air Force in March 2014, in the aftermath of Russia's annexation of Crimea, Xi warned that "some Western countries in their hearts are not willing to see our country catch up and surpass them, the things they have used to oppose Russia will similarly be used on us." He continued that, "there are countries promoting the 'rebalance to Asia' strategy, implementing the 'AirSea Battle' concept, concentrating deployments of advanced air and naval combat capabilities and methods in our periphery, increasing point-blank surveillance and reconnaissance and the strength of military deterrence near our country."[166]

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[164] Renmin Jiefang Jun Zong Zhengzhi Bu [People's Liberation Army General Political Department], *Xi Jinping Guofang He Jundui Jianshe Zhongyao Lunshu Xuanbian (Yi)*, 208.
[165] Ibid., 218.
[166] Renmin Jiefang Jun Zong Zhengzhi Bu [People's Liberation Army General Political Department], *Xi Jinping Guofang He Jundui Jianshe Zhongyao Lunshu Xuanbian (Er)*, 27.

V. Evaluating Theoretical Explanations for China's Space Postures

China's space force posture offers some of the clearest evidence of the role that credibility motivations play in China's decisions to pursue a coercive capability for non-nuclear strategic weapons. Not only did Chinese strategists view nuclear weapons as lacking strategic credibility, but they compared space weapons with nuclear weapons and judged them to be a superior source of strategic leverage. China's space force posture demonstrates that China is cautious about manipulating risk using strategic weapons when it faces a moderate expected cost of retaliation. PLA organizational interests reduced the speed and ease with which China pursued a coercive space weapons capability, which can be contrasted with its conventional missiles, for which PLA organizational interests increased the speed and ease with which China pursued a coercive capability. Nevertheless, Chinese leaders were able to reign in the organizational interests that stood in the way of a calibrated escalation space posture to ensure they could control escalation and protect their own space assets.

The theory of strategic substitution explains both the timing and process of China's decision to develop a space force posture after the Belgrade Embassy bombing in 1999. China's decision to develop a space posture satisfied its need to maximize strategic leverage over the United States after that change in its threat environment. PLA researchers judged that space weapons were more flexible and usable, but less destructive means of coercing an adversary than nuclear threats. In addition, leaders judged that China could gain leverage from its space weapons, especially its direct-ascent ASAT "shashoujian" weapons, more quickly and cheaply than it could catch up with U.S. conventional military capabilities. A space force posture also allowed

Beijing to both deter attacks on its own space assets and ensure the effectiveness of its nuclear arsenal against U.S. missile defenses. The theory of strategic substitution explains China's choice of a calibrated escalation posture after 2002 and strengthened efforts to implement that posture after its 2013-5 posture review, given its extensive investment in space assets.

The theory of strategic substitution cannot explain why China did not establish a space force posture at the end of the Cold War or after the 1995-6 Taiwan Straits Crisis when it had a need for strategic leverage. China may not have developed a space force posture in the late 1980s, as its conflict scenario shifted from a total war to a local war, because the full potential of space weapons as a source of coercive leverage was not clear until after the 1991 Gulf War. That conflict demonstrated the ability of space support assets to enhance the effectiveness of conventional military operations. It is more surprising that China did not establish a space force posture after the 1995-6 Taiwan Straits crisis worsened China's threat environment and created a need for strategic leverage over the United States. The theory of strategic substitution can explain why China reviewed its space force posture, given the growth of its satellite fleet between 2002 and 2012. The theory can also account for China's decision to review its posture in light the imminent deployment of its space weapons, which required it to confront the competing doctrinal and organizational proposals for its space weapons. But it cannot fully explain the timing of the review in 2013-5.

The alternative explanations of organization theory and emulation theory do not provide a complete an explanation of China's space force posture decisions. Both alternative explanations would have expected the PLA to adopt a calibrated escalation force posture much

earlier than 1999, either copying U.S. and Soviet ASAT weapons deployments in the 1960s or establishing a space weapons posture quickly after the 1991 Gulf War demonstrated how militaries could use space capabilities in conventional operations. There is speech evidence to support emulation theory in Jiang Zemin's speech indicating that China would develop a space force posture in 2002, in which he referred to the U.S. pursuit of space superiority and its withdrawal from the Anti-Ballistic Missile Treaty. Xi Jinping also referred to keeping up with superior military powers in his decision to establish the SSF. Nevertheless, the space force posture China adopted after 2002 bears little resemblance to U.S. space posture.

The organizational interest of China's defense industry, missile force and air force played a role in the implementation of its space force posture, but there is no evidence to support an organizational explanation for its decision to develop a force posture between 1999 and 2002. The establishment of China's SSF as an independent space force in 2015 also demonstrates the limits of organization theory in explaining Chinese space force posture decisions. China's space force structure eventually prioritized the strategic objective of controlling escalation over the organizational interests of the Air Force.

Conclusion

China pursued a coercive space weapons capability after the U.S. bombing of the Chinese embassy in Belgrade in May 1999 in order to maximize its strategic leverage over the United States in case the two countries fought a limited war over Taiwanese independence. The PLA has slowly implemented a calibrated escalation posture since 2002. It selected that posture

some time between 2002 and 2009 because it faced a moderate expected cost of retaliation for space attacks, given its extensive and growing fleet of satellites. Establishing a space force posture also allowed China to deter U.S. attacks on its space assets. Beginning in late 2012, Chinese leaders ordered a review of China's space posture. Although it is difficult to explain why Chinese leaders reviewed its space posture at that time, the review ensured its doctrine and command and control arrangements were optimized for controlling escalation, rather than facilitating conventional joint operations.

Conclusion

This dissertation developed a theory of strategic substitution to explain how and why Beijing developed space, cyber and conventional missile postures to maximize its strategic leverage in a limited war without using nuclear weapons. These non-strategic nuclear weapons gave Chinese leaders the tools to coerce Taiwan and the United States in a limited war. China would not have been able to deter Taipei, backed by Washington, from declaring independence if it relied its conventional military forces. But Chinese leaders did not judge that they could credibly threaten to use nuclear weapons to coerce Taipei or Washington to preserve the status quo, or restore it if a cross-Strait war broke out. Non-nuclear strategic weapons helped China solve the problem of maximizing strategic leverage in a limited war, when threatening to use nuclear weapons would be overkill. Chinese leaders also selected force postures for these non-nuclear strategic weapons to maximize their strategic leverage. Their force posture choices for space, cyber and conventional missile weapons demonstrated different degrees of risk tolerance, depending on the different costs of retaliation China expected to suffer if it carried out threats to use those different weapons.

The theory of strategic substitution explains how and why states develop space, cyber and conventional missile postures to maximize its strategic leverage in a limited war, given that nuclear weapons are not well-suited to the task. China is the only country that satisfies all three of the theory's scope conditions: a retaliatory nuclear posture, a limited war primary conflict scenario, and conventional military inferiority to the adversary in that scenario. But the theory is articulated in general terms because it offers insights into the behavior of other nuclear-armed states.

The theory of strategic substitution assumes that states want to maximize their strategic leverage to coerce an adversary in a limited war without turning that limited war in a total war. The nuclear strategy literature demonstrates that states have had difficulty using their nuclear weapons to achieve both of these objectives. Threats to use nuclear weapons are hard to make credible to an adversary and increase the risk of a total war. States can make more credible threats to use non-nuclear strategic weapons in a limited war because they are less destructive than nuclear weapons and do not increase the risk of a total war, even in the worst-case scenario where both states unleash their most destructive weapons on each other.

Variation in a state's need for strategic leverage determines why it pursues a coercive non-nuclear weapons capability. A state has a need for strategic leverage at certain points in time but not others because crises or conflicts involving its adversary worsen its threat environment. These events interact with two motivations states have for developing non-nuclear strategic weapons: to make more proportionate, credible threats to escalate a limited conflict than they are able to make with nuclear weapons, and to compensate for their inferior conventional military power quickly, easily and cheaply. Variation in a state's expected cost of in-kind retaliation determines a state's level of risk tolerance in its choice of a force posture. A brinkmanship posture exploits an adversary's fear of rapid, uncontrolled escalation. It is the optimal choice for a state facing a low expected cost of retaliation. A calibrated escalation posture initiates controlled, coercive bargaining to try to avoid the worst-case scenario of unrestrained space, cyber or conventional missile attacks. It is the optimal choice for a state facing a moderate expected cost of retaliation.

The evidence from China's post-Cold War strategic force postures demonstrates the explanatory power of the theory of strategic substitution, which has important implications for theories of limited war and nuclear strategy, as well as for policy-makers. Below, I briefly summarize the key findings and consider the scholarly and practical implications of these findings. In brief, the theory of strategic substitution may be able to explain why other nuclear-armed states are developing non-nuclear strategic weapons. Other states may estimate the expected cost of retaliation to help them select force postures for their non-nuclear strategic weapons, regardless of why they develop those weapons. I also describe the next steps be in a research agenda explaining the role of nuclear weapons in limited wars and the role of non-nuclear strategic weapons in international politics. Finally, I examine the practical implications of the findings for policymakers looking to understand Chinese behavior and the impact of new technology on international security.

Key Findings

The Chinese strategic force postures and decisions outlined in the previous chapters established the empirical validity of the theory of strategic substitution. Of course, no scholarly work based on the limited open sources available would be able to offer perfect evidence to support the theory of strategic substitution. Indeed, the quality of the evidence to support the theory or alternative explanations varies throughout the empirical chapters according to the availability of sources. The empirical record diverges from the expectations of the theory in places, but that does not undermine the findings. The theory should fail to explain China's behavior at times. The theory probabilistic and is based on strong assumptions about China's behavior as

a rational unitary actor, which should not hold at all times. Nevertheless, on the whole, it provides a persuasive and complete explanation for China's post-Cold War strategic force posture decisions. It also provides a more convincing explanation for how and why China developed and adopted force postures for its non-nuclear strategic weapons than the alternative explanations of organization theory and emulation theory.

One of the key contributions of the theory of strategic substitution is to highlight non-nuclear strategic force postures as an alternative response to the challenges states face in making nuclear threats credible. That option is overshadowed in the existing literature by the more common response among nuclear powers such as the United States, making nuclear coercion more credible, for example using tactical nuclear weapons. One of the most striking findings of the dissertation is the consistency of China's assessments that nuclear threats lacked credibility and did not give Beijing strategic leverage.

When China's threat environment deteriorated, its leaders affirmed that nuclear threats could not be used as a source of strategic leverage, the ability to change an adversary's calculations about fighting a limited war. These judgments persisted, despite the People's Liberation Army's (PLA) conventional inferiority in both a total and a limited war over the past seven decades. When China began to prepare for a total war against the Soviet Union rather than the United States after the Cultural Revolution in the late 1970s, its leaders dismissed the option of deploying tactical nuclear weapons. When China began to prepare for limited wars at the end of the Cold War, Chinese leaders rejected the option of a "limited nuclear deterrence" posture that would allow the country to fight a limited nuclear war. Finally, when China

scrambled for options to strengthen its military after the United States bombed the Chinese embassy in Belgrade in 1999, its leaders dismissed the idea of relaxing its No First-Use nuclear policy. On every occasion, Chinese leaders viewed nuclear threats as lacking strategic credibility.

China pursued a coercive conventional missile capability to gain the strategic leverage it could not acquire with its nuclear weapons once China began to prepare for limited wars as the Cold War came to a close. China's pathway to a conventional missile capability during the late 1980s and early 1990s offers some the most persuasive evidence that the need for strategic leverage drove China's decisions to develop non-nuclear strategic weapons. Even the commanders of the People's Liberation Army (PLA) nuclear missile force acknowledged that, to maximize strategic leverage in a limited war over Taiwan, Beijing needed conventional missiles not nuclear weapons. Later in the 1990s, top party and military leaders, Jiang Zemin and Zhang Wannian, provided very persuasive evidence that China also had a conventional inferiority motivation to bolster its conventional missile force. China's conventional missiles were "shashoujian" weapons, which would play a central role in maximizing China's strategic leverage while it modernized its backward conventional military forces. On the other hand, there is scant evidence to show that China selected a brinkmanship missile posture because of the expected cost of retaliation.

Of the three cases, China's cyber force posture decisions provide the strongest support for the theory of strategic substitution. China responded to a need for strategic leverage by developing a cyber posture. It adopted a brinkmanship posture to exploit its low expected cost of retaliation,

as the theory of strategic substitution would expect. For Chinese leaders faced with an unexpected change in their threat environment due to the 1999 U.S. bombing of China's embassy in Belgrade, a cyber force posture was an ideal source of strategic leverage in a limited war over Taiwan. PLA researchers took inspiration from the Kosovo War and recognized that cyber attacks would be highly disruptive to the United States but nowhere near as destructive as a nuclear attack. Moreover, a cyber force posture could be established much more quickly and cheaply than building up conventional forces to maximize China's strategic leverage. China also took advantage of the large asymmetry in U.S. dependence on information networks.

China's cyber force posture demonstrates that the expected cost of retaliation can explain changes in force posture for the same weapon over time, as well as across China's three types of non-nuclear strategic weapons. The PLA's shift to a calibrated escalation posture in 2014 demonstrates that the expected cost of retaliation drives force posture choices, even if it took a few years for the PLA to bring its cyber force posture into line with the exponential growth in the use information technology within Chinese society, government and the military.

Among China's three non-nuclear strategic force postures, it is most difficult to parse the reasons why Chinese leaders decided to develop a space force posture around 2002. Chinese leaders were certainly responding to a need for strategic leverage following the Belgrade embassy bombing. Strategists also clearly recognized the superior credibility of threatening space attacks compared to nuclear first-use. But deterring U.S. space attacks and ensuring the effectiveness of China's nuclear deterrent also contributed to the decision to develop a space force posture. The theory of strategic substitution cannot explain why China did not decide to

develop a space force posture to respond to earlier changes in its threat environment, or reviewed its posture after 2012. China's space force posture review after 2012 also demonstrates that parts of the PLA tenaciously pursued their organizational interests in China's non-nuclear strategic weapons postures. Party leaders were, however, able to suppress those interests where they conflicted with the requirements of optimal force posture for coercion. Top civilian leader Xi Jinping ended the Air Force's bid for the space mission, which would have made it difficult to control escalation and minimize damage to China's extensive satellite fleet from any use of force in space, in the organizational reforms to the PLA in 2015-6. By contrast, the memoirs and biographies of missile force leaders demonstrate that their organizational interests played a prominent role in realizing China's conventional missile posture in 1988, but those interests of the missile force aligned with China's optimal force posture choice for maximizing leverage.

The evidence from the seven decisions in the three cases of China's space, cyber and conventional missile force postures broadly supports the claims of the theory of strategic substitution. In general, decisions to pursue a non-nuclear strategic weapons capability have followed crises or conflicts that created a need for strategic leverage because they changed China's threat environment for the worse. Decision-makers or strategists cited China's conventional inferiority and/or the lack of strategic credibility of nuclear threats as driving China's pursuit of a coercive capability for all three of its non-nuclear strategic weapons. Leaders and strategists took the expected cost of in-kind retaliation into account when selecting a force posture for China's cyber and space weapons, but not its missile postures. China did not pursue a non-nuclear strategic weapons capability when it faced a total war, demonstrating

that China's non-nuclear strategic force postures are a solution to a specific problem of maximizing strategic leverage in limited wars under the nuclear shadow. The fact that China had the technology to pursue a coercive space or conventional missile capability during the Cold War but did not do so underscores the importance of the limited war scope condition. Emulation theory and organization theory help to explain China's behavior when the theory of strategic substitution cannot, but neither alternative explanation provides as complete and persuasive an explanation of China's force posture choices. The table below summarizes the performance of the theory of strategic substitution based on the congruence of changes in the values of the independent variables and outcome variables.

Year	**Weapon**	**Need for Leverage**	**Expected Cost of Retaliation**	**Outcome**	**Support for theory?***
1988	Missile	Strong	Moderate	Pursue capability	✓-
1995	Missile	Strong	Moderate	Brinkmanship	✓✗
1999	Missile	Strong	Moderate	Brinkmanship	✓✗
2001	Cyber	Strong	Low	Pursue capability, Brinkmanship	✓✓
2002	Space	Strong	Moderate	Pursue capability, Calibrated Escalation	✓✓
2010	*Cyber*	-	*High*	*Brinkmanship*	✗✗
2013	*Missile*	-	*Moderate*	*Calibrated Escalation*	✗✓
2014	Space	-	Moderate	Calibrated Escalation	✗✓
2014	Cyber	-	Moderate	Calibrated Escalation	✓✓

* The first check mark or cross indicates support for theory's explanation of the timing and reason for pursuing the capability, the second check mark or cross indicates support for the theory's explanation of posture choice.

Table 4: Summary of Independent and Dependent Variables for China's Force Postures

The table below summarizes the performance of the theory based on the evidence that Chinese leaders and strategists connected the independent variables to the outcome variables during the decision-making processes examined in the empirical chapters.

Year	**Weapon**	**Reason for Decision Timing**	**Evidence of Motivations**	**Explained by Need for Strategic Leverage?**	**Evidence of Cost of Retaliation Estimate**	**Explained by Expected Cost of Retaliation?**
1988	Missile	Limited war scenario	Credibility	✓	No	-
1995	Missile	Worse threat environment	Inferiority	✓	No	×
1999	Missile	Worse threat environment	Both	✓	No	×
2001	Cyber	Worse threat environment	Both	✓	Yes	✓
2002	Space	Worse threat environment	Both	✓	Yes	✓
2010	*Cyber*	*Expected Cost of Retaliation*	-	-	*No*	×
2013	*Missile*	*Precision Improvements*	-	-	*No*	×
2014	Space	*Domestic Politics*	Credibility	×	Yes	✓
2014	Cyber	Expected Cost of Retaliation	-	-	Yes	✓

Table 5: Summary of Evidence from China's Decision-Making Processes

External Validity

The theory of strategic substitution and research design in this dissertation prioritized the internal validity of the theory over its external validity. China is the only state that satisfies the three scope conditions of (1) facing a primary conflict scenario that is a limited war, (2) fielding an inferior conventional military in that conflict, and (3) a retaliatory nuclear posture. The theory offers a persuasive explanation for China's strategic force postures in limited wars, which raises the question of whether China is unique or simply a most-likely case for a theory of strategic substitution that is more widely applicable. Below, I briefly consider whether the theory has the potential to explain how other states maximize strategic leverage in a limited war if each of the three scope conditions are relaxed. The theory could therefore be applied to states retaliatory nuclear postures, latent nuclear states, and states with first-use nuclear postures.

States with Retaliatory Nuclear Postures

The theory of strategic substitution is most likely to be able to explain the strategic force postures of other states with retaliatory nuclear postures. China's strict No First-Use nuclear policy is distinctive among nuclear-armed states, but other states also have retaliatory nuclear postures. India has a No First-Use policy with exceptions for chemical, biological and radiological attacks. Israel has an assured retaliation nuclear posture, although it does not officially confirm that it has nuclear weapons.[1]

[1] Vipin Narang, *Nuclear Strategy in the Modern Era* (Princeton, N.J.: Princeton University Press, 2014), chap. 7.

India would be the next most-likely state for the theory of strategic substitution, but it does not have strong motivations to develop non-nuclear strategic force postures. India's primary conflict scenario is a war with Pakistan in which Delhi has conventional military superiority. When India's threat environment has changed in recent decades because of Pakistan's border incursions in Kashmir and state-sponsored terrorist attacks, India has responded by changing its conventional military posture.[2] Further, in recent years, Indian strategists have floated the idea of conducting a disarming first-strike on Pakistan, which stands in stark contrast to the skepticism of Chinese leaders that they could use nuclear weapons to maximize strategic leverage.[3]

India does have incentives to develop strategic substitutes to maximize strategic leverage in one of the other possible conflicts it faces, a limited border conflict with China. That scenario fits the scope conditions of the theory of strategic substitution. In that conflict, India would have strong incentives to develop non-nuclear strategic force postures. Its conventional military forces are weaker than the PLA. Delhi is unlikely to consider using nuclear weapons first to maximize strategic leverage over Beijing due to its No First-Use policy. India has established cyber forces and acquired conventionally-tipped cruise missiles,[4] but there is no

[2] Walter C. Ladwig, "A Cold Start for Hot Wars? The Indian Army's New Limited War Doctrine," *International Security* 32, no. 3 (Winter 2007/8): 158–90.
[3] Ankit Panda, "Nuclear South Asia and Coming to Terms With 'No First-Use' With Indian Characteristics," *The Diplomat*, March 28, 2017, https://thediplomat.com/2017/03/nuclear-south-asia-and-coming-to-terms-with-no-first-use-with-indian-characteristics/.
[4] Ajit Dubey, "India Beefs up Online Offensive and Defensive Capabilities," *Daily Mail Online*, March 3, 2017, http://www.dailymail.co.uk/indiahome/indianews/article-4279848/India-beefs-online-offensive-defensive-capabilities.html.

indication that it has postured those weapons for coercion. Indian defense officials have expressed interest in developing an ASAT capability.[5]

Israel may also have strategic credibility motivations to develop force postures for its non-nuclear strategic weapons to maximize strategic leverage in limited wars against its regional adversaries. Although the ambiguity surrounding Israeli nuclear posture likely allows it to gain more strategic leverage from its nuclear weapons than China or India, given their No First-Use policies, Israel's nuclear ambiguity precludes it from making clear threats to use nuclear weapons first to maximize strategic leverage in a limited war. Israel may therefore have a strategic credibility motivation to develop non-nuclear force postures to maximize its strategic leverage. As Shimshoni describes, "Israel has tried to do everything possible to keep the conflict within the realm of conventional warfare through a highly ambiguous declaratory policy and by trying to maintain wide conventional security margins. Israel's apparent refusal to admit to the possession of nuclear weapons, to make explicit threats, or to develop a doctrine can be seen as an attempt to widen the apparent margins. Israel is thereby saying, in effect, that it does not depend on nuclear weapons for its security. The result may be a severe credibility problem for her covert nuclear threats."[6] On the other hand, Israel has a superior conventional military force compared to its neighbors, and would not satisfy the limited war scope condition of the theory given its lack of strategic depth and concern that its neighbors pose an existential threat to the state.

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[5] Harsh Vasani, "India's Anti-Satellite Weapons," *The Diplomat*, June 14, 2016, https://thediplomat.com/2016/06/indias-anti-satellite-weapons/.

[6] Jonathan Shimshoni, *Israel and Conventional Deterrence* (Ithaca, N.Y.: Cornell University Press, 1988), 31.

Not only may Israel have the motivations to develop non-nuclear strategic force postures according to the theory of strategic substitution, but there is also some evidence that its cyber force posture has evolved as its expected cost of cyber retaliation has risen over the years. Israel initially focused on developing cyber attacks to support conventional operations, for covert or clandestine operations, and to gather intelligence. For example, it conducted cyber attacks on Syrian air defenses to facilitate Israeli air strikes on an undeclared Syrian nuclear facility in 2007, and together with the United States orchestrated the Stuxnet attack on the Iranian nuclear centrifuge facility reported in Western media 2012. As Israel's adversaries such as Iran and Hamas have developed their cyber capabilities, Israel has modified its cyber force posture to increase its efforts to protect its own networks, given its high level of dependence on cyberspace. In recent years it has centralized national cyber policy coordination, strategy, peacetime defense, and capacity building within a National Cyber Directorate, reporting directly to the Prime Minister.[7] In this manner, Israel has shown a sensitivity to its growing exposure to cyber attacks and has responded to that sensitivity by adopting some aspects of a calibrated escalation posture. On the other hand, there is no clear evidence to suggest that Israel's nuclear posture influenced its decision to develop a cyber posture. Further research is necessary to determine whether Israel has deployed conventionally-tipped missiles to coerce its regional adversaries, as well as its approach towards space weapons.[8]

[7] Dmitry (Dima) Adamsky, "The Israeli Odyssey toward Its National Cyber Security Strategy," *The Washington Quarterly* 40, no. 2 (2017): 113–27.

[8] In 2015 it successfully tested its Arrow-3 ballistic missile interceptor, which could also be used as an anti-satellite weapon. Dan Williams, "Israel Says Arrow 3 Missile Shield Aces Test, Hitting Target in Space," *Reuters*, December 10, 2015, https://www.reuters.com/article/us-arms-israel-arrow-trial/israel-test-launches-arrow-3-ballistic-missile-interceptor-idUSKBN0TT0HU20151210.

Latent Nuclear Weapon States

The theory of strategic substitution may be able to explain the development of non-nuclear strategic force postures by states that cannot develop nuclear weapons because of powerful allies or adversaries. Although decision-makers in those states may view nuclear threats as highly credible sources of strategic leverage in a limited war, they cannot develop those weapons to maximize strategic leverage because of pressure from a senior ally or the threat of preventive war. Those states face similar constraints to China on their ability to use nuclear weapons to maximize strategic leverage in a limited war, but those constraints are involuntary rather than voluntary.

Two examples of latent nuclear weapon states who may on occasion have a need for strategic leverage are Japan, an extended nuclear deterrence recipient, and Iran, which is constrained from acquiring a nuclear weapon by the threat of preventive war. Japan has a need for strategic leverage in its territorial disputes with China that it may satisfy by developing a coercive conventional missile posture. Japan is the recipient of a U.S. extended nuclear deterrence guarantee, which precludes it from acquiring nuclear weapons to compensate for its conventional inferiority. The Japanese government is acquiring air-launched cruise missiles, ostensibly to attack North Korea.[9] Those missiles may also help Japan to compensate for its conventional inferiority compared to China.[10] In a similar manner, Iran has not been able to

[9] Reuters Staff, "Japan to Acquire Air-Launched Missiles Able to Strike North Korea," *Reuters*, December 8, 2017, https://www.reuters.com/article/us-northkorea-missiles-japan/japan-to-acquire-air-launched-missiles-able-to-strike-north-korea-idUSKBN1E20YR.

[10] Eric Heginbotham and Richard J. Samuels, "Active Denial: Redesigning Japan's Response to China's Military Challenge," *International Security* 42, no. 4 (Spring 2018): 159–62.

acquire a nuclear weapon to maximize its strategic leverage over regional adversaries because of U.S., Israeli and European military, diplomatic and economic pressure. It has, however, developed conventional missiles and cyber weapons that it could use to coerce U.S. allies in the Middle East in a conventional conflict.[11]

States with First-Use Postures

The theory of strategic substitution would require some modifications to explain how states with first-use nuclear postures use non-nuclear strategic weapons to maximize strategic leverage in a limited war. The motivations for those states to develop non-nuclear strategic force postures are likely to be weaker or perhaps different altogether. Below I consider a number of reasons why they may not have a need for strategic leverage, they key independent variable in the theory of strategic substitution that leads states to develop non-nuclear force postures. States with first-use postures may, however, develop non-nuclear strategic force postures as a complement to their nuclear forces and thereby maximize strategic leverage. They may also select force postures based on their expected cost of retaliation.

The first reason why states with first-use nuclear postures are unlikely to have a need for strategic leverage is that they can use ambiguity about when they might use nuclear weapons first to maximize strategic leverage in a limited war. France, the United States, Russia, Pakistan and the United Kingdom did not select their first-use nuclear postures for limited war

[11] Collin Anderson and Karim Sadjadpour, "Iran's Cyber Threat: Espionage, Sabotage, and Revenge" (Washington, D.C.: Carnegie Endowment for International Peace, 2018); Joshua R. Itzkowitz Shifrinson and Miranda Priebe, "A Crude Threat: The Limits of an Iranian Missile Campaign against Saudi Arabian Oil," *International Security* 36, no. 1 (July 1, 2011): 167–201.

contingencies.[12] But they can rely on the ambiguity of exactly how serious a conflict must become before they would consider using nuclear weapons to gain strategic leverage in a limited war. For example, the French Defense White Paper stated that, "nuclear deterrence protects France from any State-led aggression against its vital interests, of whatever origin and in whatever form. It rules out any threat of blackmail that might paralyse its freedom of decision and action."[13]

The second reason why states with first-use nuclear postures may not have a need for strategic leverage is that they have found ways to make nuclear threats credible to achieve non-survival interests, for example using tactical nuclear weapons, and are willing to accept the elevated risk of nuclear war those weapons create. U.S. extended deterrence guarantees relied on tactical nuclear weapons to make credible threats to use nuclear weapons first in Europe during the Cold War, even if conflict in Europe did not directly or immediately pose an existential threat to the United States.[14] The United States, Russia, Pakistan, France and possibly North Korea all have tactical nuclear weapons or limited nuclear options that allow them to fight limited nuclear wars or manipulate the risk of a strategic nuclear war.[15]

States with first-use nuclear postures may nevertheless have strong motivations for developing non-nuclear weapons. They may use non-nuclear strategic weapons to enhance the effectiveness of a nuclear counterforce strike, or to more effectively manipulate the risk of

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[12] See Narang, *Nuclear Strategy in the Modern Era.*
[13] Government of the Republic of France, "Defence and National Security White Paper," 2013, 67.
[14] J. Michael Legge, "Theater Nuclear Weapons and the NATO Strategy of Flexible Response" (Santa Monica, C.A.: RAND Corporation, April 1983).
[15] Hans M. Kristensen and Robert S. Norris, "Nonstrategic Nuclear Weapons, 2012," *Bulletin of the Atomic Scientists* 68, no. 5 (2012): 96–104.

nuclear escalation. They may also see space and cyber weapons, and conventional missiles, as useful tools to maximize strategic leverage as a complement to their nuclear weapons.

Non-nuclear weapons may be used to disable or destroy an adversary's nuclear arsenal, in conjunction with a nuclear counterforce attack. For example, United States has showed an interest in using conventional missiles and cyber weapons for nuclear counterforce.[16] Cyber attacks could be used to disable nuclear command and control systems. The *New York Times* claimed that the United States had initiated such a "left-of-launch" effort to compromise North Korean missiles.[17] Conventional missiles could be used to destroy nuclear weapons and supporting facilities. The Bush Administration's conventional prompt global strike program initiated in 2000 intended to target smaller nuclear powers' weapons of mass destruction.[18] Finally, counter-space weapons could destroy an adversary's missile early warning and nuclear command and control satellites. Alternatively, states may also use their space, cyber and conventional missiles to grease the slippery slope to strategic nuclear war. They may use small-scale attacks on an adversary's nuclear weapons and supporting ground-based infrastructure, command and control networks, and space-based nuclear support satellites to degrade an adversary's nuclear arsenal even if they are unable to eliminate that arsenal.

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[16] On the U.S. interest in nuclear counterforce, see Charles L. Glaser and Steve Fetter, "Should the United States Reject MAD? Damage Limitation and U.S. Nuclear Strategy toward China," *International Security* 41, no. 1 (July 1, 2016): 49–98; Brendan Rittenhouse Green and Austin Long, "Stalking Secure Second Strike: Intelligence, Counterforce, and Nuclear Strategy," *Journal of Strategic Studies* 38, no. 1–2 (2014): 38–73; Keir A. Lieber and Daryl G. Press, "The New Era of Counterforce: Technological Change and the Future of Nuclear Deterrence," *International Security* 41, no. 4 (Spring 2017): 9–49.

[17] David E. Sanger and William J. Broad, "Trump Inherits a Secret Cyberwar Against North Korean Missiles," *The New York Times*, January 20, 2018; William J. Broad and David E. Sanger, "U.S. Strategy to Hobble North Korea Was Hidden in Plain Sight," *The New York Times*, January 20, 2018.

[18] James M. Acton, *Silver Bullet? Asking the Right Questions About Conventional Prompt Global Strike* (Washington, D.C.: Carnegie Endowment for International Peace, 2013).

States with first-use nuclear doctrines may not have the same strong need for non-nuclear strategic force postures as China, but they may still see those postures as useful complements to their nuclear weapons to maximize strategic leverage. The theory of strategic substitution can, therefore, still offer some insights into how states with first-use nuclear postures might use their non-nuclear strategic weapons to maximize strategic leverage in a limited war below the nuclear threshold. For example, in mid-2017, Commander of the U.S. Strategic Command, John Hyten, remarked that while the nuclear triad is "where deterrence starts" for the United States, "today it's more than just nuclear. It requires the integration of all our capabilities — nuclear, space, cyber, missile defense, electronic warfare, and conventional forces."[19] Russian thinking on how to deter threats from advanced U.S. conventional capabilities has also evolved away from a reliance on nuclear threats in the past decade. Russian strategists have increasingly looked to non-nuclear and non-military means of "strategic deterrence."[20] Western observers of Russian military strategy explain that "doubts about nuclear deterrence have contributed to the creation of a more comprehensive concept [of strategic deterrence], aimed at offering more than nuclear options to prevent and shape conflict."[21]

The theory of strategic substitution may also be able to explain how state with first-use nuclear postures select force postures for their conventional missiles, cyber weapons, and space weapons, regardless of why they do so. For example, changes in the U.S. expected cost of retaliation for cyber attacks has influenced U.S. military cyber posture in recent years. A fear

[19] John E. Hyten, "2017 Deterrence Symposium Opening Remarks," U.S. Strategic Command, July 26, 2017, http://www.stratcom.mil/Media/Speeches/Article/1263889/2017-deterrence-symposium-opening-remarks/.
[20] Kristin Ven Bruusgaard, "Russian Strategic Deterrence," *Survival* 58, no. 4 (September 2016): 7–26.
[21] Ibid. See also Dmitry Adamsky, "Cross-Domain Coercion: The Current Russian Art of Strategy," Proliferation Papers (Paris: Institut Français des Rélations Internationales, November 2015).

of punishing retaliation and uncontrollable escalation contributed to the Obama Administration's extreme caution in using cyber weapons to retaliate for peacetime cyber attacks from approximately 2010 until 2016.[22] In response to this high expected cost of retaliation, the Administration developed a calibrated escalation cyber posture. In 2009 the Administration established a Cyber Command to centralize resources and command and control of cyber weapons. The U.S. military began to speak publicly about its offensive cyber weapons around that time. The Department of Defense issued its first cyber strategy in 2015.[23] The United States began to publicly attribute cyber attacks to state actors, beginning with an indictment of PLA officers for cyber-enabled industrial espionage in mid-2014. This policy decision indicated to states and scholars alike that it may be feasible to control escalation from cyber attacks because decision-makers could be confident that they were retaliating against the perpetrator of the attack. The U.S.' extreme caution about using low-intensity cyber attacks appears to have diminished in the past two years. For example, recently Cyber Command began to conduct peacetime operations to disarm adversaries' cyber weapons.[24]

Future Research

The theory of strategic substitution suggests a number of avenues for future research to further develop theories of limited war and nuclear strategy. The most obvious next step for future research is to examine the question of how nuclear-armed states gain strategic leverage in

[22] Jack Goldsmith and Stuart Russell, "Strengths Become Vulnerabilities: How a Digital World Disadvantages the United States in Its International Relations," Aegis Paper Series (Hoover Institution, Stanford University, 2018), 8.
[23] U.S. Department of Defense, "The Department of Defense Cyber Strategy," April 2015.
[24] David E. Sanger, "Pentagon Puts Cyberwarriors on the Offensive, Increasing the Risk of Conflict," *The New York Times*, June 19, 2018.

limited wars from a cross-national perspective. The option of manipulating the risk of nuclear escalation is well-recognized in the existing literature. This dissertation has laid out an alternative of strategic substitution, which involves manipulating the risk of space, cyber and conventional escalation. Why do some states manipulate nuclear risk, while others opt for strategic substitution? Can states successfully mix both approaches by maintaining nuclear first-use as the option of last resort, while using non-nuclear strategic weapons first to try to bargain a less destructive end to the conflict? These questions are worthy of further study to better understand the dynamics of coercion, conflict, and military competition among nuclear-armed states.

A second important avenue for future research is to examine what happens when states taking different approaches to maximizing strategic leverage in a limited war interact with each other over time. Take, for example, a state that manipulates nuclear risk facing an adversary that relies on non-nuclear weapons to maximize strategic leverage in a limited war. In peacetime, would that state also develop non-nuclear force postures or be confident that its nuclear threats are sufficient to achieve its limited political aims? In crises and conflicts, is that state more likely to misperceive its adversary's actions? The theory of strategic substitution also updates the concept of the nuclear "stability-instability paradox." Nuclear-armed states may use their nuclear weapons as a shield for both conventional attacks as well as the first-use of non-nuclear strategic weapons.

A third area for future research is to examine the inadvertent nuclear escalation risks of using non-nuclear strategic weapons first to maximize strategic leverage in limited wars. Space,

cyber and conventional missile first-use could initiate a chain reaction to the use of nuclear weapons even if a state, like China, develops force postures for those weapons to enable strategic coercion without using nuclear weapons. For example, a state may not realize a computer network or satellite it plans to attack has a nuclear support function. In this sense, non-nuclear strategic force postures may be subject to the same lessons as states eventually learned about tactical nuclear weapons. Tactical nuclear weapons were originally intended to allow states to limit nuclear escalation, but decision-makers and strategists recognized that those weapons could just as easily make nuclear escalation more likely.

A final area for future research is to look beyond space, cyber and conventional missile weapons to examine whether the theory of strategic substitution can also explain other new technologies that could be used for strategic leverage. One example is Russia's use of influence operations in the U.S. 2016 elections, which may have been "proof of concept" that influence operations could be used independently of diplomatic initiatives or conventional military operations to gain strategic leverage. The theory of strategic substitution would not expect China to adopt a coercive force posture using influence operations against the United States. China's tight control of information, including via internet censorship, and elaborate propaganda system would make it very exposed to an attack. Although the theory's criteria for escalation control are difficult to apply to non-military "weapons," common sense suggests that influence operations could escalate very quickly to disrupt a polity or bring down a regime.

Policy Implications

The theory and empirics outlined in this dissertation have important practical implications for understanding Chinese behavior. First, China's non-nuclear strategic force postures have reduced pressure on China to change its retaliatory nuclear posture. This finding has two important practical implications. It provides more evidence that China's No First-Use policy is both sincere and has a strategic rationale. It also suggests that, at least until China is confident in its conventional military power, taking steps to undercut the leverage China gains from its space, cyber and conventional missiles could put more pressure on Beijing to change its nuclear posture. Second, the theory of strategic substitution articulates the conditions under which China is likely to become more or less risk-acceptant in its non-nuclear strategic force postures. For example, if the United States were to pull out of the Intermediate Nuclear Forces Treaty or equip its regional allies in East Asia with ground-based conventional missiles, China may accelerate its shift towards a calibrated escalation posture for its conventional missiles. A third implication of my findings is that in future China may rely less on its non-nuclear strategic weapons to coerce Taiwan and the United States. As China's conventional military modernization progresses, it may instead rely on the strategic leverage it will acquire from its ability to win a Taiwan conflict using brute force conventional military capabilities. Therefore, a Taiwan conflict may be less destructive and escalatory in future than it would be today.

A final policy implication of this dissertation is to be cautious of claims that new technologies render existing theories of international relations obsolete. My findings indicate that neither exotic new weapons technologies nor "cross-domain deterrence" is a bafflingly complex game-

changer in international politics.[25] Cyber weapons are not rewriting the rules of military conflict or state behavior.[26] New strategic weapons have not displaced nuclear weapons as the absolute weapon. Familiar international relations concepts of coercion and escalation are sufficient to explain how and why states use new technology to advance their security interests. To paraphrase Clausewitz, space, cyber and conventional coercion are a continuation of politics by other means.

[25] A. Juarez, "2015 Cross-Domain Deterrence Seminar Summary Report" (Livermore, C.A.: Lawrence Livermore National Laboratory, February 5, 2016), 3.
[26] Richard A. Clarke and Robert A. Knake, *Cyber War: The Next Threat to National Security and What to Do About It* (New York, N.Y: HarperCollins, 2010), 30–32.

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