THE PEOPLE'S NUCLEAR WEAPON: STRATEGIC CULTURE, PATH DEPENDENCE, AND CHINA'S NUCLEAR WEAPON PROGRAM, 1955-2011

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Abstract

Since becoming a nuclear state in 1964, China has maintained one of the smallest and most vulnerable nuclear forces among the great powers despite possessing the resources to build a larger force, presenting a puzzle to international relations scholars. I argue that the influence of China's Mao-era strategic culture caused China's nuclear weapons program to be limited in size, a pattern that then persisted in a path dependent manner throughout the history of the program. To establish this argument, this dissertation analyzes the historical development of China's nuclear weapons program across three major periods. During the first period, China's Mao-era strategic culture caused its nuclear weapons program to emphasize technical achievement over force production, limiting the development of the program in a path dependent manner. During the second period, China's strategic culture transformation caused Chinese leaders to improve aspects of the state's nuclear deterrent capability, yet only within an ongoing context of path dependent restraint for the nuclear weapons program. This then continued during the subsequent historical period, revealing that even as China has periodically improved certain aspects of its nuclear deterrent capability, this has occurred within a pattern of path dependent restraint for the nuclear weapons program.

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Chapter One: Introduction

Since becoming a nuclear state in 1964 China has maintained one of the smallest and most vulnerable nuclear forces of any independent nuclear power, presenting a puzzle to international relations scholars and policymakers alike. Chinese leaders believed a demonstrable nuclear capability alone was an effective nuclear deterrent, and this mindset led the development of a nuclear weapons program characterized by low numbers of vulnerable nuclear weapons that persisted throughout dramatic domestic and international change. This is at odds with both the expectations of nuclear deterrence theory and the 20th century experience of the U.S. - Soviet nuclear arms race. According to basic principles of nuclear weapon strategy, a nuclear force capable of surviving a nuclear first strike with enough capability to retaliate in kind should theoretically deter a nuclear attack. Yet China's nuclear forces have been vulnerable to first strike attack from both the U.S. and the Soviet Union (and now Russia) throughout the history of its nuclear weapons program. In terms of historical experience, the U.S. and Soviet Union sought to achieve mutual nuclear deterrence through building large numbers of nuclear weapons in part to ensure some kind of survivable second-strike capability. Yet contrary to the U.S. - Soviet experience, after its initial strategic nuclear deterrence deployments against the Soviets in 1971 and the U.S. in 1981 China never sought nuclear weapons parity with the U.S. or the Soviet Union (or later, Russia). Further, according to a consensus of open source reference material, through 2011 China has operationally deployed between approximately 140 and 190 nuclear armed ballistic

missiles that have remained vulnerable to a U.S. first strike. China's lack of pursuit of nuclear warhead numerical parity with other nuclear powers, in conjunction with the apparent vulnerability of its nuclear force, suggests that neither traditional notions of nuclear deterrence nor Cold War arms race history can explain the size and configuration of China's nuclear forces. What does explain China's approach to developing its nuclear forces?

I argue that a combination of strategic culture and path dependence theory explains the development of China's nuclear weapons program from 1955 through 2011.[1] When China decided to initiate a nuclear weapons program in 1955,[2] its strategic culture – composed of ideas about the nature of warfare centering on a mass mobilized population and reflected in Mao Zedong's People's War doctrine - shaped early decisions about China's nuclear weapons program. The interaction of China's Mao-era strategic culture with ideas about nuclear weapons established a cultural mindset of simply demonstrating a nuclear weapon capability to achieve strategic deterrence vis-a-vis other nuclear powers while retaining an emphasis on the role of "the people" in warfare. This mindset was then institutionalized as it structured China's nuclear weapons program along a particular development pathway that emphasized the technical capability to produce and detonate a nuclear weapon rather than the industrial capacity to manufacture nuclear forces to match the superpowers of the era. The influence of China's strategic culture, not domestic or international balance of power variables, explains China's initial nuclear choices; path dependence explains how these choices persisted across domestic

[1]I use this period for the following reasons. First, 1955 is the year that China decided to develop a nuclear weapons program, and so seems appropriate for a starting point for analysis. Second, I choose 2011 as an end point for this analysis because some of the most reliable information concerning China's current nuclear situation covers approximately through the 2010-2011 period.

[2]Lewis and Xue, *China Builds the Bomb*, p. 11.

and international changes.

China's Nuclear Weapon Force and Doctrine: An Overview

China's Deployed Nuclear Force[3]

As of 2011, China's strategic nuclear force was likely composed of between 140 and 190 operationally deployed nuclear warheads, assigned to (and stored separately from) ballistic missile delivery systems that were unfueled.[4] As chapter five illustrates, the total estimate of China's operationally deployed nuclear weapons remains a fraction of U.S. and Russian nuclear forces. China's nuclear warhead deployment heavily favors land-based missile systems; it bomber fleet is aging and incapable of penetrating modern air defense systems, it likely has no deployed tactical nuclear weapons, and it has no verified nuclear ballistic missile submarine (SSBN) capability despite beginning development of this system in the late 1960s.[5] Further, of China's total nuclear force deployment, there are only approximately 20 silo-based ICBMs (the DF-5A) and 20 road-mobile ICBMs (the DF-31A) with ranges capable of striking the continental United States.[6]

China's Nuclear Deterrence Doctrine

[3]Current estimates of China's nuclear forces differ according to measurement methodology, availability of information, and interpretation of information. For this section I rely upon three sources of information: Jeffrey Lewis' 2007 book *The Minimum Means of Reprisal: China's Search for Security in the Nuclear Age*, the 2006 American Federation of Scientists Report authored by Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, and Hans M. Kristensen and Robert Norris, "Chinese Nuclear Forces, 2011," published by the Bulletin of Atomic Scientists.

[4]Hans M. Kristensen and Robert Norris, "Chinese Nuclear Forces, 2011," see also Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*.

[5]Jeffrey Lewis, *The Minimum Means of Reprisal*, pp. 36-44; Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, Chinese Nuclear Forces and U.S. Nuclear War Planning, Executive Summary pp. 2-5; Hans M. Kristensen and Robert Norris, "Chinese Nuclear Forces, 2011."

[6] Hans M. Kristensen and Robert Norris, "Chinese Nuclear Forces, 2011."

China's model of deterrence likely hinges on the inherent uncertainty of an adversary's first strike against its nuclear forces successfully destroying all of its nuclear weapons rather than the absolute security of the forces themselves. Historically, China's nuclear force has followed a counter-value rather than counterforce targeting strategy, meaning its nuclear weapons target cities as a strategic deterrent against a nuclear first strike.[7] Currently, China's nuclear weapon force is likely deployed according to an informal doctrine of "no first use" minimum deterrence[8] ("houfa zhiren," 后发制人 meaning deterring or controlling through counterattack; minimum deterrence is literally translated as *zuidi weishe*, 最低威慑) characterized by a small number of operationally deployed nuclear warheads on low/no alert intended for second-strike missions against counter-value targets.[9] The likely composition of China's nuclear force aligns with this "no first use" policy and minimum deterrence doctrine;[10] the force is generally considered to be defensive in nature since the small number of operationally deployed nuclear weapons precludes most counterforce missions and since most of China's nuclear forces require several hours of pre-launch preparation. This reflects a high degree of force vulnerability, and according to Keir Lieber and Daryl Press China faces a

[7] John Lewis and Hua Di note that China's "first generation" of nuclear ballistic missiles (developed 1956-1981) were designed to be used for countervalue missions (John Lewis and Hua Di, "China's Ballistic Missile Programs," p. 6).

[8] According to Patrick Morgan, minimum deterrence – also referred to as "existential deterrence" - is a countervalue doctrine relying upon the mere possibility of retaliation in response to a nuclear first strike. This is dependent upon the uncertainty of a first strike successfully destroying all nuclear retaliatory systems and the fear of even a single nuclear weapon destroying a city in retaliation. This form of deterrence is theoretically achieved through the simple possession of nuclear weapons, is preserved with small numbers of weapons overall, and is deemed to be stable regardless of an adversary's force size and structure (Patrick Morgan, *Deterrence Now*, p. 23).

[9] Jeffrey Lewis, *The Minimum Means of Reprisal*, pp. 1, 41-42; 52; Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, p. 30; Chu Shulong and Rongyu, "China: Dynamic Minimum Deterrence," in Muthia Alagappa, ed., *The Long Shadow*, Chapter 5; Blair and Chen, "The Fallacy of Nuclear Primacy," p. 68; Michael Chase, Andrew Erickson, and Chistopher Yeaw, "Chinese Theater and Strategic Missile Force Modernization and its implications for the United States," p. 94.

[10] Jeffrey Lewis, *The minimum Means of Reprisal*, pp. 41-42.

potentially existential security vulnerability vis-a-vis U.S. nuclear capabilities. Lieber and Press (hereafter Lieber/Press) claim that the United States is fast approaching "nuclear primacy,"[11] meaning the ability to successfully conduct a nuclear first strike against any other (nuclear) state resulting in destruction of that state's nuclear retaliatory capabilities.[12] As of 2005 advances in the U.S. nuclear arsenal[13] in juxtaposition with China's small and vulnerable nuclear force leads Lieber/Press to conclude that a U.S. first strike against China's nuclear forces would likely succeed whether launched as a surprise or during a Chinese crisis alert,[14] although there is disagreement concerning whether or not the U.S. would ever take such an action.[15] China's apparently vulnerable nuclear situation has stirred debate concerning whether China's nuclear forces will continue to remain smaller and more vulnerable than theoretical and historical expectations.

China's Divergence from the Theoretical and Historical Expectations of Nuclear Deterrence Theory and Practice

[11]Lieber and Press, "The End of MAD? The Nuclear Dimension of U.S. Primacy," p. 8. This is also referred to as a disarming first strike, and is often linked to broader strategies of prevention (denying an adversary) or preemption (striking an adversary first when facing the immediate threat of attack). In a direct critique of their argument, Bruce Blair and Chen Yali argue that Lieber and Press conflate nuclear "bolt from the blue" first strike strategies with launch-on-warning nuclear preemption strategies (Blair and Chen, "The Fallacy of Nuclear Primacy").

[12]The demands for successfully conducting a nuclear first-strike are stringent due to the requirement of destroying all retaliatory nuclear weapons in a first strike and the costs of even a single surviving nuclear weapon that could be plausibly used in retaliation.

[13]Recent (last 20 years) improvements include the more accurate *Trident* II SLBM with more lethal 455 KT warheads, improved accuracy and higher yield warheads for the *Minuteman* III ICBM, and improved avionics for the B-2 bomber. Future trends include increased accuracy of *Trident* II SLBMs, changing fuses for these SLBMs to allow ground burst detonation (more destructive, used for hardened targets), and continuing the process of *Minuteman* III ICBM lethality and accuracy upgrades; all of these upgrades improve counterforce capabilities (Lieber/Press, "The End of MAD? The Nuclear Dimension of U.S. Primacy," pp. 13-29).

[14]Lieber and Press, "The End of MAD? The Nuclear Dimension of U.S. Primacy," pp. 8-9, "The Rise of U.S. Nuclear Primacy." The focus of these Lieber/Press pieces mostly concerns U.S. nuclear primacy over Russia, but there is substantial reference to China as well.

[15]Bruce Blair and Chen Yali claim that the U.S. has never had a true "bolt from the blue" first-strike policy, and additionally argue that such a strategy contains an inherent degree of uncertainty that would ultimately preclude its implementation (Blair and Chen, "The Fallacy of Nuclear Primacy").

Deterrence occurs when "one party prevents another from doing something the first party does not want by threatening to harm the other party seriously if it does."[16] Nuclear deterrence entails persuading through the threat of using nuclear weapons as the ultimate consequence. Broadly speaking, there are two schools of nuclear deterrence thought in the western academic tradition: the "deterrence statist" and "warfighting" schools, and the development of China's nuclear weapons program has historically not fit either category. Deterrence statism generally considers nuclear war to be catastrophic and uncontrollable in terms of conflict escalation strategies, and that any potential relative gains of war are outweighed by the absolute cost of using nuclear weapons.[17] According to this school achieving nuclear deterrence requires a credibly secure, counter-value targeted strategic nuclear retaliatory force, and nuclear deterrence remains stable and robust as long as a secure, strategic nuclear retaliatory capability is maintained.[18] On the other hand, the warfighting school holds that limited nuclear wars may indeed yield relative gains, conflict escalation is controllable,[19] and nuclear wars are winnable.[20] According to this view, nuclear deterrence is fundamentally *un*stable and highly contingent upon the balance of nuclear forces among potential adversaries; this school argues a large number and wide variety of nuclear weapons in conjunction with

[16] Patrick Morgan, *Deterrence Now*, pp. 1, 4.

[17] This is Daniel Deudney's definition (Daniel Deudney, *Bounding Power*, p. 247).

[18] Kenneth Waltz, "Nuclear Myths and Political Realities," p. 736. Strategic nuclear weapons are long-range, large yield nuclear weapons, and countervalue targeting refers to aiming nuclear weapons at another state's civilian population. See Lawrence Freedman's *The Evolution of Nuclear Strategy* for a detailed history of the development of these nuclear strategic ideas.

[19] The warfighting school of nuclear weapon deployment calls for "being equipped to *fight and win* at any level: very capable sub-conventional and conventional forces, plans and forces to fight limited nuclear wars, even the capability to fight and survive all-out nuclear war" (Patrick Morgan, *Deterrence Now*, p. 25).

[20] For example, see Colin Gray, "The Case for a Theory of Victory." See also works by Herman Kahn, Keith Payne, James Schlesinger, Harold Brown, and Paul Nitze (list of names drawn from Patrick Morgan, *Deterrence Now*, page 24 footnote 16).

counterforce target planning is essential for maintaining nuclear deterrence.[21] A secure second-strike capability is also essential for deterrence according to this perspective, but the security of this retaliatory capability changes with shifts in the balance of number and type of nuclear weapon between states. These schools differ with respect to the strategic importance of nuclear warhead numerical parity, but both agree that a nuclear force capable of surviving a nuclear first-strike and retaliating in kind is essential for achieving basic nuclear deterrence vis-a-vis other nuclear armed states. China deploys its nuclear forces in a manner that has not emphasized force size or first-strike security. This clearly does not accord with the warfighting school, which views nuclear deterrence as highly contingent on the balance of nuclear forces between adversaries. Yet China's nuclear weapons program has not historically aligned with the deterrence statist school of thought either, since China's leaders did not initially accept that nuclear weapons caused a change in the nature of warfare, and more importantly, its nuclear force has historically been vulnerable to a first-strike from the U.S. and Soviet Union/Russia.

China also diverged from the Cold War historical experience regarding nuclear weapon development, ignoring balance of power politics related to strategic weapon force structure.[22] Both the U.S. and the Soviet Union strongly integrated nuclear weapons into their respective national security strategies, with each developing complex

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[21] In the context of nuclear deterrence strategy "counterforce" refers to targeting the nuclear weapons of other states. Warfighting nuclear strategic ideas such as counterforce targeting were debated since the early 1950s among nuclear strategic analysts at RAND (Fred Kaplan, *The Wizards of Armageddon*, pp. 203-204; Kaplan claims Bernard Brodie as the founder of these ideas). Linked to the rise of these ideas was Albert Wohlstter's series of RAND studies concluding that U.S. SAC nuclear bomb and delivery assets were vulnerable to a Soviet nuclear first strike (Fred Kaplan, *The Wizards of Armageddon*, pp. 97, 101-102; see also Albert Wohlstetter, "The Delicate Balance of Terror").

[22] Kenneth Waltz explained the Cold War nuclear weapon build-up between the U.S. and Soviet Union in terms of balance of power politics within the context of bipolar stability. According to Waltz, the US and Soviet Union sought to increase power through building nuclear weapons, which became the primary mechanism of balancing between the superpowers (Campbell Craig, *Glimmer of a New Leviathan*, p. 147).

nuclear strategies, interlocking operational deployment patterns, and the production of tens of thousands of nuclear warheads.[23] The U.S. began integrating a nuclear weapon doctrine within its overall national security framework during the Eisenhower administration, and its first complete nuclear doctrine of "massive retaliation" required large numbers of strategic nuclear weapons. U.S. nuclear strategy became structured by the doctrine of mutually assured destruction requiring a secure-second strike capability; assuring a countervalue retaliation in the event of a nuclear first-strike played a prominent role in basic deterrence formulations as the U.S. nuclear force structure matured into a "strategic triad" of bombers, ballistic missile submarines, and ICBMs.[24] In the Soviet Union the trend towards ever greater reliance on nuclear weapons as part of the Soviet national security policy expanded under Brezhnev and by the early 1970s the Soviet Union had increased its nuclear ballistic missile forces to a level of rough parity with the U.S.[25] By the 1970s the Soviets had also implemented a strategic triad of operationally deployed nuclear weapons and the numbers of Soviet nuclear ballistic missiles (both ICBM and SLBM) surpassed that of the U.S., causing concern about the political meaning of the Soviet's lead in the arms race.[26]

China, on the other hand, never followed this historical example. China did not strongly integrate nuclear weapons into its national security strategies during the height of the Cold War, and simply never built many nuclear warheads despite its periodic

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[23]Patrick Morgan cites estimates of more than 50,000 nuclear weapons (strategic and non-strategic) held between the U.S. and Soviet Union by 1989 (Patrick Morgan, *Deterrence Now*, pp. 28-29). Barry Posen has argued that neither Cold War superpower sought true deterrence, rather each sought "military advantages that might produce 'victory' in a nuclear war," and this was a major contributor to the Cold War superpower nuclear arms race (Barry Posen, *The Sources of Military Doctrine*, p. 24).

[24]Lawrence Freedman, *The Evolution of Nuclear Strategy*, p. 326; see also Chapter 16, "Assured Destruction."

[25]Robert Berman and John Baker, *Soviet Strategic Forces: Requirements and Responses*, p. 61; Lawrence Freedman, *The Evolution of Nuclear Strategy*, pp. 255-257; 329.

[26]Lawrence Freedman, *The Evolution of Nuclear Strategy*, pp. 329-330.

geopolitical confrontations with the U.S. and the Soviets during the second half of the 20th century and beyond. If we take into consideration ideas about the effect of socialization among states seeking to maximize their security, in addition to the idea that the U.S. and the Soviet Union used nuclear weapons as a balancing mechanism, then why did China not "learn" from the superpowers and build a larger nuclear arsenal during the Cold War?[27]

Alternate Explanations of China's Nuclear Program

What explains China's nuclear weapons program choices? As a prelude to introducing my own argument, I first explore alternate explanations of China's nuclear weapons program development that differ from this dissertation's thesis, including the "China threat" hypothesis as introduced by Philip Karber; the effect of domestic budgetary constraints; and neorealist theoretical expectations. The "China threat" hypothesis rejects the generally accepted view within the academic community that China's nuclear weapons program has remained restrained throughout the history of its development, and instead posits that China's nuclear weapon force may be much larger than is commonly understood and thus represents a threat to the United States.[28] However, if we accept that China's nuclear force has historically been small and vulnerable, then two of the most common alternate explanations for this restraint are China's domestic budgetary limitations and the expectations of neorealist theory.

[27] Taylor Fravel also raises this question, extending Waltz's theorizing in this area (Taylor Fravel and Evan Medeiros, "China's Search for Assured Retaliation," p. 49).

[28] Karber's study is associated with Georgetown University and has been featured in various media outlets, to include the Washington Post and Wall Street Journal; it therefore presents a popularized hypothesis for comparison with this dissertation's analysis (for example, see William Wan, "Georgetown Students shed light on China's Tunnel System for Nuclear Weapons," *The Washington Post*; and Bret Stephens, "How Many Nukes Does China Have? Plumbing the Secret Underground Great Wall," *The Wall Street Journal*).

Regarding budgeting, some argue that financial considerations may have constrained China's leaders when it made decisions regarding its nuclear weapons program. Alternatively, according to the expectations of neorealist theory, China may have simply rationally reacted to its place within the structure of the international system and created a restrained nuclear weapons program in order to achieve basic nuclear deterrence with the least amount of effort. Following is an overview of these alternative explanations.

Alternative Hypothesis: China has 3,000 Nuclear Weapons

On September 16th, 2011, Georgetown University professor Philip Karber published online a 357 slide presentation suggesting a provocative claim: China could have as many as 3,000 nuclear weapons hidden in a vast network of underground tunnels and facilities throughout China.[29] Granting an assumption of accuracy of the study's work in identifying associations with the Second Artillery, the first 325 slides of Karber's presentation shows images of missiles, missile launchers, missile-related logistics equipment, and maps, all in relation to a system of Second Artillery-controlled tunnels that compose China's underground "Great Wall" measuring perhaps as much as 5,000km in total length.[30] Taken together, Karber's argument may be summarized as follows. China's missile force has expanded over the last 20 years. China's military-controlled tunnels have expanded for the last 25 years. Therefore, it is possible that China's nuclear warhead totals have also grown commensurate with its tunnel and missile force

[29] Philip Karber, "Strategic Implications of China's Great Wall," slide 331.

[30] Philip Karber, "Strategic Implications of China's Great Wall," slide 328. The lack of rigor in Karber's association of any given tunnel or underground facility with the Second Artillery comprises a major assumption for his study; indeed, China's "Underground Great Wall" – to the extent that China's many tunnels actually exists as a single system built for one purpose – could be designed to protect any manner of military or political target.

expansion.[31] The possibility of this claim is (indirectly) supported by Karber's extrapolation of warhead construction derived from separate intelligence estimates of the 1960s and 1980s that posits a uniform construction pace over the last 40-50 years.[32] Overall, the implications of Karber's suggested claim are fairly straightforward; if the U.S. does not know that China may have ten times the number of nuclear warheads than is commonly thought (i.e. 3,000 instead of approximately 400), then the U.S. may have a vulnerable nuclear deterrent vis-à-vis China and, by implication, may be vulnerable to a Chinese nuclear attack. Indeed, Karber implies U.S. vulnerability to Chinese nuclear attack by listing projected casualty figures and infrastructure disruptions from a theoretical (presumably Chinese, given the associations made in his report) nuclear attack.[33]

Karber's eclectic collection of visual information is impressive, and his study does raise awareness of China's extensive government and/or military-related tunnels and underground facilities. The study mentions how a recent earthquake in Sichuan resulted in the apparent collapse of some of these tunnels. This offered a rare glimpse into part of these apparent underground facilities, and the Sichuan event perhaps has led to some general insight regarding China's emergency response to accidents involving hazardous material. Hui Zhang, in his critique of Karber's study, did allow that tunnels discussed in Karber's study could form a system that serves as a launch base for China's nuclear forces, suggesting that some of the tunnels shown in Karber's study do indeed serve

[31] This is a verbal restatement of a single graph that suggests a strong, positive relationship between missile numbers, tunnel length, and nuclear warhead totals (Philip Karber, "Strategic Implications of China's Great Wall," slide 331).
[32] Philip Karber, "Strategic Implications of China's Great Wall," slide 327.
[33] Philip Karber, "Strategic Implications of China's Great Wall," slides 332-347.

China's Second Artillery organization.[34] Further, Karber's work may have uncovered important photographic information of Second Artillery tunnels and equipment that could serve to assist identification of systems and launch facilities in the future.

However, Karber's study faces several problems that render it untenable, including poorly structured and illogical argumentation, omitted information, no analysis of China's nuclear industry, a lack of consideration for basic principles of nuclear deterrence theory, and no acknowledgement of the effect of historical events on the development of China's nuclear weapons program. The problems begin with Karber's most important and controversial claim that China may secretly have as many as 3,000 nuclear weapons. Only six out of his study's 357 slides even refer to the possibility that China may have more nuclear warheads than is commonly accepted and only one slide out of the entire presentation presents the number 3,000.[35] The extreme underrepresentation of this claim relegates it to a mere suggestion, albeit one so provocative as to inspire media reports focusing on this very idea that China may secretly possess tenfold the number of nuclear weapons than is commonly understood in academic and policy communities.

The only evidence offered to support this suggestion, presented in graph form on slide 331, shows that China's nuclear warhead construction may have expanded at a uniform pace since periodic intelligence estimates of the 1960s and 1980s. Yet this graphic display both illogically extrapolates from separate, single data points and, more seriously, neglects to include vital information that would change Karber's extrapolation results. Extrapolating from a single data point offers no reference for assessing the

[34] Hui Zhang, "The Defensive Nature of China's "Underground Great Wall."
[35] Philip Karber, "Strategic Implications of China's Great Wall," slides 5, 327-331.

accuracy of that single point; one can move the trend line through a single data point in any direction, with any slope, and develop a variety of theoretically valid outcomes. Further, as Hui Zhang has noted, Karber's graph neglects to include information from a declassified 1996 CIA report estimating China's nuclear weapon totals between 200 and 300.[36] If he had included this estimate, Karber's extrapolated projected nuclear weapon total would be approximately 300-450 total nuclear weapons/warheads as of about 2010.

Considering that building a nuclear weapon requires an industrial base that includes fissile material production capacity, it is striking that Karber's study does not take into account the relationship between China's military-controlled fissile material and its nuclear warhead construction. As I show in chapter three, according to imagery analysis the Chinese never expanded their primary fissile material production facility during the Mao era. Further, all available open source material indicates that China demilitarized its primary fissile material production facilities in the late 1980s. According to Hui Zhang, this left China with enough weapons-grade HEU and plutonium to produce perhaps another 1,000 weapons if it uses all of its fissile material stock, although there is no indication that China has proceeded down this path.[37] This critique underscores the importance of understanding the relationship between a state's nuclear industry and its nuclear weapons program, a relationship that this dissertation has taken as central.

Karber's suggestion that China may have a secret arsenal of nuclear weapons further neglects a fundamental principle of deterrence, i.e. that others must have some working knowledge of one's military capability in order for one to successfully deter

[36] Hui Zhang, "The Defensive Nature of China's "Underground Great Wall;" the report is: *Proliferation Digest*, Directorate of Intelligence, March 1996.
[37] Hui Zhang, "The Defensive Nature of China's "Underground Great Wall."

them, especially with regard to nuclear deterrence. In the case of China, this was exemplified by its original public communication of a successful detonation of its first fission weapon in 1964. Given the importance of communicating military capability for practicing deterrence, and the demonstrated example of states' public communications of a general nuclear capability to other states, then how might a secret stash of 3,000 nuclear weapons – presumably strategic in nature, although this is left unstated in Karber's work - be expected to successfully deter another state? If a secret nuclear cache cannot achieve deterrence vis-à-vis other states, then what is the purpose of expending so many resources to build and hide these weapons? Left undeveloped in Karber's work is the possible strategic intent motivating China's alleged massive "Underground Great Wall" and the corollary secret nuclear arsenal he proposes.

Hui Zhang offered one explanation for China's "Underground Great Wall," while refuting the notion that it houses a secret nuclear force of 3,000 weapons. Hui Zhang argues that China's Second Artillery-controlled underground network of tunnels and facilities is to land-based missile systems as the ocean is to nuclear missile submarines, in that they serve to increase the survivability of China's mobile land-based missiles by creating uncertainty about their location.[38] This argument is plausible, yet ultimately flawed; a tunnel or underground facility remains a fixed location that, once located, is always known. Uncertainty regarding spatial location of a nuclear missile system in an underground area may be achieved for some period, however this uncertainty is bounded by territory, various geophysical conditions, and the explosive yield of a given strategic weapon launched by an adversary. As Hui Zhang suggests, Karber may be correct that China has been expanding its underground network of Second Artillery-controlled

[38] Hui Zhang, "The Defensive Nature of China's "Underground Great Wall."

tunnels and facilities; however, the extent to which this improves China's nuclear deterrent is unclear given the fundamental vulnerability of land-based missile systems once their facilities have been located. The ocean, on the other hand, offers a much larger variation of space for positioning a nuclear weapon delivery system, and this explains why a sea-based nuclear deterrent has long been considered essential for ensuring a survivable second-strike capability. However, since beginning research on SSBN/SLBM systems in the late 1960s, China still had not operationally deployed a nuclear missile submarine capable of consistent deterrence patrols as of at least 2010.[39] Indeed, the fact that China has taken more than 50 years to develop an operationally deployed sea-based nuclear deterrent indicates its nuclear force modernization has been slow and incremental, suggesting that China is not directly challenging U.S. nuclear superiority. The incremental nature of China's sea-based nuclear deterrent research and development may in fact reveal more about China's strategic intent regarding nuclear weapons than the building of potentially multi-function underground tunnels and facilities.

Further, Karber's study posits a steady, positively sloped growth pattern for nuclear warhead construction throughout China's tumultuous political history between 1960 and 2005, which ignores the possibility that political historic events may affect a

[39] In their article "Chinese Theater and Strategic Missile Force Modernization and its implications for the United States," Michael Chase, Andrew Erickson, and Chistopher Yeaw refer to a commercial satellite image of a *Jin*-class submarine as evidence that China has developed a SSBN/SLBM system as a challenge to U.S. nuclear superiority. However, the authors make no clear connection between a possible 2006 image of this type of submarine and the development status of China's SSBN system; for example, an image of a *Jin*-class submarine does not by itself indicate that China has successfully developed an SLBM for use with this SSBN. Further, the authors fail in their attempt at connecting the development of an SSBN capability with an overarching causal narrative of China's development of a more robust *and operationally deployed* sea-based nuclear deterrent to challenge U.S. nuclear superiority. That is, there is no connection between the apparent image reference and their broader analytic thesis regarding China's improving strategic deterrent; even if the submarine is correctly identified, and the authors correctly interpret what this means in terms of the development stage of this weapon system, there remains no clear connection to China's overall strategic deterrence posture.

state's strategic weapons program. Certainly there is ample evidence within U.S. history of political events affecting strategic programs; for example, after the fall of the Soviet Union the U.S. reduced its stockpile of nuclear weapons by approximately 10,000 weapons over ten years, according to NRDC data cited in this dissertation's chapter five. In relation to China, Karber ignores the influence of several major historical events on China's nuclear weapons program, to include the Great Leap Forward, the Sino-Soviet Split of 1960, the Sino-Soviet nuclear standoff in late 1969 and early 1970, the Cultural Revolution between 1966 and 1976, China's strategic culture shift during the Deng Xiaoping era, and the effect of the Persian Gulf War on Chinese political and military thinkers. In contrast, this dissertation has found that comparing these historical events to various aspects of China's nuclear weapons program has yielded important insight into the development trajectory of the program as a whole. In chapters three, four, and five of this dissertation, I show how domestic and international socio-political events have provided essential contextualization for understanding China's nuclear weapons program development.

Given the problems I have identified in Karber's work, and taking into consideration the results of my own study, I reject Karber's suggestion that China has 3,000 deployed nuclear weapons in underground facilitates throughout China, and instead support the general assessment of the academic and policy communities that China's nuclear force numbers between 100 and 200 deployed nuclear weapons, with as many as approximately 400-500 stockpiled nuclear warheads. Given this, why has China's nuclear weapon force remained small and, to varying extents, vulnerable throughout its history? Before offering my own explanation, below I explore two alternative

hypotheses that attempt to explain this phenomenon.

Alternative Hypothesis: Cost has Prohibited China from Building more Nuclear Weapons

One possible explanation for the small size of China's nuclear force is the prohibitive cost associated with engaging in an arms race, which Avery Goldstein has noted constrained all second-tier powers during the Cold War.[40] Although it is difficult to calculate the true cost of such a large-scale industrial effort, Lewis and Xue estimate China's nuclear program cost about $4 billion U.S. spread over a 10 year period, a figure that represents about 37% of 1957's entire state budget.[41] This is a considerable cost, but is it prohibitive for producing a larger nuclear force of atomic fission weapons? In the case of China, I argue it is not for the following three reasons. First, China's initial investment in its nuclear weapons program represented sunk costs into an educational, material, and political infrastructure that, once established, could have supported additional investments in expanded production of atomic fission bombs at progressively lower costs. Instead, China chose to invest in developing a nuclear fusion weapon soon after successful detonation of its first atomic fission weapon in 1964, demonstrating that China still had capital to spend on its nuclear weapons program in 1964. Given this, the fact that China invested in developing a new nuclear weapon system rather than building a stockpile of fission weapons was an issue of strategic choice, not cost. Second, China's investment in the Third Line campaign from 1965 through at least 1971 – described in greater detail in Chapter three - dominated China's annual budget during this

[40] Avery Goldstein, *Deterrence and Security in the 21st Century*, pp. 4-8; 119-120. This is somewhat contradictory with Goldstein's description of the initial shift to deterrence as cost-effective in his explanation of the original decision to develop nuclear weapons (pp. 54-57).

[41] This equates to about 12.86 billion *yuan* in 1981 prices, or 10.7 billion *yuan* in 1957 prices (John Lewis and Litai Xue, *China Builds the Bomb*, pp. 107-108).

period, with little of this money going towards nuclear facilities. As chapter three will show, this was again a matter of strategic choice, not budget constraint. Third, the issue of cost does not account for the period between1980 and 2011, when China's GDP dramatically increased and yet its strategic nuclear weapons (ICBMs) only incrementally increased in number. Taken together, given that cost did not interfere with other massive national defense-related investments, and that China's economy has expanded at a tremendous pace from 1980 through the present, therefore the costs associated with expanding a nuclear weapons program cannot account for China's overall lack of appreciable nuclear expansion between 1964 and 2011.

Alternative Hypothesis: Neorealist Theory as Explanation of China's Nuclear Program

Neorealism's founder Kenneth Waltz incorporated nuclear weapons into writings about the Cold War in terms of balance of power politics within the context of bipolar stability.[42] More recently, Avery Goldstein has articulated a neorealist argument concerning China's nuclear weapon choices in his book *Security and Deterrence in the 21st Century*. Goldstein argues that the bipolar character of superpower relations during the Cold War established the need for second ranking military powers such as China to depend upon one of the superpowers for security assistance, while the anarchic nature of the system encouraged self-reliance. The emergence of nuclear weapon technology offered a cost-effective alternative encouraging security independence from the

[42] According to Waltz, the U.S. and Soviet Union balanced against one another by trying to increase their power as expressed through the building of nuclear weapons, which became the primary mechanism of balancing between the superpowers within the otherwise anarchical international system (Campbell Craig, *Glimmer of a New Leviathan,* p. 120, 147; see also Chapter 7, "Retreat from Parsimony;" Daniel Deudney, *Bounding Power*, pp. 77-78. Deudney describes Waltz's initial neglect of nuclear weapons as part of a broader lack of attention to the effect of material context and "violence interdependence," and he interprets Waltz's later attention to nuclear weapons as *ad hoc* and ultimately inconsistent with Waltz's early theorizing that became the foundation of neorealism.

superpowers.[43] In the case of China, structural position in the bipolar international system of the Cold War in combination with the strategic advantages conferred by nuclear weapons caused China to pursue security independence by building a small nuclear weapon force. This argument accords with Waltz's general reasoning that it is rational for a state to pursue nuclear weapons given interests structurally determined by the international system,[44] with the implication that a rational state should (somehow) understand that a small, secure nuclear force may effectively deter a state possessing a large, well-articulated nuclear force.[45]

But how do states know when they have built a force large enough to deter nuclear strikes? Do they learn it from other states? Historical experience seems to indicate that such learning is not automatic. For example, during the Cold War China did not attempt to match the Soviets or the U.S. in force size; China's nuclear force size remained a fraction of U.S. and Soviet forces without any SLBM capability, despite its security independence from these powers (unlike, for example, the United Kingdom and France, who have long relied upon the U.S. "extended deterrence" security policy applied to NATO member states).[46] This implies China did not primarily derive its security interests from analyzing its place in the international system, nor did it necessarily seek to "optimize its utility" (power) with respect to developing its nuclear weapons program.[47]

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[43] Avery Goldstein, *Deterrence and Security in the 21st Century*, pp. 15-17.

[44] Craig Campbell, *Glimmer of a New Leviathan*, pp. 158-160.

[45] Kenneth Waltz, "Why More May be Better," in Scott Sagan and Kenneth Waltz, *The Spread of Nuclear Weapons: A Debate*, pp. 20-26. Waltz uses China as one example in this chapter/essay, but he does not explain China's nuclear choices per se.

[46] For a recent analysis of the U.S. extended deterrence policy, see Steven Pifer et. al., "U.S. Nuclear and Extended Deterrence."

[47] Alastair Iain Johnston characterizes the neorealist paradigm in terms of states as functionally undifferentiated units seeking to optimize their utility, usually defined as power (Alastair Johnston, "Thinking about Strategic Culture," p. 35). This is part of his broader overview of work on strategic culture, a field of inquiry that began in response to examinations of differences in nuclear strategy

This reflects a broader issue: it may not be possible to know what constitutes optimum choices for any given state, as there may be competing visions of the national interest among domestic political actors and differing conceptions of what constitutes "security" between states.[48]

Further, the neorealist position emphasizes the importance of a *secure* nuclear force, positing that a secure second-strike capability for a small number of nuclear weapons is sufficient for achieving a credible nuclear deterrent. However, China's nuclear force has remained vulnerable throughout the history of its program. Further, perhaps the clearest counter to the neorealist position regarding nuclear weapons is the fact that China still has not deployed an SLBM-capable SSBN system. Given the dictates of nuclear targeting, a sea-based nuclear deterrent has long been considered essential for ensuring a survivable second-strike capability; without this capability, China's nuclear arsenal remains fundamentally vulnerable to a nuclear first strike. Neorealist theory cannot account for why China's nuclear weapon force has remained vulnerable throughout its history.

This Dissertation's Explanation of China's Nuclear Program, 1955-2011

I argue that the shaping effect of strategic culture within a path dependent historical development trajectory best explains China's nuclear weapons program. I

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between the U.S. and Soviet Union during the Cold War (Johnston, ibid.; see also Runa Das, "Strategic Culture, Identity, and Nuclear (In)Security in Indian Politics: Reflections from Critical Constructivist Lenses").

[48] George Lawson makes a similar point in his overview of the microfoundations of international relations theory (George Lawson, "The Promise of Historical Sociology in International Relations," pp. 399-400).

define strategic culture as the historically patterned manner in which state leaders "think about the use of force for political ends."[49] It entails that states possess certain strategic preferences rooted in historical experiences that are of primary importance in shaping national security-related decision making.[50] Strategic culture has periodically been employed as an explanatory variable accounting for differences between U.S. and Soviet nuclear force structures, and this dissertation follows in this tradition by arguing that China's strategic culture determined key aspects of its nuclear weapons program, accounting for why it began as a small-scale program weakly integrated within China's military doctrine.[51] While strategic culture explains how certain parameters of China's nuclear weapons program were initially established during the Mao era, and then later changed somewhat during the Deng era, path dependence explains how other aspects of the program have persisted across historical eras. Path dependence theory has been applied to areas such as technology development, economics, and political institutions; it offers a cluster of concepts for analyzing the development of various phenomena over time and within a particular historical context.[52] Certain path dependence concepts are employed here as a heuristic tool for historical analysis of China's nuclear weapons program over a 56 year period, including the idea of a development "trajectory," the importance of initial conditions, critical junctures, and reinforcing processes. This cluster of concepts forms an integral framework for explaining the development of

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[49] This is Alastair Iain Johnston's definition (Johnston, *Cultural Realism*, p. 1).

[50] Alastair Iain Johnston, "Thinking about Strategic Culture," p. 34.

[51] For example, Jack Snyder, Colin Gray, and David Jones have separately argued that differences in history and national political culture between the U.S. and the Soviet Union explain their respective variance in nuclear strategy and deployment (Alastair Iain Johnston, "Thinking about Strategic Culture," p. 36).

[52] Paul Pierson, *Politics in Time*, chapter one. Given that China's nuclear weapons program has strong technological, economic, and political associations, it is all the more relevant to analyze the program according to path dependence concepts.

China's nuclear weapons program across a 56 year period that spans radically different socio-political eras.

China's strategic culture institutionalized a mindset for China's nuclear weapons program that emphasized technological achievements rather than force parity vis-a-vis geostrategic rivals. This mindset persisted in a path dependent manner throughout the history of China's nuclear weapons program, leading to a restrained development pattern for the program as a whole. After Mao decided to develop a nuclear weapons program in 1955, leadership ideas about nuclear weapons fused with China's People's War strategic culture to form what I call People's War Nuclear Deterrence (PWND). PWND is defined by two broadly conceived strategic ideas: (1) the maintenance of mass mobilization of "the people" as the key to China's strategic culture, and (2) the simple demonstration of nuclear weapon capability as sufficient for achieving nuclear deterrence vis-a-vis other nuclear powers.[53] It is not a detailed nuclear strategy, and it does not incorporate any nuclear doctrine for the deployment of nuclear forces.[54] Rather, PWND was a "proto" minimum deterrence strategy that aimed to create uncertainty through simply demonstrating the capability to produce and detonate a nuclear weapon instead of

[53]Mao espoused "the people" as being central to resolving any armed conflict, and did not consider nuclear technology to be a decisive factor in war (Lewis and Xue, *China Builds the Bomb*, pp. 65-67; see also Chapter Eight, "Strategic Doctrines and the Hydrogen Bomb," for more on how nuclear weapon capability served to reinforce China's strategic culture rather than re-define it). After China successfully achieved the capability to detonate a nuclear weapon, the prevailing People's War strategic culture of the era blocked the integration of this capability into its military doctrine, and nuclear weapons were never deployed according to a clear plan for their use.

[54]"There is no evidence that any overarching strategic doctrine informed Chairman Mao Zedong's decision to proceed with the strategic missile program in the 1950s" (John Lewis and Hua Di, "China's Ballistic Missile Programs," pp. 5-6, 19-20), and by the time nuclear armed ballistic missiles were being operationally deployed little over a decade later there remained a wide divergence between Chairman Mao's strategic ideas about nuclear weapons and their actual production and deployment by the Second Artillery (Lewis and Xue, *China Builds the Bomb*, p. 215). This indicates weak central oversight of deployment and the lack of a clear nuclear doctrine for operational deployment. See also Taylor Fravel and Evan Medeiros' "China's Search for Assured Retaliation" for more on the lack of any clear operational doctrine for China's nuclear weapons during the first three decades of their existence.

producing a nuclear force on par with other powers. PWND structured planning for China's nuclear weapons program as a whole, effectively becoming institutionalized within China's overall nuclear weapons program, meaning that the set of strategic ideas that constituted PWND in turn structured the planning and execution of China's initial nuclear program. For example, the early emphasis on demonstrating a nuclear technical capability led to a high degree of redundancy within China's nuclear weapons program, including the simultaneous pursuit of two development pathways for achieving nuclear fission (uranium and plutonium).[55] Then, an emphasis on achieving technical breakthroughs over developing military force production capacity led specifically to China quickly moving towards researching a fusion weapon soon after detonating its first fission weapon,[56] and more generally to developing and maintaining a broad scientific human capital foundation to spur long-term technical innovation beyond China's nuclear program.[57] Taken together, the key mechanism for institutionalizing PWND was this set of initial decisions establishing China's nuclear weapons program as a set of new *institutions* reflecting China's People's War strategic culture.[58] After becoming institutionalized, PWND's core strategic idea of low numbers of nuclear weapons for

[55]Lewis and Xue, *China Builds the Bomb*, p. 113. These two paths were pursued simultaneously to provide redundancy in the event one pathway failed, and both pathways received the same priority until the Soviets withdrew scientific expertise and economic aid in the early 1960s.

[56]Lewis and Xue describe the fast switch to developing a thermonuclear device after successfully detonating its first fission device (Lewis and Xue, *China Builds the Bomb*, p. 196); it is my assertion that this decision was made because of China's overall emphasis on achieving technical breakthroughs over production capacity of nuclear weapons.

[57]This highlights another issue related to China's nuclear weapons program: the place of science and technology within China's overall economic and military development plans. Evan Feigenbaum argues strategies for long-term scientific development became a national priority after the Korean War, and he characterizes this as a result of a leading military official, Nie Rongzhen, convincing Mao to follow this long-term pathway rather than developing conventional force parity (Feigenbaum, *China's Techno-Warriors*).

[58]I use Douglas North's definition of institutions as "any form of constraint that human beings devise to shape human interaction" (Douglas North, *Institutions, Institutional Change, and Economic Performance*, p. 4).

maintaining nuclear deterrence persisted throughout subsequent domestic and international political changes from 1955 through 2011.[59] The influence of China's strategic culture explains China's initial nuclear choices; path dependence theory explains how these choices became institutionalized and then persisted across domestic and international changes.

Later, during the Deng era, China's strategic culture changed in a manner that led to an integration of its nuclear weapons into People's Liberation Army (PLA) military doctrine, improving the second-strike capability of existing forces while the program remained restrained in terms of nuclear weapons production. During this period, China continued deploying low numbers of nuclear weapons, the development of new deployment systems was incremental, and its nuclear industry remained relatively small. However, China's transformed strategic culture did cause some important changes for other aspects of its nuclear weapons program. After the highly contingent political transition to Deng Xiaoping by 1978, China reformulated its strategic culture as leaders decided the threat of major war to be low and believed the best method for improving its security entailed economic development and diplomatic engagement. As a result, China cut its overall military budget; de-militarized and commercialized its military industrial sector, to include its nuclear industry; developed educational reforms for the Second Artillery, the organization in control of China's nuclear weapons program; reformed the

[59]This characterization of the creation of a nuclear strategy as forming through a mixture of new ideas and culturally constrained choice draws on the work of the "new institutionalists" in historical sociology as reviewed by Kathleen Thelen, "Historical Institutionalism in Comparative Politics," pp. 386-387 (this area will be reviewed in the theory chapter of this dissertation). One example of this type of argument applied to nuclear weapon technology is Donald MacKenzie's *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance*, which traces the evolution of inertial guidance systems within U.S. nuclear weapons technology. MacKenzie argues inertial guidance systems were not a necessary technological development for nuclear weapons, but rather were pushed along by key personalities with particular engineering ideas that drove research in a path towards developing this technology.

command and control of its nuclear forces, to include the establishment of training programs for weapon deployment; and initiated a series of diplomatic engagements, including nuclear-related treaty accessions, that further restrained its nuclear program in a self-reinforcing manner. While remaining restrained overall, China's nuclear weapons program was reformed during this period in a manner that improved its second-strike capability without increasing the number of nuclear weapons it deployed.

This development trajectory continued during the 1993-2011 period, as nuclear weapons continued to be integrated with PLA doctrine while the program remained restrained overall. During this period, China further developed its missile deployment strategies through strategy-related publications and deployment training exercises for Second Artillery forces. Additionally, China continued incremental development of nuclear missile-related deployment systems, such as its land-based mobile missile and SSBN/SLBM systems, even as it expanded the Second Artillery's mission to include management of an extensive conventional missile force. This reinforced reforms intended to enhance the credibility of China's second-strike capability without substantially increasing the number of deployed nuclear weapons, and in fact China's nuclear force did not appreciably expand during this period, indicating the continued restraint of China's nuclear weapons program. Further, China's accession to nuclear-related treaties continued, and China further expanded bi- and multi-lateral agreements related to its nuclear industry. This further reinforced the restraint of China's nuclear program through establishing international expectations regarding the status of China's nuclear industry.

Placing this Dissertation within China Nuclear Weapon Studies Literature

I argue that strategic culture shaped the initial conditions of China's nuclear weapons program, highlighting the importance of strategic culture as a variable for analyzing China's strategic weapon's programs. Additionally, by analyzing the effect of China's strategic culture within a 56 year historical period, this dissertation has identified key junctures of change and mechanisms for reinforcement that contextualize the overall development trajectory of China's nuclear weapons program. In order to further elucidate these contributions, here I contrast this dissertation with several of the foremost studies of China's nuclear weapons program: John Lewis and Xue Litai's *China Builds the Bomb*, Avery Goldstein's *Deterrence and Security in the 21st Century*, Jeffrey Lewis' *The Minimum Means of Reprisal: China's Search for Security in the Nuclear Age*, and Taylor Fravel and Evan Medeiros' article "China's Search for Assured Retaliation: The Evolution of China's Nuclear Strategy and Force Structure." Similar to my own study's framework, each of these sources analyze the historical development of China's nuclear weapons program over varying spans of time, yet they also compose an analytically diverse set of perspectives for comparison with my own analysis.

John Lewis and Xue Litai's *China Builds the Bomb* is a seminal history of how China built its first atomic weapon. It offers a detailed historical overview of China's nuclear weapon project from approximately 1955 through the mid-1970s, and covers every facet of technological development including the project's bureaucratic organization design, development pathway choices,[60] fissile material collection, uranium

[60]China began dual development tracks for plutonium (Pu) and uranium 235 (U235) weapons, and later in 1960 chose U235 for their first atomic weapon design given the circumstances of the "three hard years" and the Soviet withdrawal of aid at the outset of what became known as the Sino-Soviet split of the early 1960s (John Lewis and Xue Litai, *China Builds the Bomb*, pp. 108, 113).

processing techniques,[61] bomb design and engineering,[62] machining of the uranium ore, selection of testing sites, final assembly of the bomb, and ultimate testing of China's first atomic weapon. Lewis and Xue emphasize the spectacular difficulties facing China's weapon scientists and engineers, including the overall lack of specialized training in nuclear physics among the PRC's scientific cadre, the withdrawal of Soviet assistance in 1960/61, management challenges inherent in overseeing the sprawling R&D organization that emerged, and the periodic intrusion of wildly disruptive domestic political campaigns that threatened to delay or shutter key parts of the weapon program at critical junctures.[63] Overall Lewis and Xue produced a masterful and comprehensive presentation of how China developed its first atomic weapon. However, although they address why Mao made the initial decision to develop nuclear weapons, the authors make little mention of how strategic ideas affected the development of China's nuclear weapons program. In subsequent work related to this theme, John Lewis and Hua Di touch briefly on nuclear strategies and doctrines in their work on China's ballistic missile programs,[64] however they also do not address the influence of strategic culture on the development of China's

[61]Upon choosing the U235 pathway, Chinese technicians then chose a gaseous diffusion process for separating the necessary U235 from their slowly accumulating store of U238. Although the Soviets had promised to build a gaseous diffusion plant and had delivered the necessary equipment disassembled, when Soviet scientists abruptly withdrew Chinese scientists had to build the factory and assemble the entire set of plant equipment with only Soviet designs to guide them (John Lewis and Xue Litai, *China Builds the Bomb*, pp. 114-121).

[62]China's first atomic weapon was an implosion triggered U235 device with a polonium initiator (John Lewis and Xue Litai, *China Builds the Bomb*, pp. 139-140, 155-156). The triggering device was a particularly difficult problem for China's engineers to solve given the poor state of China's electrical technology industry, the lack of Soviet assistance at the time of development, and the general lack of experience among China's engineers.

[63]The disastrous Great Leap Forward slowed the production and delivery of key resources to the program, including at times such basics as food (John Lewis and Xue Litai, *China Builds the Bomb*, p. 86); the Cultural Revolution interfered variously with the weapon program's design and testing of a hydrogen bomb (John Lewis and Xue Litai, *China Builds the Bomb*, pp. 202-206) and ballistic missile systems (John Lewis and Hua Di, "China's Ballistic Missile Programs: Technologies, Strategies, and Goals," p. 17).

[64]John Lewis and Hua Di, "China's Ballistic Missile Programs: Technologies, Strategies, and Goals."

nuclear weapons program, nor do they account for the persistence of China's small and vulnerable nuclear weapon force over a 56 year period from 1955 through 2011.

Avery Goldstein's *Deterrence and Security in the 21st Century* is a study of why some second ranking military powers during the Cold War decided to develop nuclear weapon capabilities. With respect to China, Goldstein offers a fairly straightforward explanation of China's initial decision to develop nuclear weapons by arguing that this served China's national security strategy under conditions of interstate anarchy. He argues that the structure of the international system "encouraged a preference for self-reliance," while the bipolar character of superpower relations during the Cold War established some necessity for security dependence upon one of the superpowers for second ranking military powers.[65] While these opposing forces might have resulted in bandwagoning with a superpower in the pre-nuclear era, the emergence of nuclear weapons as a radically new deterrence-oriented strategic option offered a comparatively cost effective alternative choice for providing existential state security.[66] According to Goldstein, the structure of the international system, the bipolar character of power distribution among two superpowers, and China's particular strategic environment (including nuclear threats from the U.S. and the new choice possibility of developing a nuclear deterrent)[67] altogether caused China to look beyond superpower alliances and develop its own nuclear weapons program.

Goldstein argues China's nuclear weapons were initially developed and deployed

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[65] Avery Goldstein, *Deterrence and Security in the 21st Century*, pp. 15-17.

[66] "Deterrence became especially attractive because the nuclear revolution in military technology altered the relative effectiveness, affordability, and robustness of the available (strategic) alternatives" (Avery Goldstein, *Deterrence and Security in the 21st Century*, p. 17).

[67] This includes well documented U.S. nuclear threats against China during the Korean War and later during Taiwan Straights crises (Avery Goldstein, *Deterrence and Security in the 21st Century*, p. 64; see also John Lewis and Xue Litai, *China Builds the Bomb*, pp. 13-14).

according to a strategy of creating first-strike uncertainty in support of China's national security, yet he fails to acknowledge that China never achieved this vis-a-vis the U.S. during Mao's lifetime, and may have never reached this standard at all given the possibility of U.S. nuclear primacy.[68] In fact, China's nuclear deployments were not even a theoretical threat to the continental U.S. until 1981 (five years after the death of Mao), despite the fact that according to Goldstein the entire program was begun in large part due to U.S. nuclear threats against China during the 1950s. This is one preliminary indication that China's eventual operational deployment of strategic nuclear weapons was not based on strict balance of power considerations. In contrast with Goldstein's argument, my dissertation explains that a combination of strategic culture and path dependence accounts for why China has not fulfilled the goals of nuclear deterrence as Goldstein characterizes them.

Jeffrey Lewis' *The Minimum Means of Reprisal* focuses on China's nuclear weapons program from a security policy perspective. Lewis gives a complete overview of China's nuclear weapons program from 1965 through 2005, providing overviews of China's nuclear weapon design evolution, its participation in international nuclear agreements, and a systematic assessment of numbers and structure of China's strategic nuclear force. Lewis estimates that as of 2005 China's strategic nuclear ICBM force

[68] Avery Goldstein, *Deterrence and Security in the 21st Century*, pp. 120-121, 124. Goldstein also fails to acknowledge John Lewis and Hua Di's important claim that no nuclear strategy informed Mao's decision to initiate a strategic ballistic missile program in the mid-1950s (John Lewis and Hua Di, "China's Ballistic Missile Programs," pp. 5-6, 19-20). Goldstein does marshal quite a bit of evidence of China's nuclear deterrence strategic thinking in a lengthy footnote on page 120 (footnote 23), but while the source list is impressive, his application of the sources to his argument is not. In a paragraph beginning at the end of page 19 and continuing onto page 120, Goldstein uses references to publications dating from 1989-1991 to support his assertion that China's *initial* deployment of nuclear weapons was according to a principle of first strike uncertainty. Unfortunately the sources he cites concern intellectual discussions of nuclear deterrence in the post-Mao era, but are not themselves evidence of a coherent nuclear doctrine during the Mao era itself.

numbered only about 20 missiles in support of a policy of minimum deterrence.[69] Lewis notes that the size of China's strategic nuclear force remained consistently small for a long period, and argues that this suggests an explicit choice on the part of leadership based on a belief that nuclear deterrence is fundamentally strategic in nature and inflexible to changing material circumstances.[70] While Lewis' work represents an important contribution to scholarship in this area, this dissertation differs in key respects. First, Lewis' book is mainly policy focused and does not engage nuclear deterrence theory, unlike this dissertation. Second, after concluding that China's policy of minimum deterrence has been explicitly chosen by the Chinese state over time, Lewis does not offer any systematic explanation for why China has made the choice of maintaining a small, vulnerable nuclear force. In contrast, my dissertation is centrally concerned with both how and why China's nuclear forces have developed against theoretical and historical expectations over a 56 year period.

Last, Fravel and Medeiros's article "China's Search for Assured Retaliation: The Evolution of Chinese Nuclear Strategy and Force Structure" identifies the same puzzle at the heart of this project: China's nuclear force structure has remained small and vulnerable over a long period[71] against expectations and in the face of dramatic domestic and international change.[72] They address four specific questions: why China's nuclear force remained small and vulnerable from 1964 through the mid-1990s; why China never developed a detailed nuclear doctrine during this period; how much China has changed

[69]Jeffrey Lewis, *The Minimum Means of Reprisal*, p. 16.
[70]Jeffrey Lewis, *The Minimum Means of Reprisal*, pp. 1-2.
[71]Fravel and Medeiros, "China's Search for Assured Retaliation," p. 54.
[72]"Despite major changes in China's external security environment, economic resources, and technological capabilities, its approach to nuclear strategy and force structure has been relatively consistent since the 1960s" (Fravel and Medeiros, "China's Search for Assured Retaliation," p. 52).

its traditional deterrence position since the mid-1990s; and they finally seek to assess the current trajectory of China's nuclear forces.[73] In answer to these questions, Fravel and Medeiros offer a two part argument. First, they argue the ideas and beliefs of China's leadership – specifically Mao Zedong and Deng Xiaoping – shaped an "assured retaliation" nuclear strategy for China that persisted through the mid-1990s.[74] Second, they argue China's military (the PLA) did not have the capacity to innovate nuclear strategies or develop a more robust nuclear weapons program through the mid-1990s.[75]

Overall Fravel and Medeiros offer important support for my own argument. They identify roughly the same puzzle for analysis, aligning with the orientation of this project.[76] Also, Fravel and Medeiros's argument concerning the influence of indigenous ideas and beliefs on the development of China's nuclear strategy is similar to that which I propose, offering further support for my own line of argumentation. I agree with the authors that strategic ideas are essential for explaining China's nuclear strategy; however, Fravel and Medeiros neglect to account for the persistence of certain ideas over time, placing too much emphasis on individual leaders.[77] China's nuclear force has remained small and vulnerable in comparison to U.S. and Russian forces throughout its history, indicating some commitment to the idea that a small number of nuclear weapons is sufficient for achieving nuclear deterrence. If China's nuclear strategy has been shaped according to the ideas of individual leaders, then why do certain ideas persists across leadership changes within China? I attempt to account for this by using path

[73]Fravel and Medeiros, "China's Search for Assured Retaliation," pp. 48-50.
[74]Fravel and Medeiros, "China's Search for Assured Retaliation," p. 51.
[75]Fravel and Medeiros, "China's Search for Assured Retaliation," pp. 51-2.
[76]However, Fravel and Medeiros address the future trajectory of China's nuclear program, which I do not propose specifically addressing in the body of this project.
[77]"The views and beliefs of China's top leaders, mainly Mao Zedong and Deng Xiaoping, had a consistently dominant influence on Chinese nuclear strategy" (Fravel and Medeiros, "China's Search for Assured Retaliation," p. 51).

dependence theory to explain how certain nuclear strategic ideas became institutionalized within China's nuclear weapons program in a manner that ensured their persistence across a variety of domestic and international changes.

Outline of the Dissertation

This dissertation will frame the argument as a whole within a literature review; detail the establishment of China's nuclear weapons program according to the prevailing People's War strategic culture of the Mao era, and show how this became institutionalized as a self-reinforcing process; and then trace the development of the program through subsequent historical periods. To begin, chapter two establishes the theoretical framework of this dissertation's path argument within the context of nuclear deterrence strategy. I review nuclear deterrence theory and practice to provide context for my argument about China's nuclear strategy ideas. I then review strategic culture studies and path dependence theory within the broader literature on institutions within comparative politics. This will include a review of the range of nuclear deterrence positions, from academic theory to historical examples.

Chapter three explains the influence of China's strategic culture on its ideas about nuclear weapons in terms of path dependence theory. I detail the establishment of China's nuclear program, use a variety of primary sources to show that the program remained restrained during the Mao era, and trace the influence of various historical events on the development of China's nuclear weapons program, showing that certain early events profoundly influenced the establishment of the program's development trajectory. I then explain how a strategic mindset emphasizing the demonstration of

technical capability became institutionalized within China's nuclear program by showing how China's People's War strategic culture fused with ideas about nuclear weapons to form People's War Nuclear Deterrence (PWND), and how it then guided the initial technical decisions for China's nuclear program in a manner that institutionalized a strategic mindset of low numbers of nuclear weapons for achieving nuclear deterrence. This institutionalization is the mechanism that set in motion a self-reinforcing development trajectory for China's PWND strategy, important in part because analysis of mechanisms of reproduction sometimes are lacking in path dependence work.[78]

Chapter four extends this argument by focusing on the effect of an historical critical juncture – i.e. China's post-Mao leadership transition - on China's strategic culture and, subsequently, its nuclear weapons program. China's domestic political leadership transition from Mao to Deng Xiaoping caused a change in its strategic culture, and this in turn caused certain changes to China's nuclear weapons program that both improved its second-strike capability and introduced new self-reinforcing mechanisms that continued the overall pattern of restraint for China's nuclear weapon force. To show this, chapter four begins by providing an overview of China's nuclear weapon force structure, the commercialization of its nuclear industry, and its accession to new nuclear-related international agreements during the Deng era. I then show how China instituted certain changes to its nuclear weapons program in the areas of scientific education, command and control, and deployment training. I explain how changes in China's strategic culture affected its nuclear weapons program during this period, tracing specific links between strategic cultural change, the establishment of a new set of socio-cultural linguistics reflecting the reordered strategic preferences of China's post-Mao leadership,

[78]Kathleen Thelen, "Historical Institutionalism in Comparative Politics," p. 390.

and subsequent policy changes within China's nuclear weapons program. I then show how these changes occurred within an overall context of continued restraint for the program as a whole, and explain how accession to international nuclear-related treaties served as self-reinforcing mechanisms supporting the restrained development pattern of China's nuclear forces. Whereas chapter three provides an overview of how several historical events affected the early development of China's nuclear weapons program, chapter four focuses on the post-Mao leadership transition as a single historical process that served as a critical juncture for China's strategic culture and, in turn, its nuclear weapons program.

Chapter five shows how China's nuclear weapons program then continued along this development trajectory, even as the Second Artillery's responsibilities expanded to include overseeing a conventional missile force. The program remained restrained in terms of its deployment of nuclear weapon systems and its nuclear industry, as China deepened international engagement through additional nuclear-related treaty accessions and continued commercializing its nuclear industry. China continued incremental modernization of key deployment systems, although by at least 2010 its SSBN/SLBM systems remained in a research and development status. The Second Artillery continued training and education programs for nuclear deterrence second-strike missions, and as China expanded the responsibilities of the Second Artillery in response to certain key historical events, this continued the trend towards integration of China's nuclear force with other PLA forces that was initiated during the Deng era. China also continued to accede to international nuclear-related treaties, supporting the restrained development pattern of China's nuclear forces. Taken together, even as China's nuclear weapons

program continued to improve its overall second-strike capability during this period, this continued to occur within a context of overall restraint regarding its nuclear weapon force in keeping with the long-term development trajectory of the nuclear program as a whole.

Sources and Methodology

Analysis of any national strategic weapons system is profoundly influenced by the availability and analytic utility of different types of information. While general knowledge about the existence of a state's nuclear weapon capability may be widely known for strategic deterrence purposes, primary source information about a nuclear weapons program is necessarily incomplete given its sensitive relationship with a state's national security. For example, due to various declassification standards, U.S. government primary sources are available only through the mid-1990s; Chinese primary sources are even more difficult to obtain, especially for the Mao Zedong era of 1949 through about 1975. Following is an overview of how availability of sources affected this dissertation's research process; how certain specialized sources were integrated into this dissertation, to include declassified U.S. government satellite imagery; the meaning and method of imagery analysis; and the methods I used to integrate written source material into this dissertation.

I define primary sources as original materials relating to the issue in question and usually dating from the period under review. In the case of this dissertation, this usually refers to official government sources of information relating to China's nuclear program. Chapter three of this dissertation utilizes declassified U.S. satellite photographs of China's primary fissile material production facility during the Mao era in conjunction

with several issues of a secret Chinese military journals recovered in 1961 (titled *Bulletin of Activities*). Given the dearth of primary source materials published in the PRC related to Mao-era nuclear weapons program development – especially including the lack of any detailed budgetary information - analysis of these satellite photographs fill important gaps in our historical understanding of China's early nuclear program. In addition, this is the first study to extensively integrate the PLA's *Bulletin of Activities* military journal into an analysis of China's historical nuclear strategy since Alice Hsieh's groundbreaking work on Chinese nuclear strategy in the 1970s. Chapter's four and five analyze the period from 1975 through 2011, and due to various classification rules U.S. government satellite imagery is not available for this period. However, during this period Chinese sources are more available than sources from the Mao era, and chapters four and five integrate a variety of Chinese primary and secondary sources. For example, chapters four and five integrate a 400 page secret manual published by the Chinese military titled *Second Artillery Campaign Science* (俦二炮兵战役学). This primary source provides an overview history of China's Second Artillery – the organization that oversees China's nuclear weapon force – and then details the Second Artillery's mobilization and deployment responsibilities at the campaign level. This particular text offers an unprecedented view of China's nuclear force readiness and deployment capabilities. Finally, chapter five integrates another book published by the Chinese military according to "internal use" restrictions that gives an overview of the Chinese military's campaign level strategy. This primary source document, titled *The Science of Military Campaigns* (战役学), has a section describing the strategic role of China's conventional missile and nuclear forces during a military campaign. Following

is a more detailed description of these sources, with a discussion of the methodologies I use to assess and integrate these sources within my research.

Imagery Analysis: Meaning and Method

Historical imagery analysis presents a literal form of information whereby the viewer sees phenomena without the distortion of human memory, language, or ideology. Yet the meaning of what is being seen on an image is still subject to interpretation, the methodology of which I divide into three separate but interrelated levels. The first level is simply correct identification of what is being seen on an image. The second level is "proximate causal narrative," referring to connecting correct identifications with a localized causal narrative regarding that which is identified. The third level of interpretation is the "overarching causal narrative," referring to how the first two levels of interpretation fit into an overall analytic thesis. To illustrate how these three levels of interpretation work as a method of imagery interpretation, below I outline how I gathered and analyzed imagery information for this dissertation.

Imagery Analytic Method: Gathering Data, Facility Identification, and Analysis

Following is an overview of how I conducted imagery analysis in support of this dissertation's overall thesis regarding the historical restraint of China's nuclear weapon production. Chapter three of this dissertation utilizes six declassified U.S. satellite photographs of the Lanzhou gaseous diffusion facility taken between 1964 and 1975 by what were then top secret U.S. government photo-reconnaissance programs, including the

Corona, Key Hole 7 (KH-7), and KH-9 programs.[79] Imagery information of this facility reveals the results of Chinese state investments in its nuclear program during this period, and as such offers a unique perspective with which to view the initial stages of China's nuclear weapons program. Below I describe how I gathered, identified, and analyzed this declassified imagery information.

Gathering the Data

To assemble this historical imagery information, I first found geographic location information for the Lanzhou gaseous diffusion facility, which I knew to be China's primary facility for producing fissile material during the Mao era. I then searched the United States Geological Service online database of declassified imagery for coverage of the facility, and found period coverage from about 1964 through 1975. I selected six images over this period, balancing image quality with developing consistent coverage over the 11 year period. The images I received are digital copies of original hardcopy satellite photographs, and they are not georeferenced.[80] There is currently no declassified U.S. government imagery data available after 1975.

Levels of Interpretation: Facility Identification, Proximate Causal Narrative, and Overarching Causal Narrative

Given that this imagery is not georeferenced, I searched each image to locate the Lanzhou facility. To do this, I used recent Google Earth imagery of the facility as a

[79] More details about the declassification status of these photographs is provided in this dissertation's bibliography and appendix sections.

[80] Georeferencing refers to the integration of a coordinate system (usually in terms of latitude and longitude) with the image data.

reference for identifying the Lanzhou facility and developed a set of visual geographic landmarks as a relative reference system. This addressed the first level of imagery analysis, i.e. proper identification. Once I found the facility on each of the six images, I prepared jpeg images of the facility to insert into this dissertation. Then, I analyzed each of the six images in comparison with the others. As chapter three shows, I found that the facility did not visibly change over these six images spanning the years 1964 through 1975. This addressed the second level of imagery analysis, i.e. proximate causal narrative. Finally, I analyzed the lack of visible change to the facility in terms of China's overall history during this period, concluding that China did not emphasize its nuclear weapons program during this period despite the pressures of the prevailing Cold War arms race and despite direct nuclear threat from the Soviet Union. This addressed the third level of imagery analysis, i.e. determining meaning of imagery-based observations in terms of an overarching causal narrative.

Primary Written Sources: Meaning and Method

In terms of this dissertation's topic, primary written sources include official documents produced by a national government. While most of these sources have been classified secret, all U.S. government primary sources that I cite here have been declassified, and this information is included in reference sections. Primary written sources used in this dissertation include U.S. government intelligence reports regarding China's nuclear weapons program and various Chinese military publications. Some of these sources have been cited in previous academic studies; others have never before been cited in previous academic work. Following is an overview of the written primary

sources I employ in this dissertation.

U.S. Government Written Primary Source Material

Declassified U.S. government written primary sources are used in chapters three and four as part of my assessment of China's nuclear weapons program. These include CIA National Intelligence Estimates, a DIA intelligence report, and a 1993 report to congress of unknown agency origin. There are no U.S. government primary sources available after 1996. The most complete collection of declassified reporting is from the CIA library, mostly covering the 1960s and 1970s. These reports are included with other secondary source information to provide a comparative assessment of China's nuclear program. While there is a general agreement among these various sources regarding the overall size and configuration of China's nuclear weapon force, the 1993 congressional report in particular offers a noticeably different estimate of China's nuclear weapon deployments. This issue will be discussed in greater detail in Chapter four.

Chinese Primary Sources

I integrate a variety of Chinese primary sources ranging in publication date from 1961 to 2004. The first group of primary sources is several issues of the secret Chinese military journal titled *Bulletin of Activities*. Published in 1961, these documents have been overlooked in recent works on China's nuclear weapons program. *Bulletin of Activities*, or *Gongzuo Tongxun*, was a secret Chinese military journal published during the Mao era. Several issues of this journal were acquired after Tibetan rebels overran a PLA outpost in 1961 and subsequently transferred captured documents to the U.S.

government.[81] After a period of internal review, these documents were released to the U.S. academic community for public review in 1963, and an English language translation was published by Hoover Institution Publications in 1966 (Chester Cheng, ed., *The Politics of the Chinese Red Army*). The documents cited here are the original Chinese versions, with supporting reference to secondary sources; further discussion of these documents can be found in Chapter three of this dissertation.

The two other Chinese primary sources cited in this study are *Second Artillery Campaign Studies* and *The Science of Military Campaigns*. These were published by People's Liberation Army-affiliated publishing houses in Beijing, China, and both are classified texts concerning Chinese military strategy. *The Science of Military Campaigns* was published by Defense University Press in 2000 and is classified "military circulation only." It is a military education text that gives a campaign/theater level assessment of various warfare scenarios, integrating strategic principles with war planning at the regional level.[82] One section of this text specifically concerns nuclear warfare principles and the Second Artillery's role within overall PLA warfare strategy at the campaign/theater level. *Second Artillery Campaign Studies* was published by the People's Liberation Army Press in 2004 and is classified "secret." This text offers a historical overview of the Second Artillery organization and generally describes the role of the Second Artillery within the PLA.

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[81] Carol McGranahan, "Tibet's Cold War: The CIA and the Chushi Gangdrug, 1956-1974," pp. 119-120. It was originally referred to according to the Wade-Giles romanization system as *Kung-tso Tung-Hsun* in English language sources from the era and often translated as "Bulletin of Activities."

[82] Chinese military science divides the study of warfare into three spheres: overall strategy, campaign/theater, and battlefield tactics. The strategic sphere is a holistic perspective of how a state makes war within the international system, incorporating economic, social, and cultural factors into analysis of warfare's general principles. The campaign/theater level is focused upon analyzing the war itself, and mixes strategic principles with war planning at the regional level. Battlefield tactics involve specific plans for military engagements as part of a broader military campaign.

Lacuna

I did not have access to certain information for this dissertation, and this necessarily affected my overall analysis. First, detailed budget information relating to China's nuclear weapons program is generally not available. In fact, the veracity of any official budget statistics relating to national security expenditures in China is questionable. Budget figures during the Mao era are especially difficult to assess; records are incomplete, and the periodic influence of Maoist ideology on official record-keeping during the Mao era raises serious credibility issues.[83] While general military spending figures are available beginning in the Deng Xiaoping era through at least 2005, this information is not specific concerning China's nuclear weapons program. Secondly, declassification of U.S. intelligence information ends during the 1980s. U.S. satellite imagery is declassified through 1980 only, limiting historical imagery analysis mainly to the Mao era. While commercial satellite imagery is available beginning in the mid-1990s, both the cost of purchasing this imagery and its sporadic coverage currently preclude additional historical imagery analysis for the 1993-2011 historical period covered in this dissertation's chapter five.

Conclusion

China's Mao-era strategic culture established the notion that a small number of nuclear weapons was sufficient for achieving nuclear deterrence; this was institutionalized within China's early nuclear weapon infrastructure; it was reinforced

[83] For example, during the Great Leap Forward Communist Party officials at the local level regularly inflated agricultural output statistics as part of the ideologically-based mass mobilization fervor of the movement.

during the 1969-1970 Sino-Soviet nuclear standoff; and this then persisted throughout the history of China's nuclear program in accord with a variety of self-reinforcing mechanisms. When China's strategic culture changed during the Deng era, this variance caused China's nuclear weapons program to improve its second-strike capability within a context of ongoing restraint for the program. This pattern then continued during the subsequent historical period, revealing that even as China has improved some aspects of its nuclear weapons program, this has occurred within a pattern of persistent restraint for the program as a whole from 1955 through 2011.

Chapter Two: Nuclear Deterrence and Path Dependence

Introduction

Analyzing the timing and sequence of historical events is critical for understanding why China's historically small and vulnerable nuclear force deviated from both theoretical expectation and the historical experience of other nuclear powers. To address this, I argue that China's strategic culture established a mindset of low numbers of nuclear weapons during the initiation of its nuclear weapons program between 1955 and 1960, and this was then reinforced through a combination of contingent events and elite strategic choices that maintained a constrained development path for China's nuclear weapons program over a 56 year period (1955-2011). This chapter establishes the theoretical and methodological foundations for this argument in the following manner. First, I provide an overview of nuclear deterrence theory as a foundation for explaining why China deviated from nuclear deterrence theoretical expectations. Second, I summarize the U.S.- Soviet Cold War nuclear experience, provided to show how China deviated from the historical experience of its two largest rivals with regard to nuclear weapon development. Third, I introduce a definition of strategic culture used to frame my explanation of China's initial decisions regarding its nuclear program. Fourth, I review path dependence theory as part of the historical institutionalism tradition in comparative politics, and I employ three of the most significant path dependence concepts to interpret the first stages of China's nuclear weapons program. Fifth, I fully introduce my argument about the influence of strategic culture and path dependence on

the development trajectory of China's nuclear weapons program as a prelude to the next chapter. Last, I provide an overview of the sources and methods I employ for this dissertation.

Literature Review

Nuclear Deterrence Theory, Politics, and History

Deterrence is when "one party prevents another from doing something the first party does not want by threatening to harm the other party seriously if it does;" it relies upon convincing your opponent that you have the military capability to carry out the threat and that you would actually attack if the threat is ignored.[1] According to these requirements of deterrence, a given state's general military capabilities must be generally understood by adversaries; indeed, in terms of practicing deterrence, it would be of little use for a state to possess a secret military capability that otherwise might deter other states from acting against its interests. Thus, central to the notion of deterrence is *communication*; opponents must persuade one another that they have certain capabilities, and that they have the willpower to use these capabilities under certain limited circumstances.

Nuclear deterrence is the practice of deterrence as it relates specifically to nuclear weapons, whose especially destructive nature has caused the emergence of specialized principles regarding circumstances under which they may be used. Nuclear deterrence theory encompasses these principles, referring to a variety of divergent philosophical debates concerning the effect of nuclear weapons on the state system, the place and value of assumed rationality for the function of nuclear deterrence, the credibility of nuclear

[1] Patrick Morgan, *Deterrence Now*, pp. 1, 4.

weapon threats, and the overall stability of nuclear deterrence as a security mechanism between states.[2] Nuclear deterrence theorizing began as an exploration of the potentially revolutionary effects of nuclear weapons on modern warfare with Bernard Brodie's *The Absolute Weapon*. Brodie was one of the first scholars to argue that warfare had forever changed in the wake of the militarization of nuclear technology, and that the destructive power of nuclear weapons forced the development of stable strategies of deterrence as the only credible defense against their use.[3] Later, Albert Wohstetter was one of the first to counter this position, arguing that nuclear deterrence strategies were unstable and that limited nuclear wars were possible and should be planned for accordingly.[4] These two perspectives foreshadowed subsequent contours of nuclear deterrence theory, as the following section details.

Nuclear Deterrence Theory: An Overview

Daniel Deudney and Patrick Morgan categorize various interpretations of the effect of nuclear weapons on the state system and interstate behavior, offering a foundation for understanding the development of nuclear deterrence theory and state nuclear policy. In terms of theory, Deudney divides theory-based interpretations into five categories: classic one worldism, nuclear strategism, automatic deterrence statism, institutional deterrence statism, and federal republican nuclear one worldism. Of these five categories, nuclear strategism and both types of deterrence statism refer directly to nuclear deterrence, while classical nuclear one worldism and federal-republican one

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[2] Patrick Morgan's *Deterrence Now* provides a summary of these theoretical issues.

[3] Bernard Brodie, *The Absolute Weapon*; see also Fred Kaplan, *The Wizards of Armageddon*, Chapter Two, and T.V. Paul, Richard Harknett, and James Wirtz, *The Absolute Weapon Revisited: Nuclear Arms and the Emerging International Order*, Chapter One.

[4] Albert Wohlstetter, "The Delicate Balance of Terror."

worldism refer to theoretical approaches for securing humanity from the threat of nuclear war through either forming a world state that would control nuclear weapons (classic nuclear one worldism) or moving nuclear weapons from individual state control to a centralized institution controlled through federal-style arrangements between states (federal-republican nuclear one worldism).[5] Following is a more detailed overview of deterrence statism and nuclear strategism as facets of nuclear deterrence theory.

Deterrence statism is a general category for organizing scholarship about the effect of nuclear weapons on the state as a political unit.[6] The deterrence statist position holds nuclear war would be catastrophic, uncontrollable in terms of conflict escalation strategies, and that any potential relative gains of war are outweighed by the absolute cost of using nuclear weapons.[7] Given this, nuclear deterrence is interpreted as causing a revolutionary change in the behavior of states within the international system towards peaceful interaction between nuclear armed states.[8] For some deterrence statist scholars, nuclear deterrence is automatic given a mutual, second strike capability of a credibly secure, counter-value targeted strategic nuclear retaliatory force. Under this rubric, deterrence remains stable and robust as long as a secure, strategic nuclear retaliatory capability is maintained.[9] Other deterrence statists maintain that while

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[5] Daniel Deudney, *Bounding Power*, pp. 246-248.

[6] Daniel Deudney uses two varieties of "deterrence statism" in his review of the nuclear political debate (automatic deterrence statism and institutional deterrence statism, explained later in this review). According to Deudney, deterrence statist scholars include Bernard Brodie (editor, *The Absolute Weapon*; "The Development of Nuclear Strategy"); Kenneth Waltz ("Nuclear Myths and Political Realities" and "More May be Better" in Scott Sagan and Kenneth Waltz, eds., *Nuclear Weapons: A Debate Renewed*); and Robert Jervis (*The Meaning of the Nuclear Revolution*) (Deudney, *Bounding* Power, p. 247; 369, note 15).

[7] This is Deudney's definition (Daniel Deudney, *Bounding Power*, p. 247).

[8] Robert Jervis makes this explicit claim (Robert Jervis, *The Meaning of the Nuclear Revolution*, pp. 14-5; 23-4); see also Patrick Morgan, *Deterrence Now*, pp. 7-8.

[9] Deudney calls this "automatic deterrence statism" (*Bounding* Power, p. 247); see Kenneth Waltz ("Nuclear Myths and Political Realities," p. 736; *The Spread of Nuclear Weapons: A Debate*, p. 20) and Robert Jervis (*The Meaning of the Nuclear Revolution*, pp. 8-9) for more specific arguments along these

nuclear deterrence is revolutionary for geopolitics it nonetheless requires political institutions designed to reduce uncertainty between nuclear-armed states to ensure that nuclear deterrence functions properly.[10] Overall, deterrence statism is less concerned with specifying a specific number of warheads for achieving nuclear deterrence, focusing rather on force survivability and theoretical issues such as the overall stability and credibility of nuclear deterrence and the effects of nuclear weapons on international relations at a general level.

Nuclear strategism (also referred to as "warfighting") is a phrase synthesizing perspectives sharing the assumption that nuclear war is not revolutionary and does not change how states relate within the international system. It holds that limited nuclear wars may indeed yield relative gains, conflict escalation is controllable,[11] and nuclear wars are winnable.[12] According to this view, nuclear deterrence is fundamentally unstable and highly contingent upon the balance of nuclear forces among potential adversaries. A secure second strike capability is also essential for deterrence according to this perspective, but the security of this retaliatory capability changes with shifts in the balance of number and type of nuclear weapon between states. Nuclear strategism argues a large number and wide variety of nuclear weapons, along with counterforce

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lines. For further background, see also Lawrence Freedman's *The Evolution of Nuclear Strategy* for a history of the development of ideas about strategic bombing and the development of "strategic" nuclear weapons.

[10] This is what Deudney refers to as "institutional deterrence statism," and cites as one example the role of arms control as a mechanism for reducing uncertainty between nuclear armed states (Deudney, *Bounding Power*, pp. 247-248).

[11] The nuclear warfighting school calls for "being equipped to *fight and win* at any level: very capable sub-conventional and conventional forces, plans and forces to fight limited nuclear wars, (and) even the capability to fight and survive all-out nuclear war" (Patrick Morgan, *Deterrence Now*, p. 25).

[12] Daniel Deudney, *Bounding Power*, pp. 246-247. For a full example of the nuclear strategist position, see Colin Gray, "The Case for a Theory of Victory." Robert Jervis highlights Paul Nitze as another proponent of this position in his overview of the nuclear warfighting perspective (Jervis, *The Meaning of the Nuclear Revolution*, pp. 16-19). Patrick Morgan lists works by Herman Kahn, Keith Payne, James Schlesinger, Harold Brown, and Paul Nitze in his overview of this perspective (Morgan, *Deterrence Now*, page 24, footnote 16).

target planning, is essential for maintaining nuclear deterrence, and it is therefore more specific than the deterrence statist position about numbers and types of nuclear weapons necessary for achieving nuclear deterrence.[13]

At a theoretical level, deterrence statism and nuclear strategism have mutually exclusive assumptions regarding nuclear war. However, state nuclear policies have combined elements of these theories into sometimes overlapping positions. Patrick Morgan's *Deterrence Now* categorizes these policy-based positions into four schools: rejection, minimum deterrence, massive destruction, and warfighting.[14] The rejection school seeks to completely reject the use of nuclear weapons for national security; the massive destruction school (derived largely from Eisenhower's massive retaliation policies of the 1950s) sought security gains through the threat of total nuclear destruction; the warfighter school sought to integrate nuclear weapons into all aspects of military planning from the tactical and campaign level through full strategic deterrence; and minimum deterrence sought to use few nuclear weapons (from 10 to several hundred) to establish strategic deterrence.[15] Of these schools, minimum deterrence is most ambiguous concerning nuclear force composition since the exact number of weapons is less important than generating uncertainty regarding the use of nuclear weapons.

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[13] In the context of nuclear deterrence strategy "counterforce" refers to targeting the nuclear weapons of other states. Warfighting nuclear strategic ideas such as counterforce targeting were debated since the early 1950s among nuclear strategic analysts at RAND (Fred Kaplan, *The Wizards of Armageddon*, pp. 203-204). Linked to the rise of these ideas was Albert Wohlstter's series of RAND studies concluding that U.S. SAC nuclear bomb and delivery assets were vulnerable to a Soviet nuclear first strike (Fred Kaplan, *The Wizards of Armageddon*, pp. 97, 101-102; see also Albert Wohlstetter, "The Delicate Balance of Terror").

[14] These schools represent *post hoc* classifications of nuclear policies spanning half a century; they are not deductively derived.

[15] Patrick Morgan, *Deterrence Now*, pp. 22-26; see also Lawrence Freedman, *The Evolution of Nuclear Deterrence*.

Several authors have used China as an example of this approach.[16] However, while minimum deterrence as conceptual category may accurately reflect the character of China's nuclear program during the late 20th century, this is not to say that China had a clear nuclear strategic doctrine or policy that guided the development of its nuclear weapons program. Minimum deterrence may conceptualize the outcome of China's nuclear weapons program, but it does not explain how this outcome occurred, since minimum deterrence itself derived neither from the expectations of nuclear deterrence theory nor from Cold War historical experience. Indeed, at the time China was developing its nuclear program it had the U.S. and the Soviet Union as the main examples of nuclear weapon strategy and policy to learn from, and neither was following a policy of minimum deterrence.[17] China did not follow the superpowers' historical example; to illustrate this, next is an overview of the US – Soviet Cold War arms race history.

The U.S. - Soviet Arms Race Experience

Both the U.S. and the Soviet Union strongly integrated nuclear weapons into their respective national security policies, with each developing complex nuclear strategies, interlocking operational deployment patterns, and the production of tens of thousands of

[16] For example, see Jeffrey Lewis, *The Minimum Means of Reprisal,* Taylor Fravel and Evan Medeiros, "China's Search for Assured Retaliation," Avery Goldstein, *Deterrence and Security in the 21st Century*, and George H. Quester, "The Continuing Debate on Minimum Deterrence," in T.V. Paul, Richard J. Harknett, and James Wirtz, eds., *The Absolute Weapon Revisited*.

[17] This statement is somewhat at odds with Lawrence Freedman's characterization of the Soviet Union's early nuclear program (Freedman, *The Evolution of Nuclear Strategy*, p. 248), however by 1960 the Soviets had produced thousands of nuclear warheads, far beyond the general threshold required for minimum deterrence. The next section provides an overview of the history of Soviet nuclear weapon production.

nuclear warheads.[18] Despite these similarities, after successfully achieving their nuclear weapon detonations, the US and the Soviet Union increased their nuclear stockpiles at different rates and illustrated different strategic pathways of nuclear development.

After successfully detonating the first nuclear weapon in 1945, the U.S. nuclear weapon stockpile numbered two at the end of 1945, nine by July 1946, 13 by July 1947, and 50 by July 1948.[19] Then, in1949 president Truman ordered the development of a hydrogen fusion nuclear weapon and the expansion of the U.S. nuclear weapon production infrastructure to accommodate increased production of atomic fission weapons.[20] Later, during the Eisenhower administration the U.S. adopted the nuclear doctrine of "massive retaliation" that required large numbers of strategic nuclear weapons and a secure second strike capability that eliminated the appeal of a nuclear first-strike by assuring an overwhelming countervalue retaliation.[21] U.S. nuclear strategy shifted from massive retaliation in the 1950s to a "no cities" targeting approach in the early 1960s that prioritized targeting nuclear sites, conventional military facilities, political leadership facilities, and industrial areas (i.e. "counterforce"[22]) with several thousand deployed

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[18] Patrick Morgan cites estimates of more than 50,000 nuclear weapons (strategic and non-strategic) held between the U.S. and Soviet Union by 1989 (Patrick Morgan, *Deterrence Now*, pp. 28-29).

[19] David Alan Rosenberg, "U.S. Nuclear War Planning, 1945-60," p. 38, in Desmond Ball and Jeffrey Richelson, eds., *Strategic Nuclear Targeting*.

[20] David Rosenberg, "American Strategy and the Hydrogen Bomb Decision," and "U.S. Nuclear War Planning, 1945-60," p. 41; and Stephen I. Schwartz, ed., *The Atomic Audit*, pp. 67-68. This decision included a massive investment in nuclear weapon production infrastructure, the incorporation of mass production techniques, and construction of more enrichment facilities, component fabrication plants, and specialized storage facilities.

[21] Bernard Brodie mentions the importance of securing nuclear retaliatory arsenals in his early writings on nuclear strategy (Kaplan, *The Wizards of Armageddon*, p. 31). Albert Wohlstetter argues that vulnerable nuclear forces cause nuclear deterrence to be unstable by tempting a nuclear first strike, and he concludes that a secure nuclear retaliatory capability is essential for maintaining nuclear deterrence (Wohlstetter, "The Delicate Balance of Terror"). Wohlstetter's ideas were formed in part through his participation in RAND studies concluding (in 1952) that U.S. SAC nuclear bomb and delivery assets were vulnerable to a Soviet nuclear first strike (Fred Kaplan, *The Wizards of Armageddon*, pp. 97, 101-102; Lawrence Freedman, *The Evolution of Nuclear Strategy*, p. 128).

[22] Counterforce, no-cities, and warfighting nuclear strategism ideas had been explored since the early 1950s among nuclear strategic analysts at RAND, and over the 1950s some of these ideas slowly gained

nuclear weapons.[23] However, there always remained a stated goal of maintaining the capability of destroying hundreds of Soviet cities at least through 1979,[24] and by 1983 the U.S. stockpile had increased to about 11,200;[25] this is some indication that both deterrence statism and nuclear strategism principles guided U.S. nuclear weapon policy towards the USSR throughout most of the Cold War.[26]

In the Soviet Union, after the death of Stalin Soviet military leaders expanded nuclear weapon technology research as a top military priority.[27] Khrushchev pushed for the development of a strategic rocket program that resulted in the establishment of the Soviet ICBM force, which became the most prominent nuclear warhead delivery system for the Soviet Union.[28] The fall of Khrushchev and subsequent rise of Brezhnev ushered an expansion of the role of nuclear weapons in Soviet military planning, and during the 1960s the Soviet Union's nuclear strategic doctrines adopted nuclear warfighting and assured destruction strategies buttressed by a larger and more diverse nuclear ballistic missile arsenal complete with a more secure second strike capability.[29]

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currency as massive retaliation ebbed in popularity and technical achievements in warhead and missile technology allowed greater doctrinal flexibility (Fred Kaplan, *The Wizards of Armageddon*, pp. 203-204; Kaplan claims Bernard Brodie as the founder of these ideas).

[23] By early 1960 the U.S. had about 3,200 nuclear bombs and warheads; this number grew quickly throughout the decade (Desmond Ball, "The Development of the SIOP," p. 57).

[24] Jeffrey Richelson, "Populations Targeting and U.S. Strategic Doctrine," p. 242, in Desmond Ball and Jeffrey Richelson, eds., *Strategic Nuclear Targeting*.

[25] Desmond Ball, "The Development of the SIOP, 1960-1983," p. 57, in Desmond Ball and Jeffrey Richelson, eds., *Strategic Nuclear Targeting*.

[26] Considering many "counterforce" targets were located near urban areas it is not likely that the analytical separation of military from civilian nuclear targets would have been achieved in the event of a U.S. nuclear strike against the Soviet Union.

[27] Lawrence Freedman, *The Evolution of Military Strategy*, pp. 136-138.

[28] Lawrence Freedman, *The Evolution of Military Strategy*, p. 143; 247-249. Freedman suggests Khrushchev's push for developing a robust ICBM nuclear force was motivated in part by a desire to cut conventional military forces in order to strengthen his own political power, as there was a rift between himself and various political factions of the Soviet military elite.

[29] Lawrence Freedman, *The Evolution of Nuclear Strategy*, p. 325. In terms of developing a more secure second strike capability, the Soviets began developing SLBMs along with new nuclear ballistic missile submarines starting in the late 1960s (Robert Berman and John Baker, *Soviet Strategic Forces: Requirements and Responses*, pp. 60-63).

In terms of warhead production, the Soviet Union steadily grew its nuclear warhead stockpile during the 1950s and 1960s and its rocket forces in the 1960s. Then, in the late 1960s the Soviets greatly increased nuclear weapon production after a series of political debates concerning nuclear strategy,[30] resulting in a dramatically expanded MIRV'd ICBM force. By the mid-1970s the Soviet Union had increased its ICBM force to a level of rough parity with the U.S. and the Soviets were adding approximately 500 warheads to its ICBM force annually;[31] by the late 1970s the number of Soviet nuclear ballistic missiles (both ICBM and SLBM) surpassed the U.S.[32] Regionally,[33] between 1960 and 1980 the Soviets maintained 1,500 to 2,000 delivery systems that included bombers, tactical missiles, intermediate and medium range ballistic missiles (IR/MRBM), and sea-based missiles all capable of targeting China.[34] In terms of overall nuclear warhead estimates, in 1970 the USSR had between 2,300 and 3,000 warheads in its nuclear arsenal, and by 1985 this number had increased to between 10,000 and 12,600.[35]

By the late 1960s, both the U.S. and the Soviet Union considered a survivable second strike capability essential for achieving stable nuclear deterrence vis-à-vis their

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[30] Pavel Podvig, "The Window of Vulnerability that Wasn't," pp. 122-123.

[31] Pavel Podvig, "The Window of Vulnerability that Wasn't," pp. 118-119; Robert Berman and John Baker, *Soviet Strategic Forces: Requirements and Responses*, p. 61; Lawrence Freedman, *The Evolution of Nuclear Strategy*, pp. 255-257; 329.

[32] Lawrence Freedman, *The Evolution of Nuclear Strategy*, pp. 329-330.

[33] The USSR divided the world into geographic theaters of operations (TVDs) that included Asia, (Western) Europe, and transatlantic (the U.S.) theaters, and the Soviets planned nuclear weapon development according to targeting requirements within each theater (William Lee, "Soviet Nuclear Targeting Strategy," p. 87-88, in Desmond Ball and Jeffrey Richelson, eds., *Strategic Nuclear Targeting*).

[34] Robert Berman and John Baker, *Soviet Strategic Forces: Requirements and Responses*, p. 42; William Lee offers figures of about 650-1,300 IR/MRBM regional nuclear warheads in 1970 rising to about 1,250-2,900 by the mid-1980s (William Lee, "Soviet Nuclear Targeting Strategy," p. 98, in Desmond Ball and Jeffrey Richelson, eds., *Strategic Nuclear Targeting*). Although the U.S. dominated Soviet nuclear weapon planning, the Soviets maintained a commanding lead in nuclear weapons over China throughout the Cold War.

[35] William Lee, "Soviet Nuclear Targeting Strategy," p. 98, in Desmond Ball and Jeffrey Richelson, eds., *Strategic Nuclear Targeting*; see also Robert Berman and John Baker, *Soviet Strategic Forces: Requirements and Responses*, p. 42.

rival, which led to the eventual development of an interlocking "strategic triad" deployment of forces constituting bombers (air-based), ballistic missile submarines with SLBMs (sea-based), and ICBMs (land-based).[36] Each "leg" of the triad has strengths and weaknesses; air-delivery allows greater command of the strike forces and their extended delivery timeline allows flexibility for being recalled, but air bases are vulnerable to a nuclear strike and air units could be vulnerable to anti-air defense systems after deployment. Silo-based ICBMs are quickly and efficiently commanded, but once launched ICBMs cannot be recalled, and the fixed location of silos makes these forces vulnerable to a nuclear strike. Nuclear missile submarines are difficult to command while on patrol, however submarines are the most difficult leg of the triad to locate and, therefore, the most likely to survive a nuclear strike with their retaliation capability intact. Indeed, despite the inherent difficulty of communicating with any submarine that is on patrol, a sea-based nuclear deterrent remains the most survivable form of nuclear weapon delivery for a state.

The U.S. and the Soviet Union mobilized their respective nuclear programs in different manners during the Cold War. The U.S. first expanded its nuclear infrastructure in the early 1950s and thereafter steadily produced nuclear weapons; the Soviets at first produced a few thousand weapons, then dramatically increased their nuclear forces in the 1970s. Although their nuclear weapon development occurred at different paces, by the early 1980s both the U.S. and the Soviet Union deployed approximately 10,000 nuclear weapons each.

[36] Lawrence Freedman, *The Evolution of Nuclear Strategy*, p. 326; see also Freedman's Chapter 16, "Assured Destruction."

China's Theory and Practice of Nuclear Deterrence

China's nuclear weapon force structure has diverged from both nuclear deterrence theoretical expectations and the historical example of the U.S. - Soviet Cold War arms race. In terms of theory, although deterrence statism and nuclear strategism differ with respect to advocating exact numbers and types of nuclear weapons, both agree that a secure retaliatory force is crucial for establishing and maintaining nuclear deterrence. However, when Mao Zedong decided to establish a nuclear weapons program, he did not believe that nuclear deterrence replaced China's existing People's War strategic culture,[37] and from 1955 through 1976 China did not deploy its nuclear forces in a manner that emphasized either competitive force size or first strike security. Indeed, as will be detailed in chapter five, through at least 2010 China still had not deployed a sea-based nuclear deterrent and its total deployed nuclear force is estimated to number between 140-190 deployed100 nuclear missiles of varying ranges, with between 20 and 40 strategic ICBMs. This clearly does not accord with nuclear strategism, which views nuclear deterrence as highly contingent on the balance of nuclear forces between adversaries. Yet China's nuclear weapons program also has not been aligned with deterrence statism, since China's leaders did not accept that nuclear weapons caused a change in the nature of warfare and thus institutionalized a nuclear deterrence strategy based on the uncertainty generated by demonstrable technical capability rather than a secure retaliation force or nuclear force parity – a quality that has endured through at least 2011.

China never followed the superpower Cold War historical example either. After detonating its first atomic fission weapon in 1964, rather than increasing production of

[37] I will define my conception of China's Mao-era strategic culture later in this chapter.

fission weapons China instead began a massive industrial investment in 1965 based on People's War principles that relocated defense industries to interior regions of the country, detailed in chapter three. Further, depending on the systems that are included in nuclear force assessments,[38] China very likely never developed more than 500 total nuclear weapons from its first detonation of a fission nuclear device in 1964 through 2011, of which likely no more than 150 nuclear warheads were ever deployed on ballistic missile systems that could serve as an inter-regional or intercontinental deterrent.[39] China never fully integrated nuclear weapons into its national security strategies and never built many nuclear warheads despite its periodic geopolitical and militaristic confrontations with the U.S. and the Soviet Union during the second half of the 20th century. Why did China forgo building large numbers of nuclear weapons despite competing against both superpowers at various points during this period? Why did China not "learn" from the superpowers and build a larger nuclear arsenal during the Cold War?[40]

I argue that ideas about security embodied in China's People's War strategic culture formed the context within which China's elites initiated their nuclear program. China's People's War strategic culture fused with ideas about nuclear weapons to establish a mindset of achieving the technical capability of nuclear weapon detonation over nuclear

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[38] Jeffrey Lewis distinguishes between weapon systems that China likely never deployed (such as SLBMs and tactical nuclear weapons) and clearly deployed weapon systems such as ballistic missiles of various ranges (Jeffrey Lewis, *The Minimum Means of Reprisal*, p. 54). There is good reason for doing this; for example, it has never been verified that China has developed a functioning SLBM system despite decades of research, and gravity bombs – delivered by bomber aircraft - likely would never have survived Soviet Union air defense systems or had the range to reach the U.S. mainland.

[39] Five years after detonating its first atomic weapon China possessed between 50 and 100 nuclear weapons; by 1980, between 100 and 300 nuclear weapons; and by 1990 between 75 and 425 nuclear weapons (Jeffrey Lewis, *The Minimum Means of Reprisal*, p. 54). Further, as will be detailed here in subsequent chapters, according to Natural Resource Defense Council (NRDC) estimates China's nuclear weapon stockpile plateaued at less than 450 warheads between 1985 and 1995. In contrast, the U.S. and Soviet Union combined had more than 20 times this number of deployed nuclear weapons during this period.

[40] Taylor Fravel and Evan Medeiros make this point in "China's Search for Assured Retaliation" (p. 49).

force parity. This mindset was then implemented through early decisions that structured China's nuclear program according to a particular development pathway emphasizing scientific and technical achievement over specific nuclear force structuring. China's strategic culture structured initial decisions concerning China's nuclear program, and path dependent processes solidified these decisions into a development trajectory centered on the achievement of technical capability. To explain this further, the next section introduces strategic culture and path dependence theory in terms of China's nuclear program.

Strategic Culture, Path Dependence, and China's Nuclear weapons program

Strategic Culture

This dissertation takes ideas, defined in terms of strategic culture, as causally important for China's decision-making regarding its nuclear weapons program.[41] Strategic culture explanations are a subset of political cultural studies that began with explaining variance between the U.S. and Soviet Union regarding nuclear strategy. While analysis of the literature on strategic culture tends to divide it into three "generations" of scholarship with different research agendas,[42] the overall goal of these approaches has been to explain how historically derived cultural aspects have influenced state action with regard to national security issues.[43] According to Alastair Johnston, the

[41] This approach challenges the neorealist position that structurally determined utility and interests determine action, and implies a "mutually constitutive" relationship between interests and ideas. Mark Blyth describes possible relationships between ideas and interests in this manner in his review of these issues (Blyth, *Great Transformations*, pp. 27-30). This dissertation uses "strategic culture" as an ideational category to explain the causal importance of ideas for the structuring of China's nuclear weapons program.

[42] Alastair Johnston, "Thinking about Strategic Culture," p. 36; see also Runa Das, "Strategic Culture, Identity, and Nuclear (In)Security in Indian Politics: Reflections from Critical Constructivist Lenses."

[43] This is related to the constructivist approach in international relations theory, defined as state identity

first generation of strategic culture scholarship applies to under-defined, over-deterministic studies from the late 1970s and early 1980s that placed heavy explanatory emphasis on culture to account for national security policy differences between states.[44] Second generation scholarship refers to "instrumental" studies that posit strategic culture as a policy instrument of state policymakers decoupled from a state's behavior; here, the U.S. example of claiming a general nuclear deterrence strategy while developing a detailed nuclear warfighting strategy in the 1980s is cited as an example of this approach.[45] Third generation scholarship conceives of strategic culture as culturally rooted ideas about the role of the state in international affairs (independent variable) whose variation over time explains variance in strategic decision-making (dependent variable).[46]

According to this ontological framework, this dissertation accords with third generation scholarship on strategic culture. In general, China's strategic culture was a set of ideas shared by military and political elites that affected decision-making regarding

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and interests endogenously created through interaction within the international system rather than exogenously determined and fixed by the structure of the system. According to Alexander Wendt, constructivism has at its core three main claims: states are the main units of interaction; the structures of the international system are intersubjective, i.e. are inherently social structures; and state interests and identities are constructed through interaction within the social structures of the international system (Alexander Wendt, "Anarchy is What States Make It;" "Constructing International Politics," *International Security* 20 (1) 1995; "Collective Identity Formation and the International State," *American Political Science Review* 88 (2) 1994). This dissertation does not take a clear constructivist approach because it focuses on the initial effects of China's *indigenous* strategic culture on its early nuclear program; rather than being constructed through state interaction, China's post-1949 strategic culture was formed by a three decade civil war and contained a strong domestic political component.

[44] Alastair Johnston, "Thinking about Strategic Culture," p. 36-39. Jack Snyder's study on the effect of the Soviet Union's strategic culture on the development of damage limitation strategies for U.S. nuclear war planning is cited as the preeminent example of this approach; Snyder characterized the Soviet Union as possessing a distinct strategic culture that determined a preference for a particular type of deterrence strategy. While akin to this dissertation's approach, Snyder's work only weakly defined Soviet strategic culture, this conception of culture did not vary over time, and other potential variables for explaining the study's dependent variable were not sufficiently explored (Jack Snyder, *The Soviet Strategic Culture: Implications for Nuclear Options*).

[45] Alastair Johnston, "Thinking about Strategic Culture," p. 39-41.

[46] Alastair Johnston, "Thinking about Strategic Culture," p. 41-42.

China's national security and varied over time. More specifically, in agreement with Alastair Iain Johnston, I define strategic culture as the historically patterned way in which the state and state elites "think about the use of force for political ends;"[47] it is a "'system of symbols (e.g. argumentation structures, languages, analogies, metaphors) which acts to establish pervasive and long-lasting strategic preferences by formulating concepts of the role and efficacy of military force in interstate political affairs," and consists of assumptions regarding the place of war within human experience, types of threat the state faces and from which adversaries, and the effectiveness of using force for resolving threats and increasing the state's overall security.[48] Although strategic culture has been defined as being distinct from domestic politics,[49] in the case of China there is a strong domestic political aspect to China's strategic culture.[50]

During the Mao era, China's strategic culture was best explained in terms of the People's War, which defined warfare as a constant state of the human experience; it defined threats to the Chinese state as global in terms of socialist ideology, and the U.S. and Soviet Union were considered China's primary adversaries; and warfare was perceived as a justified for preserving the security of the state from existential threats.[51] At a socio-political level, a mass mobilized domestic population was seen as the foundation of warfare and the role of technology in waging successful military campaigns

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[47] Alastair Iain Johnston, *Cultural Realism*, p. 1.

[48] Alastair Iain Johnston, "Thinking about Strategic Culture," p. 46.

[49] For example, Scott Sagan describes three distinct theoretical approaches for explaining why states choose different military doctrines: organizational theory, which emphasizes the role of domestic politics within national military organizations; realism, which emphasizes the influence of external balance of power politics; and strategic culture, which focuses on the effects of culture and ideas upon leaders' decisions to choose various military doctrines (Scott Sagan, "The Origins of Military Doctrine and Command and Control Systems," in Peter Lavoy et al., *Planning the Unthinkable: How New Powers will use Nuclear, Chemical, and Biological Weapons*).

[50] Andrew Scobell has also argued that China's strategic culture should include links to the domestic political realm.

[51] See Ralph Powell, "Maoist Military Doctrines," for an overview of these ideas; this strategic culture outlook will also be addressed in chapter three.

was explicitly de-emphasized.[52] Taken together, this is a unique definition in that it takes People's War - usually categorized as a military doctrine - and assigns it deeper political and cultural meaning based on its historical emergence from the shared experiences of China's elite political and military leaders during China's civil war.[53] In relation to China's nuclear program, People's War principles composed a set of shared cultural understanding that served as a causal variable for elite decisions regarding nuclear weapons in China, forming a set of ideas that I term "People's War Nuclear Deterrence" (PWND).[54] Because the People's War definition of the nature of warfare was grounded in an anti-technological worldview, China's leaders believed that nuclear weapons did not change the nature of warfare. This led China's leaders to believe that the mere capability of detonating a nuclear weapon resulted in a stable nuclear deterrent; PWND emphasized achieving the technical capability to successfully detonate an indigenously produced nuclear weapon while maintaining the role of a mass mobilized population as the centerpiece of China's warfare strategy and ultimately proscribing the

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[52] As I will detail in chapter three, People's War ideas comprised a political-military philosophy that called for the mobilization of local populations to a political cause. This philosophy became the foundation for Mao's military strategy during China's civil war, and so became part of the shared experience of Communist military leaders. After winning the civil war, Communist political elites adopted this set of ideas as a governing philosophy. For background reference to this interpretation, see Huang Jing's *Factionalism in Chinese Politics* and Chen Jian's "continuous revolution" argument in his book *Mao's China and the Cold War* (see especially his introduction, pp. 6-10).

[53] This differs from other definitions of China's strategic culture that are primordialist in nature; for example, Andrew Scobell defines China's strategic culture according to the enduring philosophical traditions of Confucianism and Realpolitik (Andrew Scobell, *China's Use of Military Force*, p. 26). Scobell's blend of classical eastern and western philosophical ideas to explain China's use of state force during the latter half of the 20th century seems intuitively appealing, but his analysis does not directly link these ideas to state action. Instead, I argue that China's post-1949 strategic culture is composed of a set of ideas that have directly affected China's decision-making regarding its nuclear weapons program, and these ideas have varied after 1949.

[54] A background variable is a kind of independent variable that is prior to the explanatory model yet still exerts some influence on the model itself (Henry Brady and David Collier, *Rethinking Social Inquiry*, p. 274). I identify strategic culture as a background variable that changes after the death of Mao and the rise of Deng Xiaoping as *de facto* leader of China in the 1980s.

importance of nuclear deterrence within China's overall strategic culture.[55] PWND relegated nuclear weapons to a secondary role in China's military planning and initiated the nuclear program's focus on achieving technical capability rather than nuclear force parity.

China's strategic culture changed after the death of Mao and as Deng Xiaoping transitioned to become the de factor leader of China between 1976 and 1980. As Deng Xiaoping came to power, he publically stated that the threat of world war was drastically reduced; the threat that China might become involved in a major war was low; and that international engagement through diplomacy and economic reform was the most effective way for China to enhance its security within the international system. China's leaders then established a new set of linguistic cultural symbols reflecting a reordered set of strategic preferences for China's post-Mao leadership. This reformulated strategic culture caused widespread changes to China's military, to include its nuclear weapons program. This shows how China's strategic culture has indeed varied over time, resulting in changes to aspects of China's nuclear weapons program within the context of continued overall restraint for the program as a whole, as China maintained low numbers of nuclear weapons.

While aspects of this dissertation's approach resonates with third generation scholarship on strategic culture, this dissertation departs from other strategic cultural studies by focusing on the path dependent manner in which aspects of China's strategic culture became institutionalized within its nuclear weapons program. It is this institutionalization that allowed certain aspects of the program, such as the overall

[55] This reflects a fundamental tension that persisted throughout the Mao era: reliance on "the People" as the foundation of military strategy coupled with an intense desire to modernize the state and the military through developing and harnessing technology.

constraint of the number of nuclear weapons it produced, to persist across changes in strategic culture, changes in leadership, and changes in the distribution of power in the international system. This focus on institutionalization addresses a classic difficulty in strategic culture studies: the linking of aspects of culture to behavioral outcomes.[56] China's strategic culture structured initial decisions regarding China's nuclear program, but it was the institutionalization of PWND within China's nuclear program that established a self-reinforcing process that persisted over time. Analysis of the developmental pathway of China's nuclear institutional arrangements moves this argument beyond strategic culture and into path dependence theory.

Path Dependence Theory

Path dependence is an explanation for how the timing and sequence of events shape historical outcomes, and it has been associated with the historical institutionalism approach in political science. Historical institutionalism is a branch of comparative politics that emphasizes the importance of institutions for understanding political phenomenon and focuses on the effect of historical processes on political institutional development. Path dependence has been associated with historical institutionalism in part because of a shared emphasis between these two approaches on the shaping power of inherited shared contexts among social actors.[57] However, path dependence theory has been applied to a wide variety of phenomenon, from economic-technical studies of

[56] Alastair Iain Johnston develops a complex text-based research methodology in an attempt at linking what he interprets as realpolitik cultural ideas to historical state actions (Alastair Iain Johnston, "Thinking about Strategic Culture"). I avoid this by arguing that aspects of People's War strategic culture are institutionalized within China's nuclear program, the development of which becomes self-reinforcing.

[57] Peter Hall and Rosemary Taylor, "Political Science and the Three New Institutionalisms," pp. 937-942; see also Kathleen Thelen, "Historical Institutionalism in Comparative Politics."

railway gauge standardization to paradigm development and technical innovation for firms in the marketplace.[58] While this dissertation is amenable to the historical institutionalist approach in comparative politics, my emphasis on origins, national strategic decision-making, and technical infrastructure lead me to emphasize path dependence as an appropriate theoretical framework for my argument.

Perhaps the most important, yet mostly implicit, concept within path dependence theory is the idea that phenomena periodically develop according to a discernible path or trajectory, beginning with an open period containing a variety of possible directions or pathways.[59] Particular pathways are then established – or re-established- through "critical junctures," which are periods of contingency "characterized by the adoption of a particular institutional arrangement from among two or more alternatives," with contingency defined as the "inability of theory to predict or explain...the occurrence of a specific outcome."[60] Once a pathway is established, it is reinforced through various feedback mechanisms, such as self-reproducing sequences or reactive sequences.[61] Although path dependence theory has its critics,[62] applying path dependence concepts to

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[58] Douglas Puffert, *Tracks Across Continents, Paths Across History*, and Giovanni Dosi, "Sources, Procedures, and Microeconomic Effects of Innovation," respectively. For an overview of applications of path dependence theory across fields of study, see James Mahoney and Daniel Schensul, "Historical context and path dependence," in Robert Goodin and Charles Tilly, eds., *The Oxford Handbook of Contextual Political Analysis*.

[59] Giovanni Capoccia and Daniel R. Keleman, "The Study of Critical Junctures: Theory, Narrative, and Counterfactuals in Historical Institutionalism," pp. 343, 352.

[60] James Mahoney, "Path Dependence in Historical Sociology," pp. 513-514. See also: Paul Pierson, *Politics in Time*, pp. 50-51, and Kathleen Thelen, "Historical Institutionalism in Comparative Politics," pp. 387-396.

[61] Self-reproducing mechanisms are usually divided into two groups: increasing returns, where each outcome increases the chance that the same outcome will be repeated (often associated with economic and technical studies of path dependence), and equilibrium maintaining returns, wherein each outcome produces the same likelihood that subsequent outcomes are the same (James Mahoney and Daniel Schensul, "Historical context and path dependence," p. 466). Reactive sequences are a chain of events wherein "cause A" results in "effect Z" to form a pathway (James Mahoney and Daniel Schensul, "Historical context and path dependence." p. 467, and James Mahoney, "Path Dependence in Historical Sociology").

[62] Path dependence theory has been criticized as being too deterministic and for not adequately accounting

China's nuclear program provides an essential framework for understanding the historical arc of this set of political and technical institutions. Specifically, path dependence theory facilitates insight relating to the "openness" of initial conditions facing China's nuclear program, the contingency of some events during the first five years of the program (1955-1960), the importance of critical junctures, and reinforcement of certain aspects of the program's development path over time.[63] Following is an overview of each of these areas in relation to China's nuclear weapons program.

Path dependence highlights a period of "causal possibility"[64] wherein a variety of outcomes are possible prior to the establishment of a particular pathway, and this certainly applies to the beginning of China's nuclear weapons program. When Mao Zedong decided that China would create a nuclear weapons program, there were a variety of possible pathways open to China regarding the manner of its execution. Nuclear weapons were a new technology in 1955, China had never engaged in this kind of national technological program before, and China had no history of any nuclear industry

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for detailed institutional changes due to its focus on pathway development and maintenance (for more on these critiques, see Guy Peters, Jon Pierre, and Desmond King, "The Politics of Path Dependency: Political Conflict in Historical Institutionalism," and Ian Greener's "The Potential of Path Dependence in Political Studies"). In response to this critique, and as part of a broader argument about institutional development and change, Kathleen Thelen argues path dependence theory should take into account the potential for institutions to adapt in response to changing political, social, and economic conditions (Kathleen Thelen, "How Institutions Evolve: Insights from Comparative Social Analysis," in James Mahoney and Dietrich Rueschemeyer, eds., *Comparative Historical Analysis in the Social Sciences*). However, I argue these critiques miss a fundamental point: path dependence is at its core a theory that explains persistent outcomes over time, especially when these outcomes may not be expected on the basis of other theory, and thus accounting for change is not a primary goal for path dependence theory. In this dissertation, path dependence is applied to an unexpectedly stable outcome: China's low number of nuclear weapons over a period of fifty years that defies the expectations of nuclear deterrence theory and international historical practice.

[63] Each of these concepts are debated among path dependence theorists. For more on these debates, see James Mahoney and Daniel Schensul, "Historical Context and Path Dependence" and Andrew Bennet and Colin Elman, "Complex Causal Relationships and Case Study Methods: the Examples of Path Dependence."

[64] Bennet and Elman use this phrase in their discussion of historical openness (Andrew Bennet and Colin Elman, "Complex Causal Relationships and Case Study Methods: the Examples of Path Dependence," p. 252).

or research. Given these initial conditions, China's leaders could have believed that nuclear weapons fundamentally changed the nature of warfare, and that nuclear deterrence was automatic given a credible nuclear deterrent that was reasonably secure from a first strike – the deterrence statist position.[65] Alternatively, China's leaders could have believed that nuclear weapons did not fundamentally change the nature of warfare, that interstate warfare could easily include the use of nuclear weapons, and that therefore China should prepare itself by developing a large and varied nuclear force, ranging from tactical nuclear weapons to ICBMs – an early version of the nuclear strategist position.[66] In terms of observing practices, China could have attempted to follow the U.S. path and move from successful detonation to building a large fission bomb stockpile and developing a variety of nuclear deterrence strategies governing the stockpile's deployment. Or China could have followed the Soviet model of a slower but steady stockpile development, building several thousand fission warheads by the 1970s. As China's nuclear history shows, there was no necessary reason to follow – or *not* to follow - either established theory or practice; the beginning of China's nuclear weapons program was open to different development pathways.

Contingency and critical junctures are other important concepts within path dependence theory, and both influenced the development of China's nuclear weapons program.[67] A series of contingent events shaped the first five years of China's nuclear

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[65] This is essentially Bernard Brodie's position in *The Absolute Weapon*, published in 1946, nine years before China's decision to develop nuclear weapons.

[66] An early version of this reasoning is found in Albert Wohlstetter's "The Delicate Balance of Terror," published in 1959, four years after China's decision to develop nuclear weapons and five years prior to China's first successful detonation of a nuclear device.

[67] The extent to which contingency is an integral part of path dependence theory is debated; see Bennet and Elman, "Complex Causal Relationships and Case Study Methods: the Examples of Path Dependence," p. 256, and James Mahoney and Daniel Schensul, "Historical Context and Path Dependence" for overviews of this debate. In agreement with Mahoney, I argue contingency defines a critical juncture

program; for example, Mao's Great Leap Forward socio-economic program and the following "three had years" slowed the building of key nuclear facilities, as will be described in greater detail in chapter three. Further, this period of contingency was punctuated by a critical juncture event that further shaped the path of China's nuclear weapons program in a manner that was not expected according to that period's predominant theory and practice of nuclear deterrence. This event was the Sino-Soviet split, and it marks a critical juncture because China's initial choices regarding how to establish a nuclear weapons program depended heavily on the Soviet Union to provide aid, and the unexpected withdrawal of this aid dramatically affected China's nuclear program.[68] Another critical juncture came with the political transition from Mao to Deng Xiaoping in the late 1970s; this transformed China's strategic culture in a manner that directly affected its nuclear weapons program, even as the program remained restrained in terms of the number of weapons it deployed. Altogether, contingency and critical junctures played a major role in the development of China's nuclear weapons program.

Finally, various types of reinforcement mechanisms are central to path dependence explanations,[69] and there were several events that reinforced the early

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by establishing that prediction of a particular pathway was not possible beforehand and that this separates path dependence from other types of historical explanations (James Mahoney, "Path Dependence in Historical Sociology;" and James Mahoney and Daniel Schensul, "Historical Context and Path Dependence").

[68] Although the Sino-Soviet split is certainly explainable in general as an historical event with various causes and effects, it lies outside the boundaries of China's nuclear weapons program as an unforeseen, somewhat random event that affected the development of the program.

[69] Some scholars emphasize self-reinforcement as the mechanism of maintaining pathways, while others leave room for other types of feedback mechanisms, such as negative reinforcement and even reactive sequences (James Mahoney; Bennet and Elman, "Complex Causal Relationships and Case Study Methods: the Examples of Path Dependence;" Mahoney and Schensul, "Historical Context and Path Dependence"). For example, James Mahoney identifies two types of path dependent outcomes following critical junctures: reactive sequences and self-reinforcing processes (James Mahoney, "Path Dependence in Historical Sociology"). I do not attempt to characterize the events I describe here

trajectory of China's nuclear program. After the Sino-Soviet split, by 1962 China's nuclear weapons program developed according to a pathway best suited for achieving scientific and technical capabilities rather than large-scale weapon production. This pathway was then reinforced by three major events: the successful detonation of a fission nuclear device in 1964; the decision to pursue a nuclear fusion weapon in 1965; and the Third Line industrialization mobilization from 1965 to 1971. Later, certain self-reinforcing mechanisms were created as part of China's nuclear weapons program, such as China's accession to various international agreements relating to nuclear testing, materiel handling, and proliferation issues. These agreements imposed a set of periodic reporting requirements upon the Chinese government in a manner that reinforced certain expectations regarding China's nuclear program, especially its nuclear industry.

Taken together, path dependence theoretical concepts provide essential heuristic tools for organizing this historical analysis of China's nuclear weapons program. Conceiving of this program as having a development trajectory is useful for understanding how it spans across historical eras. Identifying critical junctures assists analysis of periods of change, while identifying self-reinforcing mechanisms assists explaining persistent outcomes over long periods. To illustrate how these concepts facilitate this dissertation's historical analysis, following is a more detailed overview of this dissertation's argument as an introduction to the next three empirical chapters.

The Argument in Detail

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according to these categories at this point, intending instead to first focus on sufficiently identifying and describing the events themselves.

Chapter Three: PWND

After Mao decided to develop a nuclear weapons program in 1955, leadership ideas about nuclear weapons fused with China's People's War strategic culture to form what I call People's War Nuclear Deterrence (PWND). PWND is defined by two broadly conceived strategic ideas: (1) the maintenance of mass mobilization of "the people" as the key to China's strategic culture, and (2) the simple demonstration of nuclear weapon *detonation capability* as sufficient for achieving nuclear deterrence vis-a-vis other nuclear powers.[70] PWND structured planning for China's nuclear weapons program as a strategy that aimed to create uncertainty through simply demonstrating the capability to produce and detonate a nuclear weapon rather than producing a nuclear force on par with other powers.[71] It is not a detailed nuclear strategy, and it does not incorporate any nuclear doctrine for the deployment of nuclear forces.[72] Chapter three will detail China's strategic culture during the Mao era, describe the formation of PWND, and define PWND. Since I take strategic culture to be a set of symbols reflected in language that establish strategic preferences through ideas about the role and efficacy of military force in interstate political affairs, I analyze Mao-era national security

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[70] Mao espoused "the people" as being central to resolving any armed conflict, and did not consider nuclear technology to be a decisive factor in war (Lewis and Xue, *China Builds the Bomb*, pp. 65-67; see also Chapter Eight, "Strategic Doctrines and the Hydrogen Bomb," for more on how nuclear weapon capability served to reinforce China's strategic culture rather than re-define it).

[71] This is similar to Avery Goldstein (*Deterrence and Security in the 21st Century*) and Jeffrey Lewis (*The Minimum means of Reprisal*), however I emphasize the demonstration of technical capability as achieving deterrence for China in conjunction with the lack of a detailed strategic doctrine guiding the program.

[72] "There is no evidence that any overarching strategic doctrine informed Chairman Mao Zedong's decision to proceed with the strategic missile program in the 1950s" (John Lewis and Hua Di, "China's Ballistic Missile Programs," pp. 5-6, 19-20), and by the time nuclear armed ballistic missiles were being operationally deployed little over a decade later there remained a wide divergence between Chairman Mao's strategic ideas about nuclear weapons and their actual production and deployment by the Second Artillery (Lewis and Xue, *China Builds the Bomb*, p. 215). This indicates weak central oversight of deployment and the lack of a clear nuclear doctrine for operational deployment. See also Taylor Fravel and Evan Medeiros' "China's Search for Assured Retaliation" for more on the lack of any clear operational doctrine for China's nuclear weapons during the first three decades of their existence.

publications, speeches, and media to inform these definitions.

PWND's Institutionalization

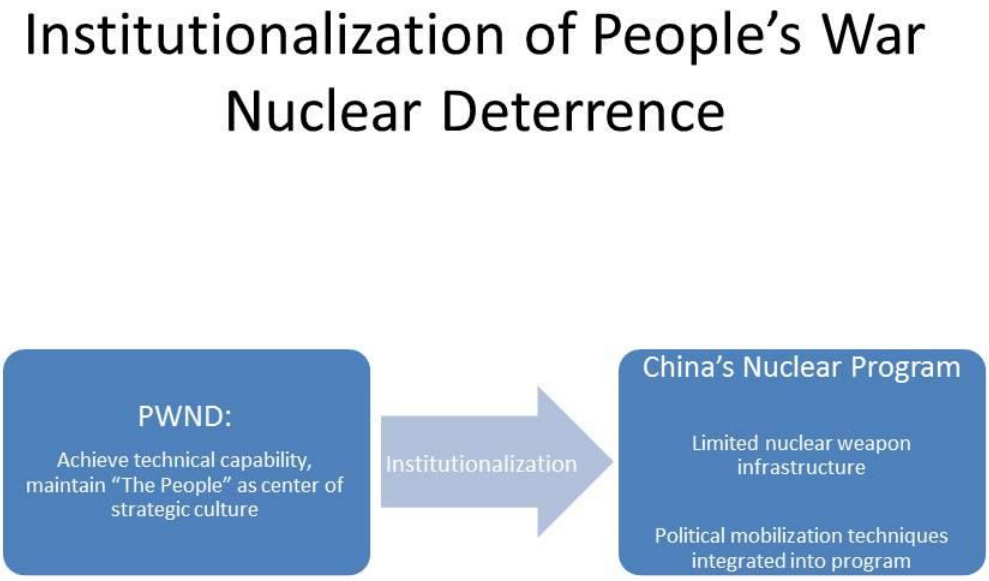
PWND was institutionalized through the initial decisions made by elites that established the nuclear weapons program. To say that PWND became "institutionalized" means the set of strategic ideas that define PWND structured the planning and execution of China's initial nuclear program. This occurred in two main ways. First, an early emphasis on achieving technical breakthroughs over developing military force production capacity led China to build a limited nuclear weapon industrial infrastructure dedicated to producing prototype weapons along both the uranium and plutonium pathways of developing fissionable material,[73] with little flexibility for expanding warhead production. Second, mass mobilization political techniques were periodically incorporated into the nuclear weapons program itself, with the initial mining of the first batch of uranium serving as a prime example of the fusion of domestic mass mobilization politics with China's nuclear weapons program.[74] While China also invested heavily in developing a nuclear technical workforce[75] and created a new system of political institutions designed to manage its nuclear program, the limited nuclear weapon industrial infrastructure and the fusion of mass mobilization political methods

[73] Lewis and Xue, *China Builds the Bomb*, pp. 104-105.

[74] For example, CCP cadres incorporated Great Leap Forward "mass mobilization" techniques for finding and collecting uranium ore in their provinces. This entailed mobilizing thousands of ordinary peasants and workers; arming them with Geiger counters, very little specialized training, and no protective equipment; and directing them to find ore deposits, dig shallow mines, and haul U238 ore to collection sites. Some of the U235 in China's first atomic weapon was processed from material procured according to these methods (John Lewis and Xue Litai, *China Builds the Bomb*, pp. 87-88).

[75] This highlights another issue related to China's nuclear weapons program: the place of science and technology within China's overall economic and military development plans. Evan Feigenbaum argues strategies for long-term scientific development became a national priority after the Korean War, and he characterizes this as a result of a leading military official, Nie Rongzhen, convincing Mao to follow this long-term pathway rather than developing military force parity (Feigenbaum, *China's Techno-Warriors*).

with the program are the clearest examples of how PWND structured the initial formation of China's nuclear weapons program. Chapter three will detail this institutionalization by analyzing China's initial nuclear infrastructure and showing how the politics of mass mobilization, grounded in China's People's War strategic culture, infused parts of China's nuclear program. (See below graphic: Institutionalization of People's War Nuclear Deterrence)

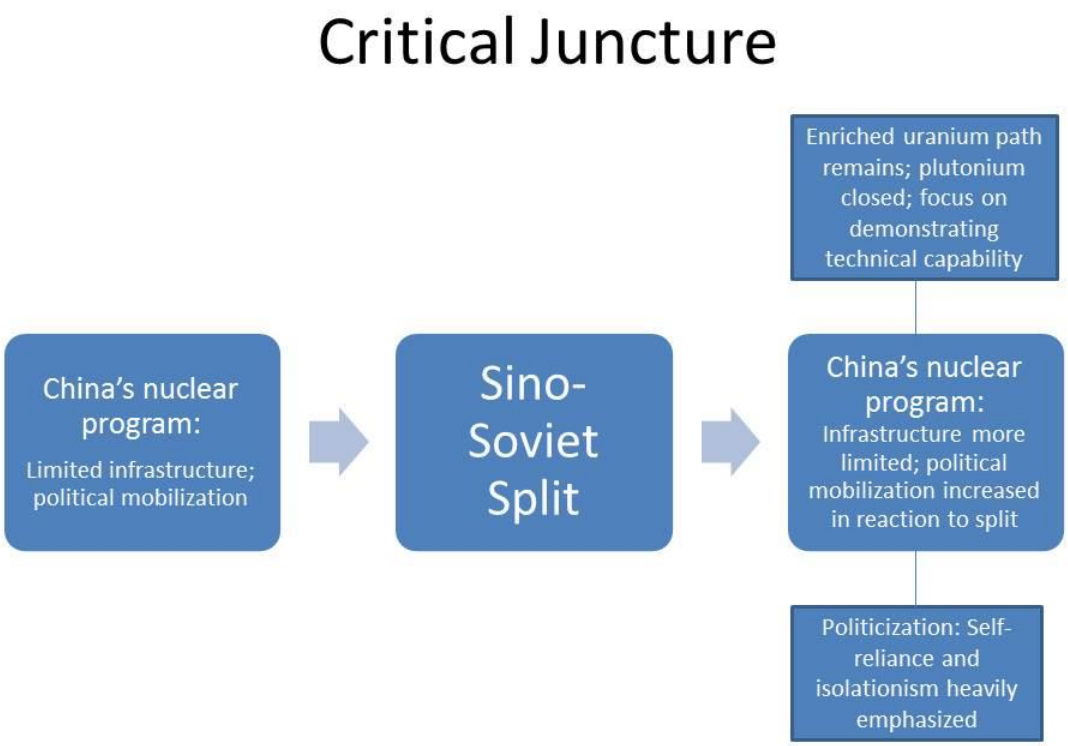


Critical Juncture and Reinforcement

A critical juncture locked in this institutionalization, and it was reinforced by subsequent events throughout the rest of the Mao era. The critical juncture process

began in 1959 as the Soviet Union withdrew advisors and other forms of economic aid to China in some of the first visible manifestations of the eventual Sino-Soviet Split.[76] This unexpected event had major implications for China's nuclear program; since the Soviet Union was providing the expertise for building a plutonium producing nuclear reactor, once Soviet aid was fully withdrawn in 1960 China emphasized the highly enriched uranium (HEU) pathway for developing its first nuclear weapon (delaying the use of plutonium in China's nuclear weapon testing until the late 1960s) and focused on achieving the successful detonation of a nuclear device above all else.[77] Demonstrating technical capability became the threshold for China's achievement of nuclear deterrence vis-a-vis the superpowers. (See below graphic: Critical Juncture)

[76] Lorenz M. Luthi, *The Sino-Soviet Split*, Chapter Five; John Lewis and Litai Xue, *China Builds the Bomb*, p. 108, 113.
[77] Lewis and Xue, *China Builds the Bomb*, p. 112-113.



Reinforcement began with series of events that occurred in a sequence and caused reactions that further reinforced China's PWND configuration of its nuclear weapons program: China's first successful detonation of a fission nuclear device; its decision to pursue fusion weapons; and the Third Line industrialization plan. The successful detonation of a fission nuclear device in 1964 offered the first major positive feedback for China's nuclear weapons program. China's subsequent choice to develop a hydrogen bomb further reinforced the "scientific and technical capabilities" pathway; rather than build a large stockpile of fission weapons based on its successful fission weapon design,[78]

[78] I argue this would have required a different "technical paradigm" devoted to scaled production of nuclear fuel, bomb component fabrication, assembly plants, and storage areas. Borrowing from Thomas Kuhn, Giovanni Dosi uses the idea of a technical paradigm to describe the patterns of learning and knowledge inheritance among technical knowledge communities in his article "Sources,

China instead chose to replicate the process of strategic weapon research and development organized around the goal of technical achievement rather than force parity.[79] Then this pathway was again reinforced shortly thereafter by the Third Line industrialization plan, initiated in 1965.[80] The Third Line was a massive industrialization investment based on People's War principles that shifted the location of heavy industry, including military industry, away from China's eastern coastline and towards China's interior regions in part because of the perceived vulnerability of China's coastline to attack in the event of war.[81] This reorganization of China's military industry became the central focus of China's national strategic investments from 1965 through at least 1971, funneling investments to basic heavy industry and away from expanded production of nuclear warheads. China's Third Line industrialization investment demonstrated that nuclear weapons never changed China's overall strategic culture during Mao era; even after China developed a (theoretical) nuclear deterrent capability, nuclear deterrence as a military and political strategy simply never deeply affected Chinese elite

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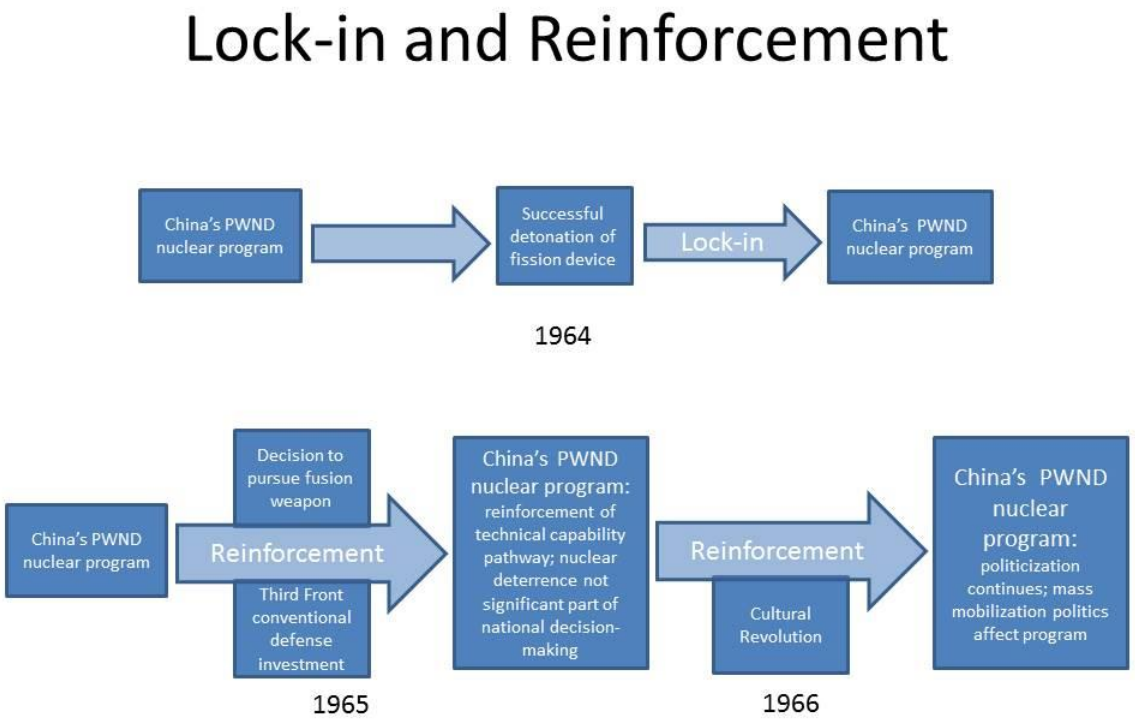
Procedures, and Microeconomic Effects of Innovation." China's nuclear scientific "tacit knowledge" base, referring to knowledge that exists between people that is not written but rather passed through interpersonal communication, was founded on the experience of researching initial weapon designs and producing prototype weapons. It was thus more suitable for researching the next generation fusion weapon rather than developing scaled weapon production systems and facilities. (The above definition of tacit knowledge is drawn from Donald Mackenzie and Graham Spinardi's article "Tacit Knowledge, Weapons Design, and the Uninvention of Nuclear Weapons," where they argue that nuclear weapons can theoretically be uninvented due to the inherent fleetingness of the tacit knowledge needed to produce and maintain nuclear weapon systems within the nuclear science community.)

[79] Lewis and Xue describe the fast switch to developing a thermonuclear device after successfully detonating its first fission device (Lewis and Xue, *China Builds the Bomb*, p. 196).

[80] The Third Front Industrialization plan was implemented from 1965 through 1971 and represented enormous investment in a variety of heavy industry in China's central region of the country in order to both spread investment to poorer regions of China as well as move strategic industries away from potentially vulnerable areas of China's east coast. As will be explored in the next chapter, the focus on this program revealed that China's leaders did not fully understand or believe in nuclear deterrence theory. For more on the Third Front, see John Lewis and Litai Xue's *China's Strategic Seapower*, and Barry Naughton's "The Third Front: Defence Industrialization in the Chinese Interior."

[81] Avery Goldstein, *Deterrence and Security in the 21st Century*, p. 38 (especially footnote 40), 56. Strangely Goldstein does not explore the apparent paradox between the development of a nuclear deterrent and the establishment of the Third Front as grounded in conventional People's War principles.

decision-making during the Mao era. At the same time, mass mobilization politics continued to infuse aspects of the nuclear program during the active phase of the Cultural Revolution. (See below graphic: Lock-in and Reinforcement) Chapter three will detail this series of events and decisions that reinforced China's nuclear weapons program PWND development trajectory, from the Sino-Soviet split to China's decision to develop a nuclear fusion weapon and the Third Line industrialization plan.



Chapter Four: Change in Strategic Culture causes Change in China's Nuclear weapons program

In accord with Maoist strategic culture, by 1975 China's nuclear weapons

program could achieve technical breakthroughs in nuclear weapon design and prototype production, but was not established for large-scale production of nuclear weapons. China's nuclear weapons program remained materially constrained during the subsequent Deng Xiaoping era as its nuclear industry began slowly commercializing and China acceded to nuclear-related international treaties that served a self-reinforcing mechanisms further restraining China's nuclear weapons program. However, after Mao's death in 1976 and in the wake of the ensuing leadership competition that followed, a new vision of Chinese strategic culture emerged with implications for China's nuclear weapons program. China's transformed strategic culture redefined the role of military within the Chinese state; this caused a series of reforms to the nuclear weapons program relating to nuclear theory development, training, and internationalization that improved China's strategic nuclear deterrent without increasing its number of deployed nuclear weapons. This strategic culture shift was marked by the adoption of a new set of cultural phrases - "seek truth from facts" and "opening" – that became cultural-linguistic reinforcements of China's strategic culture change; they were linguistic symbols that embodied the set of new strategic preferences of China's dominant military and political leadership during the Deng era. Detailing the resolution of China's post-Mao leadership competition reveals the process of how China's strategic culture changed during this period, clarifies links between strategic culture and China's nuclear weapons program, and altogether reflects the importance of strategic culture as a variable for explaining China's nuclear weapons program. Yet this change occurred within the context of a persistent path dependent development pattern, as China's nuclear weapon force did not appreciably expand during this period.

Chapter Five

From 1993 through 2011 China's nuclear weapon force remained materially restrained, and its nuclear weapons program as a whole continued to develop along the trajectory established during the Deng era emphasizing nuclear theory development, training, and internationalization. China's Second Artillery organization was assigned the new function of overseeing China's conventional missile forces, a role that reflected the increased specialization of the PLA in line with trends in professionalization of China's armed forces. Commercialization of China's nuclear industries continued as well, as nuclear enrichment facilities expanded to meet emergent domestic and international demand for nuclear power plants. And co-binding engagement with other states and international organizations deepened as China acceded to a host of international agreements regarding nuclear material handling, storage, and testing, in keeping with the Deng Xiaoping era's establishment of international engagement as a cornerstone of China's national security strategic outlook; this reinforced the overall restraint of China's nuclear weapon force during this period, as China's nuclear weapon force did not appreciably expand during this period.

Conclusion

The next chapter will first define Mao era strategic culture in terms of the People's War, explain how this strategic culture mixed with ideas about nuclear weapons to form People's War Nuclear Deterrence (PWND), and define PWND. Then, chapter three will show how PWND became institutionalized within China's nuclear program, particularly

through the building of a limited infrastructure - mixed with mass mobilization domestic politics – that was devoted to technical achievements rather than force production. Finally, chapter three will show how China's PWND-directed nuclear program became locked-in and reinforced through several key decisions and events during the 1960s.

Chapter Three: People's War and Strategic Nuclear Deterrence, 1955-1975

Introduction

According to both theoretical and historical expectations, China should have developed a strong nuclear deterrent during the Mao era given myriad external threats to its national security. After U.S. military pressure during the Korean War, China established its nuclear weapons program in 1955 with assistance from the Soviet Union. Then, in 1960 China's relations with the Soviet Union disintegrated and China became increasingly isolated from both Cold War superpowers; rather than expand its nuclear arsenal , it instead implemented People's War-inspired, mass-mobilized political movements that interfered with the development of its nuclear weapons program. Most strikingly, even after China and the Soviet Union engaged in numerous armed conflicts along their borders that culminated with the Soviet threat of nuclear attack in 1969, China responded by dramatically expanding investment in its conventional military infrastructure instead of expanding its nuclear weapons program. Despite expectations China simply never significantly expanded its strategic nuclear deterrent during a period when it faced a robust variety of threats to its national security, and even periodically initiated domestic programs that directly interfered with the development of its nuclear weapons program.

I argue that China's People's War strategic culture caused China's nuclear weapons program to be configured as a technical research and development effort that never

meshed with prevailing People's War-inspired strategic defense ideas.[1] Once this configuration was achieved, path dependent processes determined the overall development trajectory of the program. First, a development pathway was formed within a particular set of initial conditions. Then, certain key historical events further influenced the program's development trajectory, to include the critical juncture of the Sino-Soviet split. Certain aspects of the program became institutionalized, to include the notion of small numbers of nuclear weapons for achieving deterrence and China's limited nuclear infrastructure; these aspects extended into the subsequent Deng Xiaoping era. People's War strategic culture configured the program, historical events further shaped it, and then aspects of the program persisted over time.

This chapter explains how China's nuclear weapons program was limited, how certain historical events shaped the program, and then why it remain tightly circumscribed and limited in scope in spite of various Cold War political pressures. Part one of this chapter begins with an overview of China's nuclear weapon deployments through 1975, establishing that these deployments were indeed quite limited through the end of the Mao era. I then provide an overview of China's nuclear weapon production infrastructure in order to show that while this infrastructure allowed the capability to produce a limited number of nuclear warheads, it was not expanded to a scale that would allow mass-production of a large nuclear force in line with China's periodic rivals, the U.S. and the Soviet Union. To show this, I treat China's primary fissile material production facility during the Mao era, the Lanzhou Gaseous Diffusion Facility, as a case

[1] Mulvenon and Yang's edited volume on the historical development of the PLA also assesses that China's early nuclear weapons program was focused on R&D, although they argue this was a rational choice and was not based on China's strategic culture (Mulvenon and Yang, *The People's Liberation Army as Organization*, p. 518).

study for China's overall nuclear weapon production infrastructure according to the following expectations.[2] If China was intent on developing a stockpile of nuclear weapons on par with the Soviet Union or U.S., then we should expect a steady expansion of the facilities associated with producing these weapons. If, on the other hand, China's nuclear weapons program was circumscribed, then we would see minimal development of China's nuclear weapon production infrastructure. To establish the Lanzhou facility as a case study of China's nuclear weapon production infrastructure, I provide a geospatial overview of the Lanzhou facility and introduce a basic assessment of the facility's development during the Mao era.

Part two of this chapter then examines links between People's War ideas, elite decision-making, and key historical events in order to illustrate how China's People's War strategic culture constrained the development of its nuclear weapons program in a path dependent manner throughout the Mao era.[3] This section applies the Lanzhou facility case study by linking imagery analysis of the Lanzhou facility with key historical events that affected the development of China's nuclear weapons program during the Mao era, revealing that even during periods of military threat China did not expand its primary fissile material production facility. This section highlights China's choice to spend 30-50% of its annual national budget on the People's War-based Third Line defense program instead of expanding its fissile material production capability, offering the clearest historical example of how China's People's War strategic culture constrained the development of its nuclear weapon production capacity.

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[2]The relevance of the Lanzhou facility as a case study is predicated on an assumption that there exists a strong, positive relationship between fissile material production capacity and number of nuclear warheads.

[3]A timeline of these events is provided in Appendix One at the end of the chapter for reference purposes.

Part three of this chapter then explains *why* China did not develop a robust strategic nuclear deterrent during the Mao era by detailing how China's People's War strategic culture was fundamentally incompatible with nuclear strategic deterrence ideas. To advance this argument, this section first establishes that China's Mao-era strategic culture was defined in terms of the People's War in contrast with other, more conventional military doctrines. I show how China's People's War strategic culture emerged from debates within China's military leadership concerning how to develop China's military, how proponents of Mao's vision of the People's War eventually won this debate, and how People's War principles then defined China's strategic culture throughout the Mao era. I conclude this section by showing how this People's War strategic culture was incommensurable with strategic nuclear deterrence concepts, and how this constrained the development of nuclear strategic deterrence as a national security paradigm among China's leadership.

Part One: Deployed Nuclear Forces and Nuclear Infrastructure

China's Deployed Nuclear Forces during the Mao Era

After China demonstrated the technical capability to detonate a nuclear weapon in 1964 it simply did not build a large number of strategic nuclear weapons, and the few nuclear weapons it did possess were not integrated with China's military forces.[4] Although there is some indication that China favored research and development of land-based missile systems as its primary method of deployment for nuclear warheads,[5] by the

[4]John Lewis and Hua Di also assert that China's Mao-era nuclear forces were not well integrated with PLA planning and operations, however they offer no evidence supporting this assertion nor any broader argument of this point (Lewis and Hua, "China's Ballistic Missile Programs").

[5] John Lewis and Xue Litai, *China's Strategic Seapower*, p. 132.

end of the Mao era in 1975 China actually deployed a low number of short and intermediate-range ballistic missiles equipped with nuclear warheads, with no clear strategic guidance guiding their use and apparently little commitment towards force expansion.[6] According to CIA estimates during the 1970s, by 1975 China deployed approximately 10 SRBMs[7] and 30 each of CSS-1 and CSS-2 missiles.[8] While these ballistic missile systems could reach a limited number of targets in the Soviet Union, none had the range to reach Moscow.[9] In addition, China maintained a small number of attack aircraft capable of delivering nuclear (gravity) bombs, such as the TU-16, with a theoretical range of approximately 1,700 kilometers.[10] However, against the Soviet Union these bombers would have faced a powerful air defense system that likely rendered their threat negligible. China did initiate a submarine launched ballistic missile (SLBM) program in the late 1950s code named "Project 1060," and in 1959 received technical assistance and equipment from the Soviet Union towards this project.[11]

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[6] Yu Jixun, *Second Artillery Campaign Studies*, p. 12; Lewis and Hua, "China's Ballistic Missile Programs" (see pages 5-6 for mention of a lack of strategic guidance for China's nuclear missile deployments).

[7] "SRBM" (Short Range Ballistic Missile) probably refers to the 600 kilometer ranged SS-1/DF-1 (referred to as P-2 in Chinese sources), China's initial ballistic missile system that was copied from the Soviet Union in the mid-1950s and first deployed in the early 1960s for limited use in the nuclear program (Zhang Aiping, *China's People's Liberation Army, Volume One*, p. 110; Hai Ping, "Towards Modernizing China's Strategic Missile Force," p. 39; *China's Strategic Attack Programs*, National Intelligence Estimate 13-8-74, pp. 11-12; Lewis and Hua, "China's Ballistic Missile Program," p. 9).

[8] *China's Strategic Attack Programs*, National Intelligence Estimate 13-8-74 (Director of Central Intelligence, 16 July 1974), pp. 37-38. Jeffrey Lewis offers a similar estimate for the CSS-1, citing a 1978 Department of Defense report that is likely based on this CIA estimate (Jeffrey Lewis, *The Minimum Means of Reprisal*, p. 66). CSS-1 is the western designation of the DF-2, a single-stage 20-meter-long ballistic missile with a range of 1050 kilometers; CSS-2 is the western designation of the DF-3A, a single stage 24-meter-long ballistic missile with a range of 2650 kilometers (Lewis and Hua, "China's Ballistic Missile Programs," pp. 9-10).

[9] *China's Strategic Attack Programs*, National Intelligence Estimate 13-8-74 (Director of Central Intelligence, 16 July 1974), p. 29. Jeffrey Lewis asserts that after the 1969-1970 Soviet nuclear strike threat, China modified the in-development CSS-3, extending its range to include Moscow (Jeffrey Lewis, *The Minimum Means of Reprisal*, p. 66). However, according to John Lewis and Hua Di, the CSS-3 was not deployed until 1980 (Lewis and Hua, "China's Ballistic Missile Programs," p. 10).

[10] *China's Strategic Attack Programs*, National Intelligence Estimate 13-8-74 (Director of Central Intelligence, 16 July 1974), p. 29.

[11] John Lewis and Xue Litai, *China's Strategic Seapower*, p. 131.

The project was renamed "*julong yihao*," or JL-1, in 1964; however, budgetary constraints, historical events, and strategic reassessments conspired to disrupt the development of this system throughout the 1960s and 1970s, and by 1975 China still had not successfully test fired a JL-1 missile from a submarine.[12] Further, according to CIA estimates during this period, China's overall production and procurement of ballistic missile delivery systems decreased during the early 1970s, suggesting wavering commitment towards developing a strategic nuclear deterrent.[13]

According to alternative accounting methods focusing on nuclear warhead totals, Natural Resources Defense Council (NRDC) estimates that China's total nuclear warhead stockpile amounted to a fraction of those built by the U.S. and Soviet Union during the 1970s. According to the NRDC, by 1975 China had approximately 185 total nuclear warheads in its stockpile, where stockpile entails any assembled and stored warhead with any type of delivery vehicle, from gravity bombs to missiles. In contrast, by 1975 the U.S. and Soviet Union had approximately 27,052 and 19,055 stockpiled nuclear warheads, respectively (see the chart below).[14]

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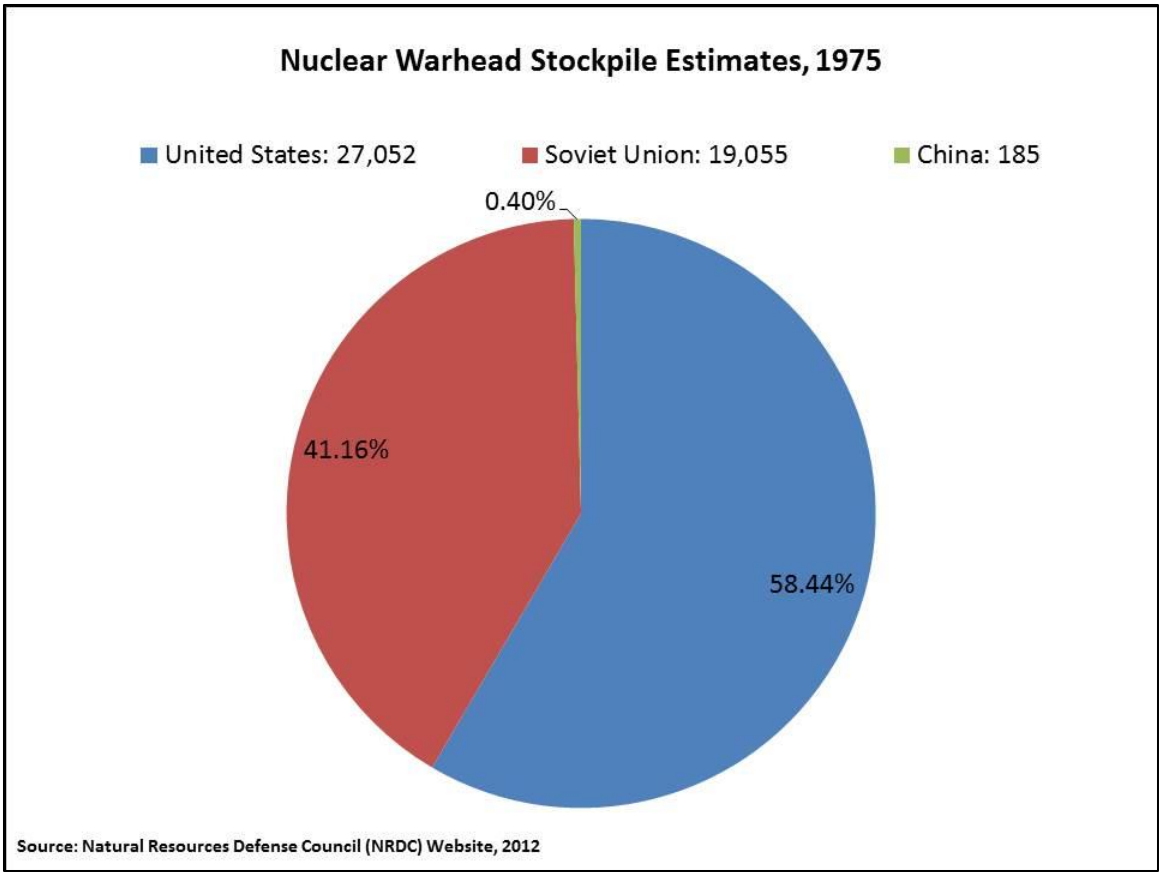
[12] John Lewis and Xue Litai, *China's Strategic Seapower*, pp. 72-73; see p. 132 for references to the JL-1 code name, which is now "*julang yihao*", or "巨浪一号."

[13] *Military Developments in China*, Intelligence Report (Central Intelligence Agency, Directorate of Intelligence, March 1975), p. 6-8; see also *China's Strategic Attack Programs*, National Intelligence Estimate 13-8-74 (Director of Central Intelligence, 16 July 1974), p. 3.

[14] I do not integrate 1975 nuclear weapon stockpile data for the United Kingdom (350) or France (188) into this analysis since they relied upon the U.S. "extended deterrence" security policy applied to NATO member states, whereas China has never been protected by another state's nuclear force. Data source: Natural Resource Defense Council (NRDC) Website, 2012. For a recent analysis of the U.S. extended deterrence policy, see Steven Pifer et. al., "U.S. Nuclear and Extended Deterrence."



Although accounting methods differ between sources of estimated nuclear weapon force numbers, all available estimates of China's nuclear forces during the Mao era from 1955-1975 indicate that China's nuclear missile force remained quite limited. During this period China likely had no more than approximately 185 total stockpiled nuclear warheads that included 40 total nuclear-armed missiles, with only a handful of nuclear-armed missiles capable of striking deep into the Soviet Union. Overall, as of 1975 China had no ballistic missile system capable of striking the United States mainland, a weak and vulnerable nuclear strategic deterrent capability against the Soviet Union, no sea-based nuclear deterrent, and no clear ambition to improve their nuclear deterrent through nuclear warhead delivery system procurement.

China's Nuclear Weapon Production Infrastructure, 1955-1975

We now move from estimates of deployed nuclear weapon systems to the scope and development of China's Mao-era nuclear weapon production infrastructure. China's initial nuclear weapon infrastructure consisted of a testing site, storage areas, nuclear enrichment facilities, reprocessing facilities, fabrication and assembly facilities, and various other research and development areas. During the initial construction period of the nuclear program's infrastructure in 1958, China built the Lop Nur testing area, the Jiuquan Atomic Energy Complex, the Northwest Nuclear Weapons Design and Research Academy, and the Lanzhou Gaseous Diffusion Facility. The Lop Nur testing area was the site of China's first series of open-air nuclear testing. The Jiuquan Atomic Energy Complex was designed as a plutonium production and processing facility, but it was not until 1967 that the complex's reactors began producing plutonium, and 1970 that its chemical processing facility began operating.[15] The Northwest Nuclear Weapons Research and Design Academy was China's primary nuclear weapon engineering design, component manufacturing, and assembly facility; it began operations approximately during 1962.[16] The Lanzhou Gaseous Diffusion Facility was China's only gaseous diffusion uranium enrichment facility until 1975; it began operation in 1963 and served a

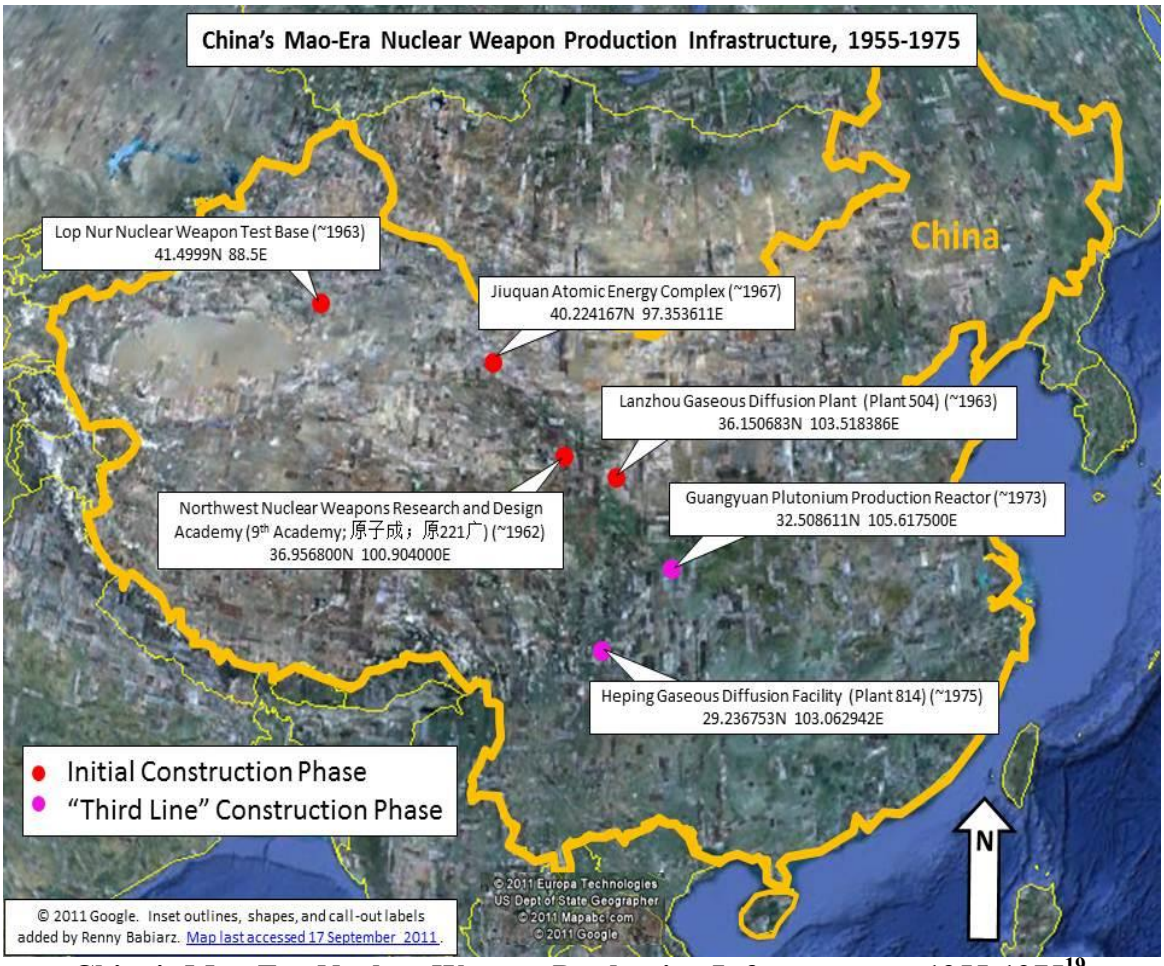
[15]Planning for the facility began in 1958, construction began in 1960 and was halted in 1962 because of the difficulties of the Sino-Soviet split, construction began again in 1964, Jiuquan's reactor began operation in 1967, and plutonium was first detected in a Chinese nuclear explosion in 1968 (John Lewis and Xue Litai, *China Builds the Bomb*, pp. 108-114; "Global Fissile Production Report 2010: Balancing the Books: Production and Stocks," p. 103; David Wright and Lisbeth Grislund, "Estimating China's Production of Plutonium for Weapons," pp. 62-65). However, the reactor remained troubled and periodically ceased operations throughout its lifetime.

[16]China also had several institutes in Beijing devoted to theoretical research and training, such as the Beijing Nuclear Weapons Research Institute (John Lewis and Xue Litai, *China Builds the Bomb*, pp. 140-141). While these play an essential role in the research and development process, I do not consider them part of China's nuclear weapon production infrastructure.

primary role in producing the fissile material used in China's first nuclear test explosions.[17] Later, during China's "Third Line" industrial reorganization during the late 1960s, a plutonium production facility in Guangyuan and a gaseous diffusion uranium enrichment facility in Heping were built but did not begin operating until the mid-1970s.[18] (See below graphic)

[17]John Lewis and Xue Litai, *China Builds the Bomb*, pp. 114-121; International Panel on Fissile Material (IPFM), "Global Fissile Production Report 2010: Balancing the Books: Production and Stocks," Chapter 7; *Communist China's Advanced Weapons Program*, Special National Intelligence Estimate 13-2-1965 (Director of Central Intelligence, 27 January 1965), pp. 6-7. The NIE asserts that the Lanzhou gaseous diffusion building could not have produced all of the required HEU used in China's first nuclear weapon test of 1964; it argues that the gaseous diffusion building enriched uranium to somewhere below the necessary 85% U235 level, and that another method-possibly electromagnetic separation, also possibly located at the Lanzhou HEU facility- "topped off" the enrichment process. While this is a possibility, it is also theoretically possible to cycle uranium through the gaseous diffusion process repeatedly until the desired enrichment level is achieved, although this is probably more time consuming (see Stephen Enke, "Some Economic Aspects of Fissile Material").

[18]John Lewis and Xue Litai, *China Builds the Bomb*; International Panel on Fissile Material (IPFM), "Global Fissile Production Report 2010: Balancing the Books: Production and Stocks," Chapter 7.



China's Mao-Era Nuclear Weapon Production Infrastructure, 1955-1975[19]

China's Nuclear Weapon Production Infrastructure Case Study: The Lanzhou Gaseous Diffusion Facility

Of particular interest in this chapter is the condition of China's fissile material production capacity during the Mao-era as an indication of China's strategic intent regarding its nuclear weapons program. Fissile material is the key explosive component

[19] All Google Maps and Google Earth products are referenced according to Google Fair Use policy (http://maps.google.com/support/bin/static.py?page=ts.cs&ts=1342531). Location information derived from: Science, Technology, and Global Security Working Group, "China's Nuclear Facilities" (KML File), Massachusetts Institute of Technology; John Lewis and Xue Litai, *China Builds the Bomb*; and International Panel on Fissile Material (IPFM), "Global Fissile Production Report 2010: Balancing the Books: Production and Stocks," Chapter 7. Dates of operation for facilities drawn from John Lewis and Xue Litai, *China Builds the Bomb*; see also International Panel on Fissile Material (IPFM), "Global Fissile Production Report 2010: Balancing the Books: Production and Stocks," Chapter 7.

of a nuclear weapon and its production is arguably the most difficult aspect of a nuclear weapons program.[20] As Part Two of this chapter will detail, China decided to emphasize U235 production in 1960 as a consequence of the Sino-Soviet split, and U235 (HEU) was present in at least the first eight of China's nuclear weapon tests.[21] Given that any expansion of a nuclear weapon stockpile necessarily requires an expanded stock of fissile material, and China relied on gaseous diffusion enrichment of U235 as the foundation of its fissile material production capacity in the early stages of its nuclear weapons program, therefore analyzing China's U235 fissile material production capacity is an essential aspect of evaluating its overall nuclear strategic intent with regard to nuclear weapon production capacity during the Mao era.

Due to historical circumstance, the Lanzhou Gaseous Diffusion Facility was China's primary facility for producing military grade highly enriched uranium (HEU) throughout the Mao era. At first, during initial planning of its nuclear weapons program Chinese leaders decided to build both a uranium enrichment facility (at Lanzhou) and a plutonium-producing reactor (at Jiuquan) as a strategic decision to establish redundancy in China's fissile production infrastructure.[22] However, due in part to the termination of technical expertise and other resources by the Soviet Union during the Sino-Soviet split of the 1960s, Chinese leaders decided to delay building the plutonium production facility at Jiuquan and instead focused on the Lanzhou gaseous diffusion facility for the

[20]The uranium isotope U235 and plutonium (Pu240) are two elements that are highly fissionable and therefore have historically been employed to produce an explosive nuclear chain reaction in nuclear weapons. While U235 is highly fissile, 99.7% of uranium found in nature is uranium 238 (U238), which is not fissile material. The extremely high ratio of U238 in nature means that finding U235 within portions of U238 is extremely difficult, and sophisticated techniques have been developed that mechanically process the U238 to separate U235, the product of which is referred to as highly enriched uranium (HEU). The technique investigated in this chapter is the gaseous diffusion technique favored by China during the 1960s (and used by the U.S. during the 1950s and 1960s).

[21]John Lewis and Xue Litai, *China Builds the Bomb*, p. 243.

[22]John Lewis and Xue Litai, *China Builds the Bomb*, p. 113.

production of China's first fissile material.[23] Even after the Jiuquan facility began operating in 1967, ongoing problems at the facility periodically halted operations through 1975.[24] The more reliable Lanzhou Gaseous Diffusion Facility was finished in 1963 and began regularly producing HEU no later than 1964. It still exists today with the same building layout and the original gaseous diffusion building still in place, although it reportedly stopped HEU production in 1979.[25]

I have conducted historical imagery analysis of the Lanzhou Gaseous Diffusion Uranium Enrichment Facility from 1964 through 1975 as a case study of China's overall fissile material production capacity during the Mao era. I treat the Lanzhou facility as a case study for several reasons. First, the Lanzhou facility was China's only HEU fissile material production facility in the early stages of its nuclear program, and it remained China's primary fissile material production facility throughout the Mao era due to problems with the plutonium-producing reactor at the Jiuquan facility.[26] If China sought to expand its nuclear weapon stockpile to compete with the U.S. or the Soviet Union, then it would have expanded its fissile material production infrastructure, which most likely would have included an expansion of the Lanzhou Gaseous Diffusion Uranium Enrichment Facility.[27] Interestingly, a CIA report from 1965 states that China's site

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[23]John Lewis and Xue Litai, *China Builds the Bomb*, p. 113.

[24]David Wright and Lisbeth Grislund, "Estimating China's Production of Plutonium for Weapons," p. 63.

[25]International Panel on Fissile Material (IPFM), "Global Fissile Production Report 2010: Balancing the Books: Production and Stocks," p. 99.

[26]For example, Jeffrey Lewis argues that China's fusion thermonuclear testing between 1968 and 1974 "probably made extensive use of uranium" (*The Minimum Means of Reprisal*, p. 64), although there was also some plutonium present in some of these tests as well (Lewis and Xue, *China Builds the Bomb*, Appendix B, pp. 244-245). Only the Lanzhou facility could have provided the HEU used in bomb development during this period.

[27]For example, in the early 1950s the U.S. decided to expand its nuclear warhead stockpile. To achieve this, it first expanded its fissile material production capacity by building more plutonium-producing nuclear reactors, new gaseous diffusion facilities, and expanding the Oak Ridge Nuclear Lab's existing gaseous diffusion capability within the "K-25" complex (Stephen I. Schwartz, ed., *The Atomic Audit*, pp.

layout of the Lanzhou facility suggested plans for constructing another large gaseous diffusion building,[28] however this did not occur during the Mao era according to my own historical imagery analysis.[29]

Second, imagery analysis of gaseous diffusion enrichment facilities is more amenable to addressing questions of fissile material production expansion because of the nature of the gaseous diffusion process, since expansion of gaseous diffusion HEU production capacity generally requires expanding physical spaces at the facility. While it is possible to increase efficiencies at the margins of the gaseous diffusion process without expanding facility floor space, such as increasing the pump flow rate (requiring more power) or improving the quality of the separation materials, these represent small-scale improvements;[30] large-scale expansion of uranium enrichment capacity using the gaseous diffusion method requires expansion of the diffusion building's floor space and/or the construction of addition buildings devoted to this process.[31] Following is a geospatial overview of the Lanzhou Gaseous Diffusion Facility.

67-68; see also David Rosenberg, "American Strategy and the Hydrogen Bomb Decision," and "U.S. Nuclear War Planning, 1945-60," p. 41).

[28]Communist China's Advanced Weapons Program, Special National Intelligence Estimate 13-2-1965 (Director of Central Intelligence, 27 January 1965), p. 6.

[29]China did build a second gaseous diffusion facility at Heping in 1975, however the strategic intent of the facility was for dispersing critical nuclear infrastructure to ensure a basic HEU production capability in the event of war (part of the Third Line campaign). Furthermore, the Heping facility did not begin producing fissile material until the very end of the Mao era, just before the Lanzhou Gaseous Diffusion Facility in 1979 ceased producing HEU. While China did build a second plutonium-producing nuclear reactor at Guangyuan in 1973, this also was part of the Third Line defense industry facility dispersion strategy and did not significantly add to China's fissile material production capability.

[30]Stephen Enke, "Some Economic Aspects of Fissile Material," pp. 226-227; see also International Panel on Fissile Material (IPFM), "Global Fissile Production Report 2010: Balancing the Books: Production and Stocks," p. 99, for mention of Chinese claims of improved separation equipment in the plant.

[31]For example, in 1954 the U.S. expanded Oak Ridge Nuclear Laboratory's gaseous diffusion HEU production capacity by adding several new gaseous diffusion buildings to the original K-25 complex. Two of the new buildings stood alone and a third was an expansion of an existing building, altogether marking a dramatic expansion of covered floor space dedicated to the gaseous diffusion production process (Stephen I. Schwartz, ed., *The Atomic Audit*, p. 68).

Overview of the Lanzhou Gaseous Diffusion Facility

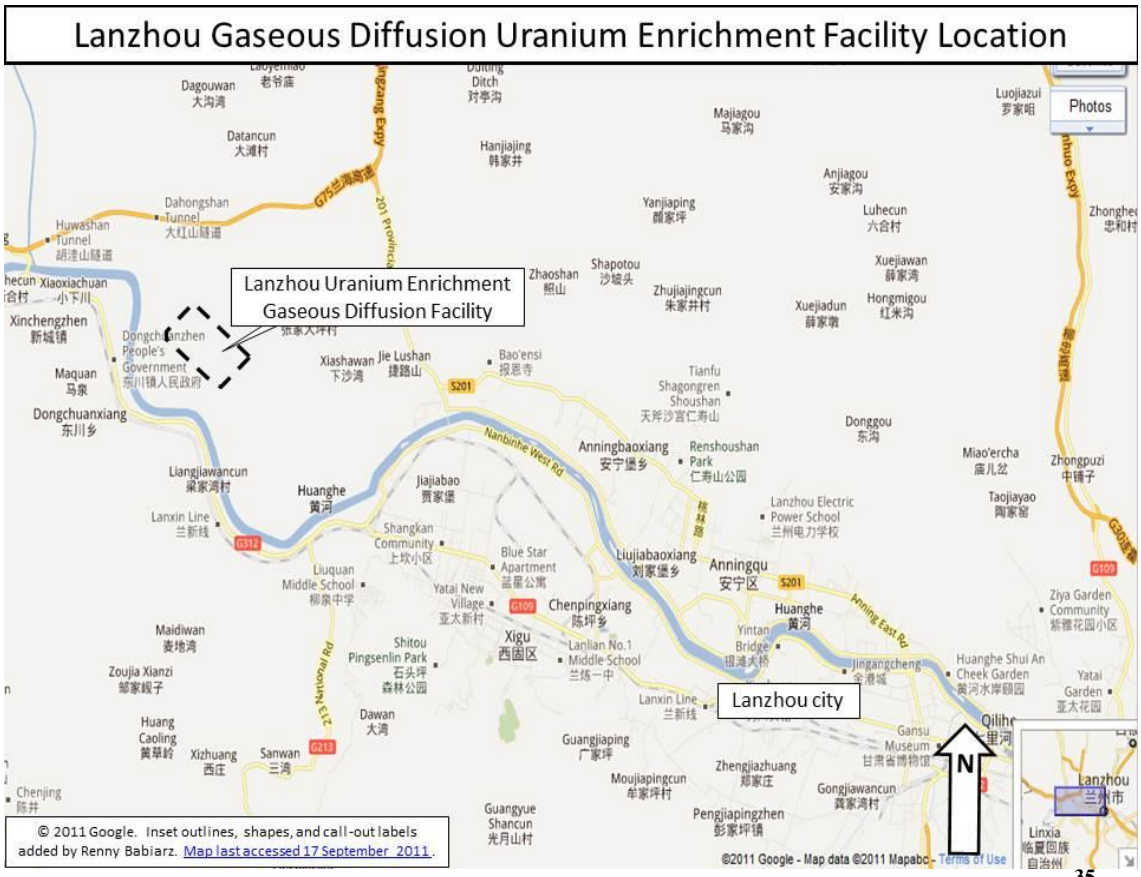
The large size and general shape of a uranium enrichment gaseous diffusion building is a function of the gaseous diffusion process itself and is distinct enough to be one possible identifying feature of uranium enrichment facilities. The uranium enrichment gaseous diffusion process separates U235 from the more abundant U238 according to atomic weight. A mass of collected uranium is converted into a gas (uranium hexafluoride) and diffused through a series of separation barriers that filter the gas through various stages; this continues until enriched U235 is collected at the last separation barrier.[32] Space is integral to this type of separation process, and therefore separation barrier area is some indication of overall plant capacity.[33] Further, separation barrier area requires horizontal floor space, and so long, low buildings have become one possible identifying feature of uranium enrichment facilities.[34]

The Lanzhou Gaseous Diffusion Facility is located on the banks of the Yellow River (黃河, Huang He) adjacent to Lanxin railroad line near Dongchuan township just west of Lanzhou city, Xiguqu at geocoordinates 36.1537N 103.5184E. (See graphic below)

[32]Stephen Enke, "Some Economic Aspects of Fissile Materials," pp. 224-225; John Lewis and Xue Litai, *China Builds the Bomb*, p. 114; Richard Kokoski, *Technology and the Proliferation of Nuclear Weapons*, p. 14. Lewis and Xue and Richard Kokoski explain that within the uranium hexafluoride gas U235 moves faster than U238 under a constant temperature, and will thus be more likely to travel through separation barriers into the next chamber.

[33]Stephen Enke, "Some Economic Aspects of Fissile Materials," pp. 226-227.

[34]China's other uranium enrichment facility, the Heping gaseous diffusion facility that was built during China's Third Line defense reorganization campaign, has a gaseous diffusion building with a size and dimension similar to that of Lanzhou's gaseous diffusion building. The U.S. Oak Ridge Nuclear Laboratory (ORNL) also had a gaseous diffusion building built in the early 1940s with a similar shape (long in length). However, ORNL expanded its gaseous diffusion capacity in the mid-1950s by building several more gaseous diffusion buildings, one of which had equal sides.



Lanzhou Gaseous Diffusion Uranium Enrichment Facility Google Location[35]

The facility's Mao-era boundaries[36] enclosed an area of approximately 1.25-kilometers-square[37] secured by a fence-line (probably walled) and anti-air defenses.[38] According to 2010 Google Earth imagery, the facility is served by a railroad line that runs into the southwestern portion of the facility through a gate and between several probable rail

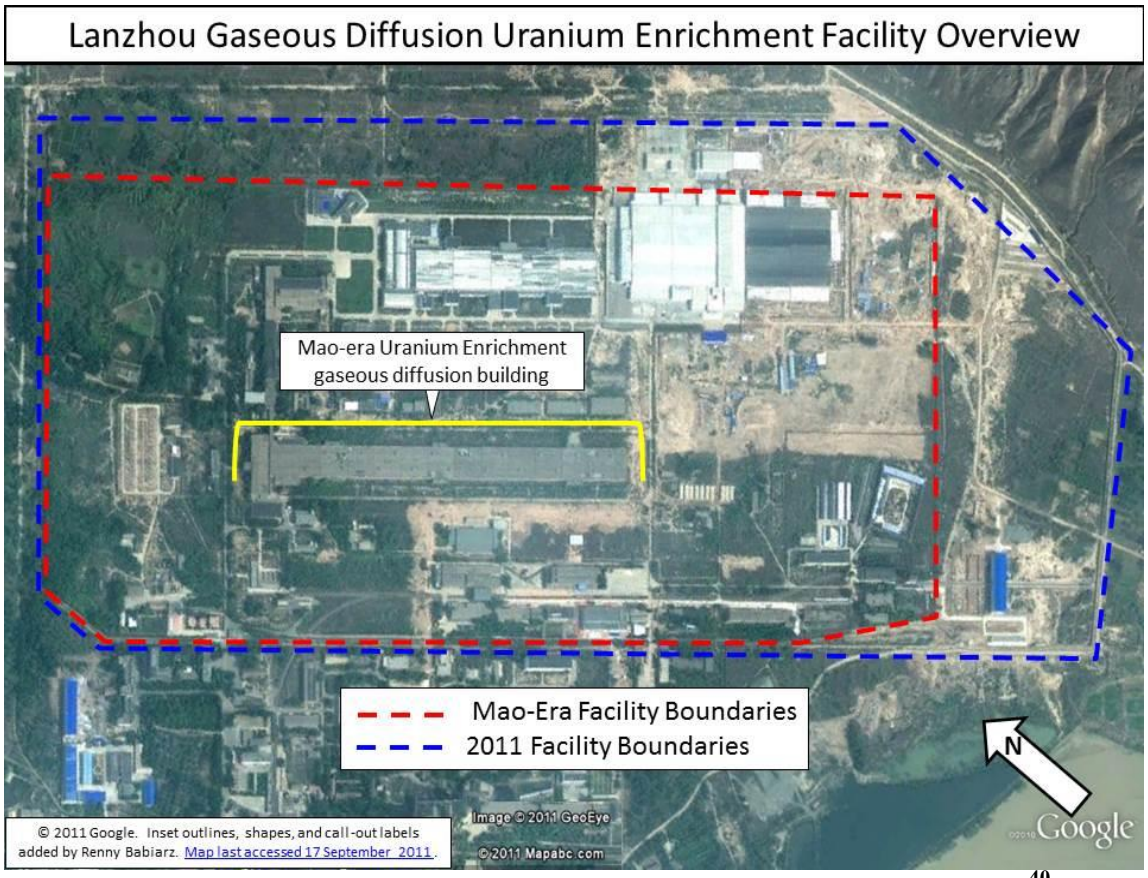
[35] All Google Maps and Google Earth products are referenced according to Google Fair Use policy (http://maps.google.com/support/bin/static.py?page=ts.cs&ts=1342531).

[36] Geospatial measurements of the Mao-era facility features was conducted using Google Earth software applications with 2010 Google Earth imagery of the facility. Based on comparative imagery analysis, the currently derived dimensions of the facility and the main gaseous diffusion building are likely the same as historical imagery; however measurements for Mao-era facility boundaries are approximated since current facility boundaries are slightly expanded.

[37] This is an approximated measurement of the Mao-era facility boundaries using 2010 Google Earth imagery to include this imagery's georeferencing and mensuration (see Figure Three).

[38] *Communist China's Advanced Weapons Program*, Special National Intelligence Estimate 13-2-1965 (Director of Central Intelligence, 27 January 1965), p. 6. This report's assessment of the presence of anti-air defenses appears to be based on imagery analysis of the facility.

support buildings. The gaseous diffusion building (GDB) is centrally located and is the facility's largest building at 628-meters-long long and 60-meters-wide with an approximate area of 37,680-meters-square.[39] The dimensions of the main gaseous diffusion building have not changed since the facility's initial operation in 1964. There is a probable electricity supply station within the facility's boundaries to the northwest of the GDB. Last, there are several unidentified buildings to the northeast of the GDB built sometime after 1975. (See below graphic)



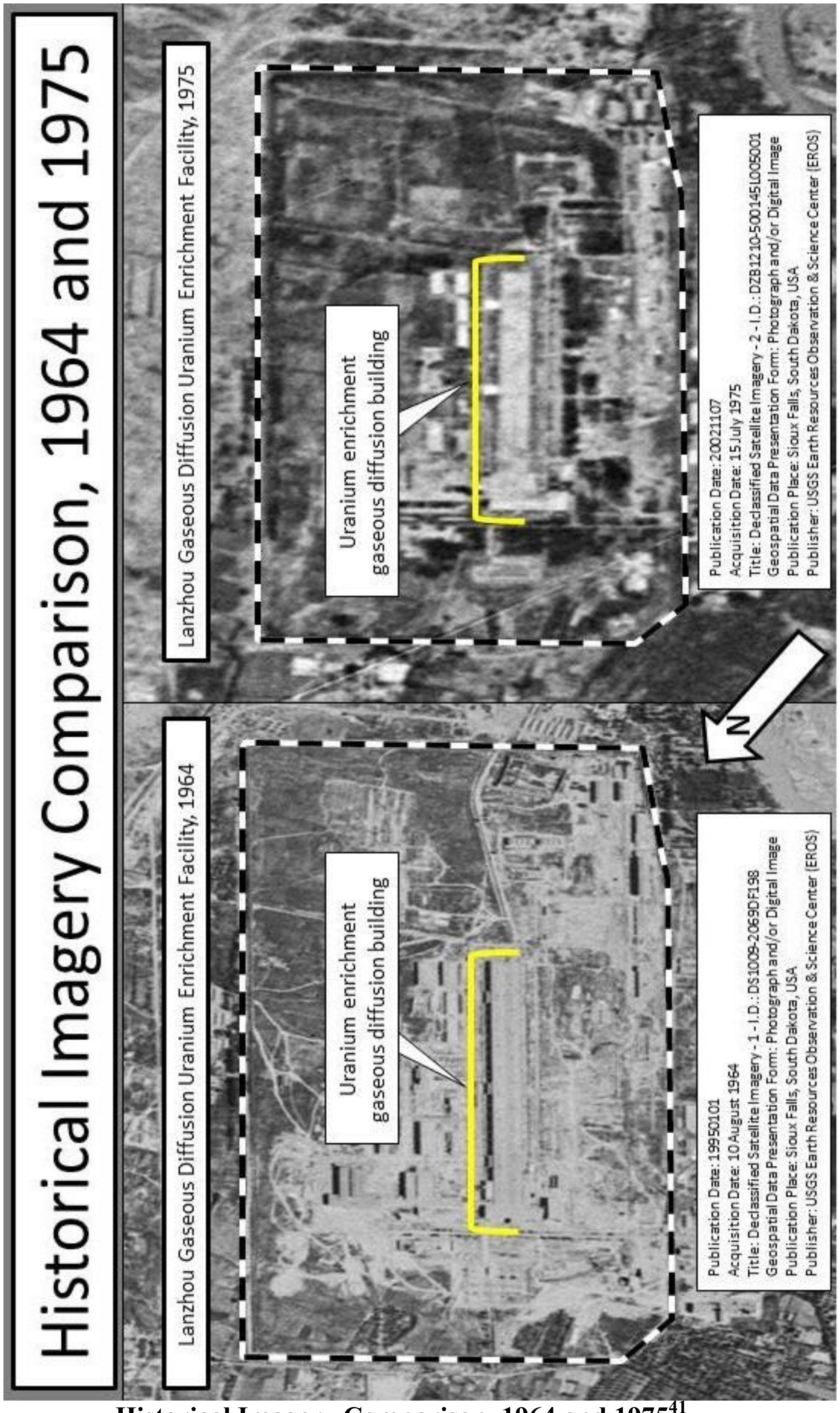
Lanzhou Gaseous Diffusion Uranium Enrichment Facility Overview[40]

[39]The current shape and measurements of the gaseous diffusion building are likely the same as those seen in declassified satellite photographs from 1964.

[40]All Google Maps and Google Earth products are referenced according to Google Fair Use policy (http://maps.google.com/support/bin/static.py?page=ts.cs&ts=1342531).

Historical Imagery Analysis of the Lanzhou Facility

The Lanzhou facility did not expand during the Mao era, corroborating aforementioned low estimates of nuclear weapon deployments by China at the end of the Mao era in 1975. Following is an overview graphic assessment of China's nuclear production facility showing the lack of gaseous diffusion building expansion during the Mao era (see below graphic):



Historical Imagery Comparison, 1964 and 1975[41]

This graphic shows that the Lanzhou Gaseous Diffusion Facility's uranium enrichment building did not expand and that no other buildings were constructed within the facility between the years 1964 and 1975. Given that the Lanzhou facility was of primary importance for providing China's nuclear weapons program fissile material during the Mao era, the fact that this facility never expanded during this period, along with the aforementioned estimated reductions in nuclear weapon delivery system procurements during the early 1970s, altogether supports the assertion that China did not intend to develop a large nuclear weapon force to challenge the US or Soviet Union during the Mao era. In the historical analysis section of this chapter I provide a more detailed analysis of the Lanzhou facility case study by linking select historical images of the facility to particular events affecting the development of China's nuclear program.

Part Two: Path Dependence and China's Nuclear Program During the Mao Era

The next section of this chapter traces key historical events that had a lasting effect on the development of China's nuclear weapons program, to include weapon deployments. As a gauge of China's strategic intent during these historical events, I integrate analysis of declassified historical imagery of the Lanzhou facility from the years 1964, 1965, 1966, 1968, 1971, and 1975 with this historical overview. I begin the section with an overview of The Great Leap Forward (1958-1960), a movement that established the dominance of People's War strategic culture over China's nascent nuclear program. During this period, People's Militias were created as part of a political

[41]Declassified Satellite Imagery. Left image: - 1 - I.D.: DS1009-2069DF198, acquired 10 August 1964, published 1 January 1995; right image: - 2 - I.D.: DZB1210-500145L005001, acquired 15 July 1975, published 7 November 2002.

mobilization campaign to carry out economic projects across China, including the "mass mobilized mining" of China's initial stock of uranium. Next, the Sino-Soviet split (approximately 1960-1961) in many ways flowed from the failures of the Great Leap Forward and resulted in the withdrawal of Soviet technical and material assistance. This caused China to cease building its plutonium production reactor at Jiuquan and focus instead on gaseous diffusion as the primary method of producing HEU for its initial nuclear weapon test explosions. Then, China made two key strategic decisions in the years after the Sino-Soviet split: develop hydrogen fusion nuclear weapons,[42] and initiate the Third Line defense industry reorganization campaign. The Third Line campaign in particular shifted money and technical expertise away from China's nuclear weapons program, further limiting the program's development and reinforcing its research and development focus. Finally, the Great Proletarian Cultural Revolution (1966-1976) revealed China's commitment to mass-mobilization political campaigns, directly affecting China's nuclear program in a manner that retarded the program's development and reinforced its status as a small-scale, R&D focused program with little flexibility for expanding production of nuclear weapons.[43]

The following section provides an overview of these historical events integrated with imagery analysis of the Lanzhou facility. First, I begin with a brief description of the factors that are widely considered to have caused China to begin a nuclear weapons

[42]This decision was made soon after the successful October 1964 atomic test built on China's recent successes in weapons research, development, and prototype production; this also locked in a mindset of technical achievement as sufficient for achieving nuclear deterrence. By contrast, soon after the U.S. established its initial nuclear weapon production infrastructure it decided to increase its stockpile of nuclear weapons and expanded many of the facilities associated with the production of nuclear weapons in order to achieve this goal.

[43]Appendix Two at the end of this chapter contains a timeline depicting these historical events alongside major developments in China's nuclear weapons program, provided for assistance in referencing this information.

program, beginning with the Korean War and the subsequent strategic debates that shaped Chinese military politics for decades afterward.

The Korean War, PLA Modernization, and Nuclear Weapons

The Korean War marked the first armed conflict wherein nuclear weapons factored into Chinese decision-making, ultimately contributing to China's initiation of a nuclear weapons program in 1955. There are many comprehensive accounts of the Korean War, and I do not seek to replicate them; I simply highlight here the effect of this conflict on China's nuclear politics of the era.[44] The Korean War began on 25 June 1950 with the North Korean People's Army's surprise attack of South Korea, and the U.S. intervened through the newly formed United Nations (UN) soon thereafter.[45] While China generally sought to stop U.S. influence in Asia, it felt directly threatened when U.N. forces approached the China-Korea border at the Yalu river. In response, China entered the Korean War by October of that year and remained a central participant throughout the conflict.[46] China eventually achieved its strategic objective of limiting U.S. influence on the Korean peninsula, but periodic reliance on People's Warfare principles, poor logistical organization, and woefully outdated military equipment exacted a at a terrible price. By the end of the conflict, China had spent about 10 billion yuan on the war and suffered over one million total casualties, including 152,000 dead.[47]

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[44] For comprehensive historical accounts of China's role in the Korean War, see Zhang Shuguang's *Mao's Military Romanticism*; Li Xiaobing's *A History of the Modern Chinese Army*, Chapter Three; and Chen Jian, *Mao's China and the Cold War*, Chapter Four. For analysis of the effect of China's role in the Korean War on the PLA modernization debates of that era, see Evan Feigenbaum's *China's Techno-Warriors*, pp. 16-21. For a historical account that integrates the influence of Chinese and American domestic politics on the course of the conflict see Thomas Christensen's *Useful Adversaries*.

[45] Chen Jian, *Mao's China and the Cold War*; Xiaobing Li, *A History of the Modern Chinese Army*, p. 81.

[46] Chen Jian, *Mao's China and the Cold War*, p. 91.

[47] Xiaobing Li, *A History of the Modern Chinese Army*, Chapter Three, "Transformation in Korea."

China's Korean War experience shaped Chinese domestic political debates regarding the role of the military for achieving national strategic goals as it also reflected the confluence of nuclear weapons with the politics of Taiwan reunification with the Chinese mainland. First, the Korean War accelerated the emergence of a debate during the Mao era concerning whether to emphasize military modernization for the PLA.[48] According to Xiaobing Li, fighting against the technologically superior U.S. forces during the Korean War forced some degree of modernization for the PLA, and by the end of the conflict China was procuring more modern weapon systems from the Soviet Union and reorganizing its military organization to increase command efficiency.[49] However, as will be explored later in this chapter, it is clear that China maintained a strong emphasis on People's War strategic principles throughout the Mao era, and extended these principles into China's Great Leap Forward and Cultural Revolution mass mobilization political campaigns.

Further, the Korean War fused the issue of Taiwan reunification with strategic nuclear deterrence for the first time, contributing to China's decision to initiate a nuclear weapons program in 1955. This began with the overall U.S. response to the outbreak of the war, as President Harry Truman sent the U.S. Seventh Fleet into the Taiwan Strait to prevent China from attacking Taiwan.[50] Then, towards the end of the Korean War, Republican presidential candidate Dwight Eisenhower publically discussed using nuclear weapons against China to resolve the Korean War. Later, newly-elected President

[48] This debate centered on the conflict between military reorganization favoring modern weapon systems and organizational specialization versus maintaining People's War principles emphasizing mass mobilization of citizen soldiers throughout Chinese society. This debate will be explored later in this chapter.

[49] Xiaobing Li, *A History of the Modern Chinese Army*, Chapter Three, "Transformation in Korea."

[50] U.S. support of Taiwan is rooted in its support of the Nationalists during China's civil war; upon their eventual retreat to Taiwan, the U.S. continued to support their leadership with economic and military assistance.

Eisenhower again discussed a nuclear strike during a National Security Council meeting as a method for ending the war.[51] Finally, during the 1955 Taiwan Strait Crisis, President Eisenhower explored a nuclear response to Chinese shelling of Taiwanese islands.[52] While it is unknown how credible these general threats were, shortly thereafter China decided to initiate its own nuclear weapons program.[53]

As China began its nuclear weapons program, ongoing domestic political debates regarding the role of the PLA in achieving national goals for the Chinese state would inevitably affect the development of its nuclear weapons program. Mass mobilization campaigns such as the Great Leap Forward were one aspect of this debate that directly affected the path of the program; following is an overview of this movement.

The Great Leap Forward: 1958-1960

The Great Leap Forward marks the first period where technical aspects of nuclear weapon research and development programs combined with People's War politics. During the Great Leap Forward (1958-1960) leading Chinese Party officials and scientists were beginning the planning of the nuclear weapons program's bureaucratic organization and initial construction of many key facilities such as the Lop Nur test site, Jiuquan Atomic City, Northwest Nuclear Research and Design Academy, and the Lanzhou Gaseous Diffusion Facility. These infrastructure projects were materially affected by the politics of the Great Leap Forward and the "three hard years" of shortages

[51] Xiaobing Li, *A History of the Modern Chinese Army*, pp. 145-146.
[52] Xiaobing Li, *A History of the Modern Chinese Army*, pp. 149; see also Chen Jian, *Mao's China and the Cold War*; and Lewis and Xue, *China Builds the Bomb*.
[53] In addition, John Lewis and Xue Litai argue that the U.S. used the threat of nuclear weapons as leverage in diplomacy over the resolution of the Korean War, and that periodic confrontation with the U.S. during the early 1950s formed the context for China's eventual decision to develop their own nuclear capability (John Lewis and Xue Litai, *China Builds the Bomb*, pp. 13-16; 35-39).

(and in some cases, famine) occurring roughly 1959 through 1961. Yet the nuclear program was also affected by the People's War-inspired politics of the Great Leap Forward, especially the sweep of mass mobilization propaganda that encouraged local communities to organize according to military hierarchy and participate *en masse* in aspects of the program that otherwise would have been highly secured and restricted from public access, such as the mass participation in uranium mining in some areas that led to some of China's initial stock of (unprocessed) uranium.

China's Great Leap Forward was economic in nature,[54] and began with a series decisions made during the CCP's Third Plenum of the Eighth Central Committee, held from 20 September to 9 October 1957.[55] After considerable debate, CCP leaders emerged from these meetings having agreed to an economic plan based on militaristic mass-mobilization of workers and farmers to engage in large-scale agricultural and industrial projects[56] with the goal of "leaping ahead" in economic production sometime over the next twelve years: "Within 12 years relevant agricultural enterprises and village areas, in accordance with need and ability, will realize a Great Leap Forward."[57] While the Great Leap Forward was marked by a series of political debates, decisions, and events from 1958 through 1960, the themes of the campaign centered on militarized mass mobilization of people across China to participate in a range of economic activity to include large-scale communal farming, local steel production, public works projects, and

[54]Mobilized labor was considered an untapped resource that could be harnessed – through the proper political mobilization techniques – to effect great increases in economic performance across agricultural and industrial sectors.

[55]Dali Yang, *Calamity and Reform in China*, p. 33.

[56]Dali Yang, *Calamity and Reform in China*, pp. 33-34; Lorenz Luthi, *The Sino-Soviet Split*, pp. 84-88.

[57]"有关农业和农村的各方面的工作在十二年内都按照必要和可能，实现一个巨大的跃" (Central Committee of the Chinese Communist Party Historical Research Office, ed., *Chinese Communist Party Record of Major Historical Events: 1919.5 – 2005.12*, p. 198).

even the mining of uranium for China's nascent nuclear program.

Mass mobilization campaigns directly affected China's nuclear program during the mining of China's initial store of uranium. In John Lewis and Xue Litai's *China Builds the Bomb*, the long process of China's uranium exploration, mining, and processing is well documented. This effort began in earnest in 1955 and was guided by extensive surveying and mapping efforts, geological and industrial expertise, back-breaking mining construction, and the (eventually) dangerous extraction and processing of uranium ore deposits.[58] Yet these efforts proceeded relatively slowly, and with the advent of mass-mobilized public works projects in 1958 as part of the Great Leap Forward, the Second Ministry (in charge of much of China's nuclear weapons program during the 1950s and 1960s)[59] issued a statement encouraging the general populace to engage in uranium mining.[60] Hunan's Bureau of Metallurgy issued a call for a "Great Leap" in the production of metals, to include uranium production; tens of thousands of peasants began prospecting, and some groups received training in exploring and extracting uranium.[61] According to Lewis and Xue, despite the major waste involved in mass mining, these methods yielded approximately 150 tons of uranium and contributed to shortening the process of weapon development.[62]

China Builds the Bomb chronicles how the Great Leap Forward and the "three

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[58]John Lewis and Xue Litai, *China Builds the Bomb*, pp. 73-86. One of the first mines did not become operational until 1960, and even then extraction and processing proceeded slowly.

[59]The Second Ministry oversaw most of the nuclear weapons program's research and development efforts, including mining and metallurgy (John Lewis and Xue Litai, *China Builds the Bomb*, pp. 54-59; page 58 contains an organizational chart for the Second Ministry). It did not oversee China's missile program.

[60]John Lewis and Xue Litai, *China Builds the Bomb*, p. 87.

[61]John Lewis and Xue Litai, *China Builds the Bomb*, pp. 87-88. Much of the local prospecting effort involved strip mining by hand close to the surface.

[62]John Lewis and Xue Litai, *China Builds the Bomb*, p. 88. It is unclear (and perhaps only academic) if this initial extraction of uranium was processed for use in any of China's first weapons.

hard years" materially affected China's nascent nuclear weapons program infrastructure. Encouraged by mass mobilization propaganda, overly zealous workers at various facilities took to improvising during plant construction, leading to some serious accidents and setting back construction time-lines.[63] During the "three hard years" there were shortages in construction materials, and many workers at many of the nuclear program's facilities suffered personal hardships including malnutrition.[64] China's SLBM program ceased for several years as military and political leaders began emphasizing the development of surface-to-surface missile systems over SLBMs and large-scale gravity bomb production.[65] While these material difficulties slowed nuclear weapon research and development, they eventually passed; however, mass mobilization campaigns - such as the "everyone's a soldier" movement - had a lasting effect on Chinese leader's ideas about nuclear weapons and permeated China's nuclear weapons program throughout the Mao era.

The "everyone's a soldier" campaign was part of the broader Great Leap Forward movement. It utilized People's War principles for organizing China's local populations, integrating the model of "workers-peasants-soldiers" throughout Chinese society into the fabric of China's social life.[66] Communes were established in rural areas according to military-style organization, including public mess hall and group housing.[67] Further, People's Militias (*min bing*, or "民兵") emphasized People's War strategies for defense of

[63]John Lewis and Xue Litai, *China Builds the Bomb*, p. 118.
[64]John Lewis and Xue Litai, *China Builds the Bomb*, p. 121-123.
[65]John Lewis and Xue Litai, *China's Strategic Seapower*, p. 132.
[66]Lorenz Luthi, *The Sino-Soviet Split*, p. 87. Luthi describes Mao's appeal to People's War principles as part of the "Yan An myth" and argues that Mao employed aspects of this myth to enhance his status, implying that Mao did not believe aspects of People's War ideology (p. 9).
[67]Lorenz Luthi, *The Sino-Soviet Split*, p. 89.

the mainland emphasizing the role of the local population in repelling foreign invasion.[68] Military exercises were conducted according to People's War principles in China's coastal areas adjacent to the Taiwan Strait, including evacuation planning.[69] During this period the People's War became embedded in the daily life of people across the Chinese nation as it emerged to define China's strategic culture among military and political elites.

During the period of the Great Leap Forward from 1958 to 1960 China's nuclear program became dominated by the period's prevailing People's War strategic culture. As portions of the nuclear program were implemented according to People's War principles, this reflected broader political debates between Maoists and those calling for steady technical modernization of China's PLA. Although the initiation of China's nuclear program was a victory for these moderate technologists, that it became subsumed by the populist People's War strategic culture reflects the overall dominance of Maoists during this period. As we see in the next section, this situation only deepened over time as the failures of the Great Leap Forward extended into the isolation engendered by the Sino-Soviet split.

Critical Juncture: The "Three Hard Years" and The Sino-Soviet Split

1959 to 1961 are referred to in China as the "three hard years" for the economic failures and extreme famines that occurred in each of those years. There is debate about the causes and the true costs of human life during this period, yet it is generally acknowledged that Great Leap Forward economic policies together with extreme weather conditions led to widespread food shortages throughout the country that took the lives of

[68]Luo Ruiqing, "Firmly Establishing the Work of the People's Militia," pp. 1-2.
[69]Lorenz Luthi, *The Sino-Soviet Split*, pp. 86-87; Communist China: Regional Affairs, "Coastal Evacuation Plan,"28 May 1965, eee1, from the Alice Hsieh Files.

tens of millions of Chinese citizens.[70] Economic disruptions resulting from poorly allocated labor and other inputs rippled throughout the country. These human and economic effects were felt by China's nuclear weapons program, delaying in particular the construction of the Lop Nur test site, the Lanzhou Gaseous Diffusion Facility, and the Northwest Nuclear Weapons Research and Design Academy.[71] These domestic problems directly affected the pace of the program's overall development; they were soon followed by a break in relations with the Soviet Union that decisively shaped the program's development path, the "Sino-Soviet Split."[72]

The roots of the Sino-Soviet split began much earlier, and both states contributed to the breakdown of relations. However, of particular focus here is the effect of this event on the development trajectory of China's nuclear weapons program. When Soviet assistance began for China's nuclear program soon after 1955, the Soviet Union trained Chinese scientists, gave plans and materials for building nuclear reactors and uranium enrichment facilities, and even promised a model atomic bomb to China.[73] This assistance provided an essential foundation for the establishment of China's nuclear

[70]Dali Yang cites estimates of this period's famine-related deaths ranging from 15 to 30 million deaths, with estimates varying depending on information sources and mortality statistical accounting methodology (Dali Yang, *Calamity and Reform in China*, pp. 33-34; see also Lorenz Luthi, *The Sino-Soviet Split*, p. 158). Yang argues that Great Leap Forward economic and social policy caused and exacerbated the famines. Lorenz Luthi also assigns most of the blame for the initial food shortages on Maoist Great Leap Forward economic policy (Lorenz Luthi, *The Sino-Soviet Split*, pp. 116-118); he additionally notes other economic consequences such as the shortages in coal that led to shortages and inflation in in other sectors of the economy (Lorenz Luthi, *The Sino-Soviet Split*, p. 118).

[71]Although delays likely plagued all of China's nuclear facilities during this period due to the extreme human and economic problems during this period, Lewis and Xue specifically cite these facilities (John Lewis and Xue Litai, *China Builds the Bomb*, p. 178 (Lop Nur), p. 124 (Lanzhou), p. 143 (Northwest Nuclear Research and Design Academy).

[72]Lorenz Luthi's *The Sino-Soviet Split* offers a detailed historical analysis of this period that identifies ideological dispute as the primary cause of the split between China and the Soviet Union, with Mao's distrust of Khrushchev greatly contributing to this breakdown of relations. For example, Mao challenged Khrushchev policy of engagement with the U.S. as "revisionist," increasingly viewed China as an emerging center of Marxist-Leninist thought, and espoused isolation and self-reliance (pp. 151-152).

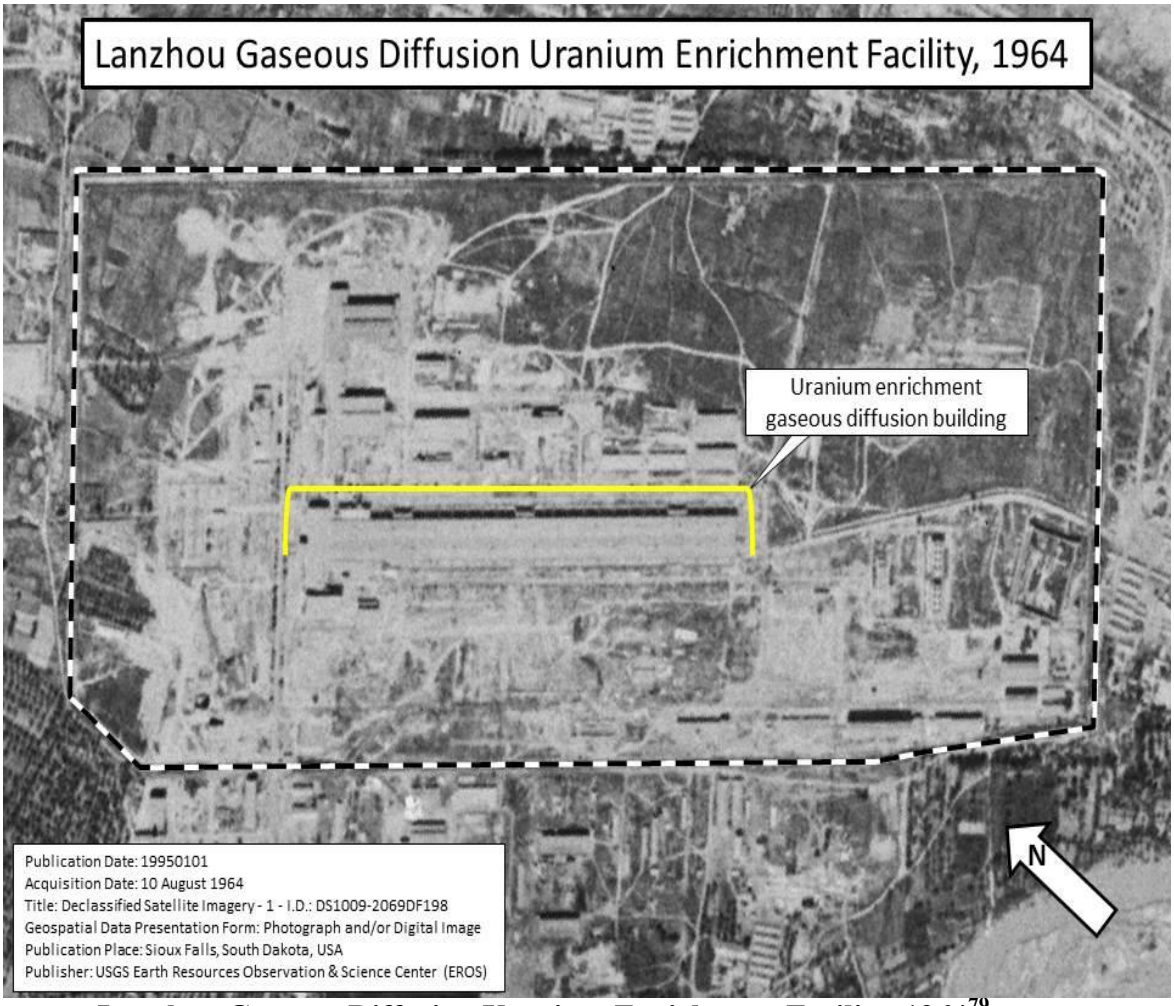
[73] Liu Yanqiong and Liu Jifeng, "Analysis of Soviet Technology Transfer in the Development of Nuclear Weapons," pp. 71-72; John Lewis and Xue Litai, *China Builds the Bomb*, pp. 60-72.

program. However, ideological and diplomatic differences developed between the Soviet Union and China after the death of Stalin in 1953, and the Soviet Union reconsidered this assistance throughout the late 1950s. Then, in June of 1959 Khrushchev formally notified Beijing that it would not deliver a promised prototype nuclear weapon,[74] and in July of 1960 the Soviet Union recalled all advisors and halted material assistance to China - including all assistance to China's nuclear program - culminating this long period of tension and dispute between the two states.[75] Although Soviet aid to the program had slowed during 1958 and 1959, the full withdrawal of assistance seriously threatened the nuclear program at a delicate stage. China was in the process of building its first two fissile material production facilities: the Jiuquan plutonium-producing nuclear reactor and the Lanzhou Gaseous Diffusion Facility. When the Soviets withdrew from China, this left Chinese technicians with partially constructed, Soviet planned facilities filled with an incomplete inventory of disassembled equipment.[76] After comparing the state of these two facilities and the assessing capability of China's technicians to finish construction without further assistance, a strategic choice was made in April of 1960 to first complete the Lanzhou facility, leaving the Jiuquan reactor dormant until 1967.[77]

The Sino-Soviet Split was a critical juncture for China's nuclear program, decisively shaping the technical pathway of China's nuclear weapons program by forcing a reliance on highly enriched uranium that required completion of the Lanzhou Gaseous

[74] John Lewis and Xue Litai, *China Builds the Bomb*, p. 150.
[75] Lorenz Luthi characterizes this as the breakdown of economic relations between China and the Soviet Union (Lorenz Luthi, *The Sino-Soviet Split*, pp. 174-180); see also: Central Committee of the Chinese Communist Party Historical Research Office, ed., *Chinese Communist Party Record of Major Historical Events: 1919.5 – 2005.12*, p. 198; and Chen Jian, *Mao's China and the Cold War*, p. 82.
[76] John Lewis and Xue Litai, *China Builds the Bomb*, pp. 118-125.
[77] John Lewis and Xue Litai, *China Builds the Bomb*, pp. 113-114; International Panel on Fissile Material (IPFM), "Global Fissile Production Report 2010: Balancing the Books: Production and Stocks," p. 103.

Diffusion Facility. After solving myriad problems during an estimated completion delay of nearly two years, the facility began trials of the gaseous diffusion process in 1963 and began full operations by early 1964.[78] (See below graphic)



Lanzhou Gaseous Diffusion Uranium Enrichment Facility, 1964[79]

The Reinforcement of Success: The 1964 Test and the Hydrogen Bomb Strategic Pathway

In October, 1964, China successfully detonated a fission atomic weapon with a

[78] John Lewis and Xue Litai's *China Builds the Bomb* offers a fascinating account of the state of the Lanzhou Gaseous Diffusion Facility in the wake of the Sino-Soviet split (pp. 118-125).

[79] Declassified Satellite Imagery - 1 - I.D.: DS1009-2069DF198, acquired 10 August 1964, published 1 January 1995.

yield of 20 kilotons (KT) employing an implosion-triggered U235 fissile core.[80] The mining and processing of uranium into U235, the machining of this material into a metal core suitable for the specific bomb design, the implosion trigger made of high explosive material with micro-electronic circuitry for precise detonation, the neutron-bombarding initiator, and the fabrication of the remaining bomb components were ultimately completed by China's indigenous scientific and technical engineering workforce across the facilities listed in part one of this chapter.[81] The success of China's first nuclear weapon test was a success of China's indigenous workforce,[82] reifying the tacit knowledge accumulated in the years of research and development leading up to the October 1964 test.[83] This reinforced China's technical paradigm governing the production of nuclear weapons and further proved the viability of China's nuclear weapon production infrastructure.[84]

China's technical paradigm favored prototype weapon development over scaled-up mass production of fission weapons. It is thus not surprising that even before China's successful 1964 test of its first atomic fission weapon, weapon "596,"[85] Chinese leaders

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[80] *Communist China's Advanced Weapons Program*, Special National Intelligence Estimate 13-2-1965, (Director of Central Intelligence, 27 January 1965), p. 1; John Lewis and Xue Litai, *China Builds the Bomb*, pp. 150-160; 244.

[81] John Lewis and Xue Litai's *China Builds the Bomb* details each of these aspects of the building of China's first nuclear weapon; my understanding of this process is drawn from their work.

[82] Liu Yanqiong and Liu Jifeng, "Analysis of Soviet Technology Transfer in the Development of Nuclear Weapons," pp. 101-104.

[83] "Tacit knowledge" refers to knowledge that exists between people that is not written but rather passed through interpersonal communication (Donald Mackenzie and Graham Spinardi's "Tacit Knowledge, Weapons Design, and the Uninvention of Nuclear Weapons").

[84] Borrowing from Thomas Kuhn, Giovanni Dosi uses the phrase "technical paradigm" to describe the patterns of learning and knowledge inheritance among technical knowledge communities in his article "Sources, Procedures, and Microeconomic Effects of Innovation."

[85] The lead design team developing China's first atomic weapon at the Northwest Nuclear Weapons Research and Design Academy named the weapon "596" after the official date Moscow informed China it would not deliver a prototype nuclear weapon (John Lewis and Xue Litai, *China Builds the Bomb*, p. 150).

decided to develop a thermonuclear hydrogen weapon.[86] Soon after the designers of the 596 weapon completed their work in 1963, they were instructed to continue working on a thermonuclear weapon design.[87] Many of the necessary materials required for a thermonuclear weapon were already being produced for atomic fission weapons, including the requisite fissionable material at the Lanzhou Gaseous Diffusion Facility. In terms of research and development, Lewis and Xue describe how designing weapon 596 was more difficult than the subsequent shift into thermonuclear weapon design:

> "One reason it was so much easier to build the thermonuclear weapon than a fission one was that a staff with the basic scientific and technical expertise had already been assembled and had gone through the experience of building a nuclear weapon."[88]

Working according to their established research and development technical paradigm, Chinese scientists and engineers used their accumulated tacit knowledge to plan a thermonuclear weapon. Because China's technical paradigm favored research and development, China's scientific and engineering cadre was more experienced at developing prototype weapon systems, and China's production infrastructure favored prototype weapon development over industrial mass-production of nuclear weapons, it was therefore easier for China's nascent nuclear industry to follow the thermonuclear weapon prototype pathway of development.

Aside from the weight that the research and development trajectory of China's

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[86] In a fusion reaction, isotopes of hydrogen are brought together at a high speed such that they fuse together, usually releasing greater energy than a pure fission reaction. This process requires fission first, the process of which may then be weaponized in such a fashion so as to produce a subsequent fusion reaction.

[87] Chinese scientists and leaders agreed to develop the more complicated multistage fission-fusion-fission weapon design because of the higher explosive yield (John Lewis and Xue Litai, *China Builds the Bomb*, p. 198).

[88] John Lewis and Xue Litai, *China Builds the Bomb*, p. 199. This quote reflects the importance of tacit knowledge during the development of technical programs.

nuclear weapon industry exerted on decision-making, at a deeper level there was the continuation of a basic strategic assumption undergirding China's decision in the early 1960s to proceed with developing a much more powerful thermonuclear weapon. The detonation of a thermonuclear weapon was perceived to carry great symbolic meaning, and simply demonstrating a thermonuclear capability was thought to have strategic deterrence value.[89] Against prevailing nuclear weapon strategic formulations and the ongoing arms race between the U.S. and the Soviet Union during the Cold War, China considered the successful demonstration of nuclear capability by itself to be a sufficient nuclear deterrent.

The "Third Line" Defense Industry Reorganization and the Cultural Revolution

In 1965 China neglected its nuclear weapons program in favor of the Third Line defense reorganization program (1964-1971) and the Cultural Revolution (1965-1975). This section introduces both of these historical episodes as two distinct campaigns that overlapped, were mutually influential, and deeply affected China's nuclear weapons program in ways that reinforced the program's constrained development trajectory. The Third Line was a strategic industrial reorganization plan assigned national priority from 1964 to 1971.[90] The Cultural Revolution was a nation-wide mass-mobilization political campaign aimed at smashing China's political and educational system of class differentiation; the campaign directly interfered with China's nuclear program and seriously retarded overall scientific development within China through the death of Mao

[89] John Lewis and Xue Litai, *China Builds the Bomb*, p. 197.

[90] Barry Naughton uses the phrase "Third Front," and uses 1965-1971 as his time-frame for the program (Barry Naughton, "The Third Front: Defense Industrialization in the Chinese Interior"). Although the Third Line was reduced in priority after 1971, some Third Line projects were continued afterward until their completion.

in 1976. Following is an overview of each campaign, with highlights of how they affected the development of China's nuclear weapons program.

The Third Line

Simultaneous to the preparations to test China's first nuclear weapon, in 1964 Mao and his supporters argued separately for a massive geographic reorganization of defense industries into China's interior provinces, conceptualized according to People's War concepts as China's "strategic rear region," to provide a separate industrial system to sustain the PLA in the event of war.[91] The strategic rationale of the Third Line was based on People's War principles that established geography, distance, and decentralized redundancy as China's main defensive bulwark against attack, including nuclear attack. This plan called for shifting much of China's heavy industry, to include military industry, to remotes areas in the interior of the country according to the guiding principle of "decentralization, closeness to the mountains, and concealment."[92] According to official CCP history, during a CCP working group meeting in Beijing between May and June 1964 Mao proposed formally dividing China into three strategic regions[93] with the goal of developing heavy industry in the third, inner-most region as a defense against military aggression to include nuclear war:

> "Mao Zedong argued that, given the estimated emergence of serious threats relating to a new world war, it is not appropriate to not have a consolidated rear

[91] John Lewis and Xue Litai, *China's Strategic Seapower*, p. 89; Barry Naughton, "The Third Front: Defense Industrialization in the Chinese Interior," p. 354; Evan Feigenbaum, *China's Techno-Warriors*, p. 98; 274, fn 51.
[92] John Lewis and Xue Litai, *China's Strategic Seapower*, p. 91.
[93] Barry Naughton describes the idea of three strategic regions as originating earlier in the decade, and cites a speech by Lin Biao in 1962 as one of the first "public" (in China) mentions of this concept (Barry Naughton, "The Third Front: Defense Industrialization in the Chinese Interior," p. 352).

> position. He thus directed splitting the country into three lines delineating strategic areas, and argued that in order to establish the most important Third Line, it was necessary to first take initial investments and build up steel and iron bases linked to transportation, coal, and electricity access."[94]

Dispersing the development of transportation, coal mining, electricity generation, steel production, machine building, and arms production to China's inner-most areas of the country created a separate industrial system from China's coastal region that would theoretically protect against coastal invasion, air attacks on China's infrastructure, and a general nuclear attack.[95] In the event of any all-out war (including any nuclear component), the PLA would "trade space for time" and pull an invading force into a protracted struggle on China's mainland, wherein the Third Line would continue to provide production of energy, key industrial inputs, and finished military products to ensure China's survival and continued resistance against aggression. This strategy would theoretically hold against a land invasion to China's north and west as well, although Third Line strategy refers mainly to coastal invasions. (See below graphic)

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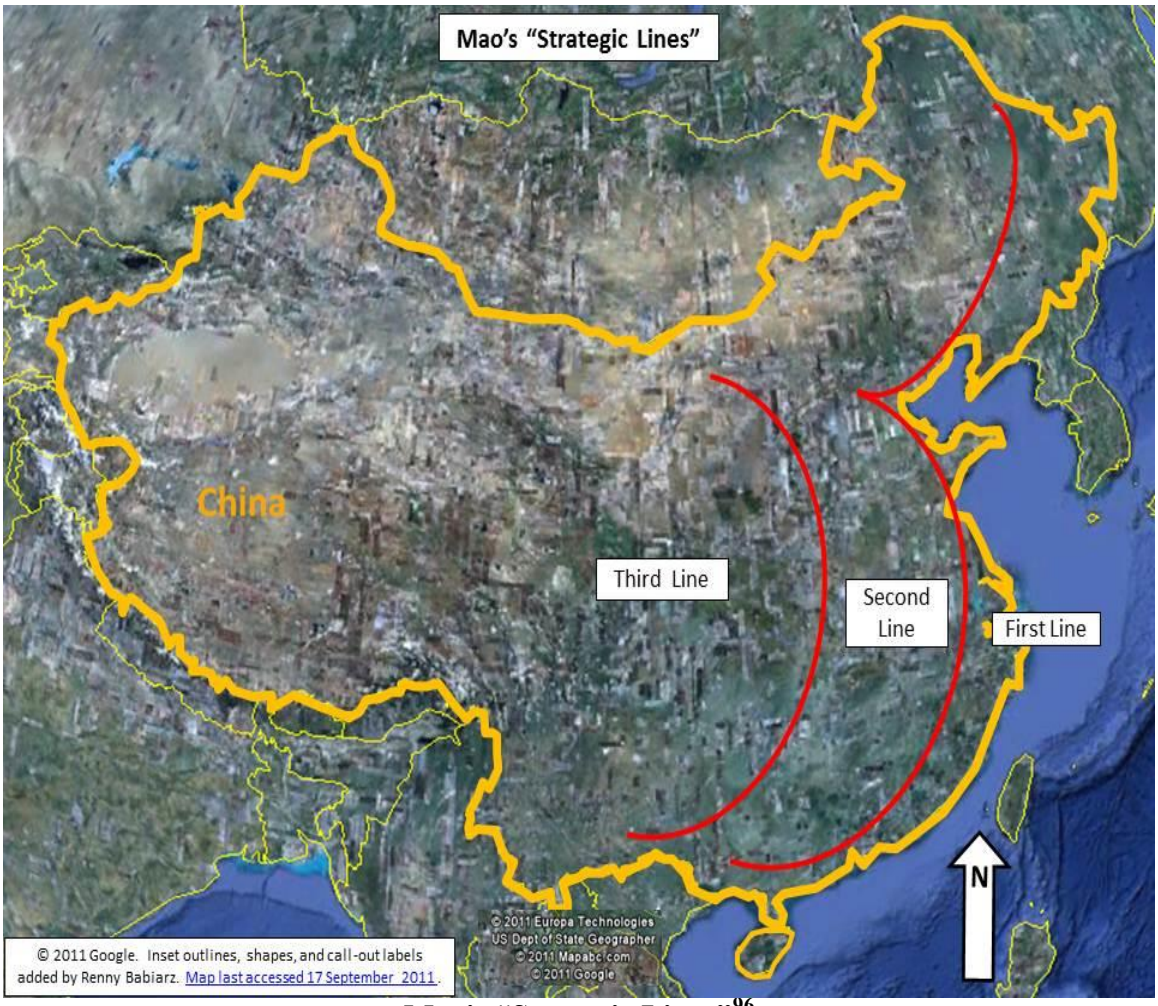
[94]"...毛泽东又从存在着新的世界战争的严重危险的估计出发指出，在原子弹时期，没有后方不行。他提出把全国划分为一，二，三线的战略布局，要下决心高三线建设，首先把攀枝花钢铁基地以及于联系的交通，煤，电建设起来." Central Committee of the Chinese Communist Party Historical Research Office, ed., *Chinese Communist Party Record of Major Historical Events: 1919.5 – 2005.12*, p. 231.

[95]John Lewis and Xue Litai, *China's Strategic Seapower*, p. 88-92; Barry Naughton, "The Third Front: Defense Industrialization in the Chinese Interior," p. 352-358.



Mao's "Strategic Lines"[96]

The scale of the Third Line was staggering. Thousands of kilometers of rail-lines were built linking cities among interior provinces. Massive steel production facilities were constructed on unforgiving terrain, the largest named *Panzhihua* in mountainous Sichuan province. Electricity generation plants, chemical production facilities, petroleum storage and processing facilities, military hardware factories, and all types of manufacturing facilities were built across the remote interior provinces of

[96] All Google Maps and Google Earth products are referenced according to Google Fair Use policy (http://maps.google.com/support/bin/static.py?page=ts.cs&ts=1342531). Approximate location of the Three Lines extracted from John Lewis and Xue Litai, *China's Strategic Seapower*, and Barry Naughton, "The Third Front: Defense Industrialization in the Chinese Interior."

Sichuan, Shaanxi, Guizhou, Yunnan, Gansu, Henan, Qinghai, Hunan, Hubei, and Ningxia in three phases of investment between 1965 and 1971.[97] Approximately 1.6 million workers were mobilized *en masse* into China's interior regions, organized by military management procedures in the style of People's Militias and employed according to various mass mobilization techniques including "human wave" labor methods.[98] (See below graphic)

[97]John Lewis and Xue Litai, *China's Strategic Seapower*, p. 88; Barry Naughton, "The Third Front: Defense Industrialization in the Chinese Interior," p. 354. Information for this section is drawn from these two sources.

[98]Barry Naughton, "The Third Front: Defense Industrialization in the Chinese Interior," p. 355; John Lewis and Xue Litai, *China's Strategic Seapower*, p. 91-92.

China's Third Line Defense Industry Reorganization, 1965-1975[99]

The estimated financial scale of the Third Line was breathtaking, and far more money was spent on the Third Line than was invested in the establishment of China's nuclear weapons program between 1955 and 1964. Lewis and Xue estimate China's nuclear program cost about 10-12 billion Yuan between 1955 and 1964, a figure that

[99] All Google Maps and Google Earth products are referenced according to Google Fair Use policy (http://maps.google.com/support/bin/static.py?page=ts.cs&ts=1342531). Approximate location of Third Line investment phases from: Barry Naughton, "The Third Front: Defense Industrialization in the Chinese Interior," p. 354 (Figure 1: Third Front Regions).

represents about 37% of 1957's entire state budget.[100] On the other hand, many more tens of billions of Yuan were poured into the Third Line. In 1988 Barry Naughton estimated that investment for the Third Line totaled approximately 140 billion Yuan, ranging from 35-50% of China's national annual budget *every year* between 1965 and 1971.[101] In their 1994 book *China's Strategic Seapower*, Lewis and Xue estimated total spending for Third Line projects at 200 billion Yuan, about 43% of total national spending.[102] Others estimate that while 50% of China's national expenditures were planned to be allocated to the Third Front during this period, actual costs approached 80% of available funds.[103] At the same time, according to CIA intelligence reports from 1974-1975, China's procurement of missile delivery systems plummeted and investment in nuclear warhead production also probably slowed during the early 1970s,[104] another indication that China was favoring investment in the People's War-guided Third Line military industrial reorganization rather than nuclear weapon systems.

Imagery analysis of the Lanzhou Gaseous Diffusion Facility during the height of the Third Line campaign supports the thesis that the overwhelming focus of China's military strategy from 1965 through at least 1971 was the creation of an alternative industrial production system in remote areas of China (i.e. the Third Line), not expansion of nuclear weapons production capacity. Historical imagery analysis of the Lanzhou Gaseous Diffusion Facility in 1965, 1966, and 1968 – during some of the most intense

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[100] John Lewis and Litai Xue, *China Builds the Bomb*, pp. 107-108.

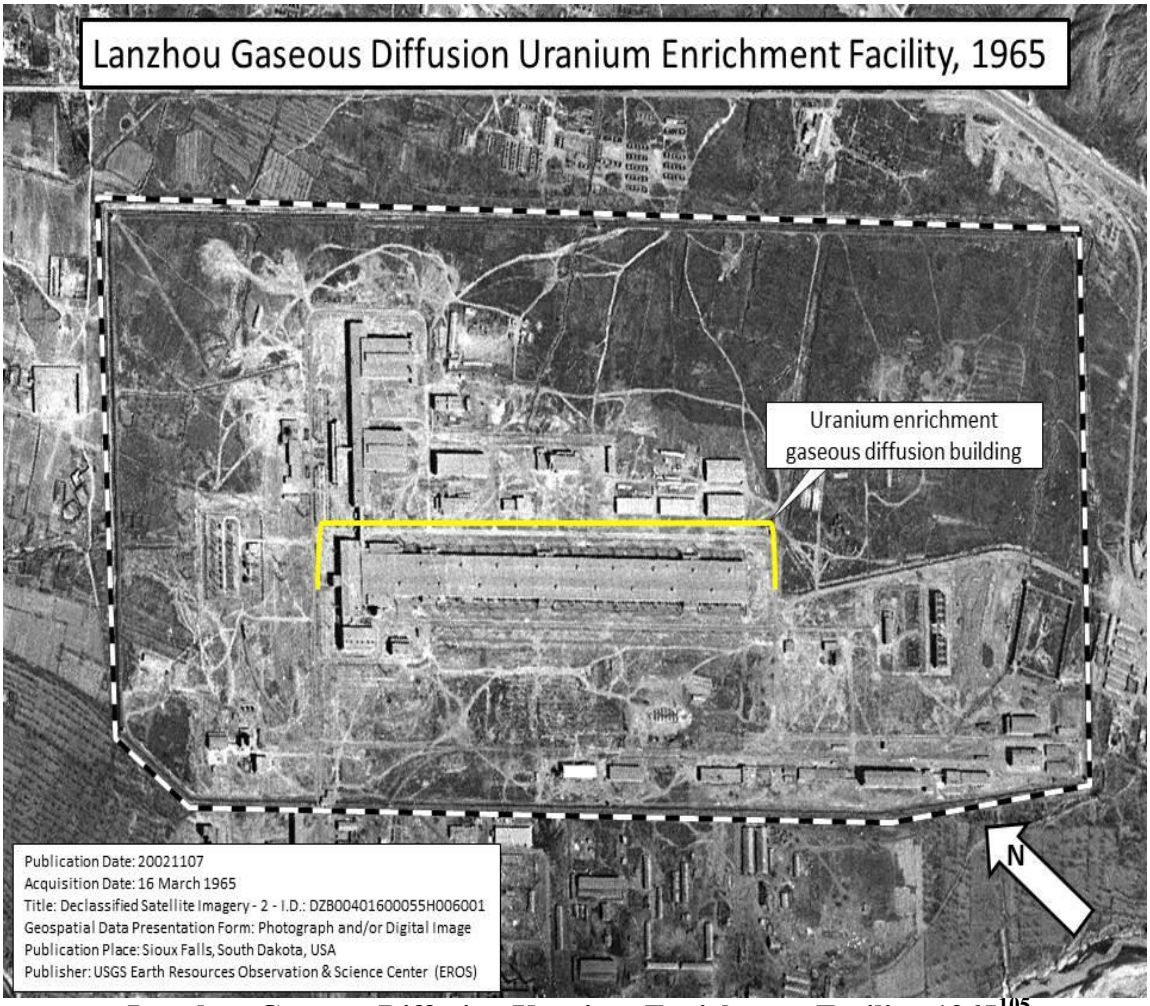
[101] Naughton's estimates were based on based on statistics published in China in the mid-1980s that were incomplete at the time (Barry Naughton, "The Third Front: Defense Industrialization in the Chinese Interior," p. 379).

[102] John Lewis and Xue Litai, *China's Strategic Seapower*, p. 93.

[103] John Frankenstein and Bates Gill, "Current and Future Challenges Facing Chinese Defense Industries," p. 403.

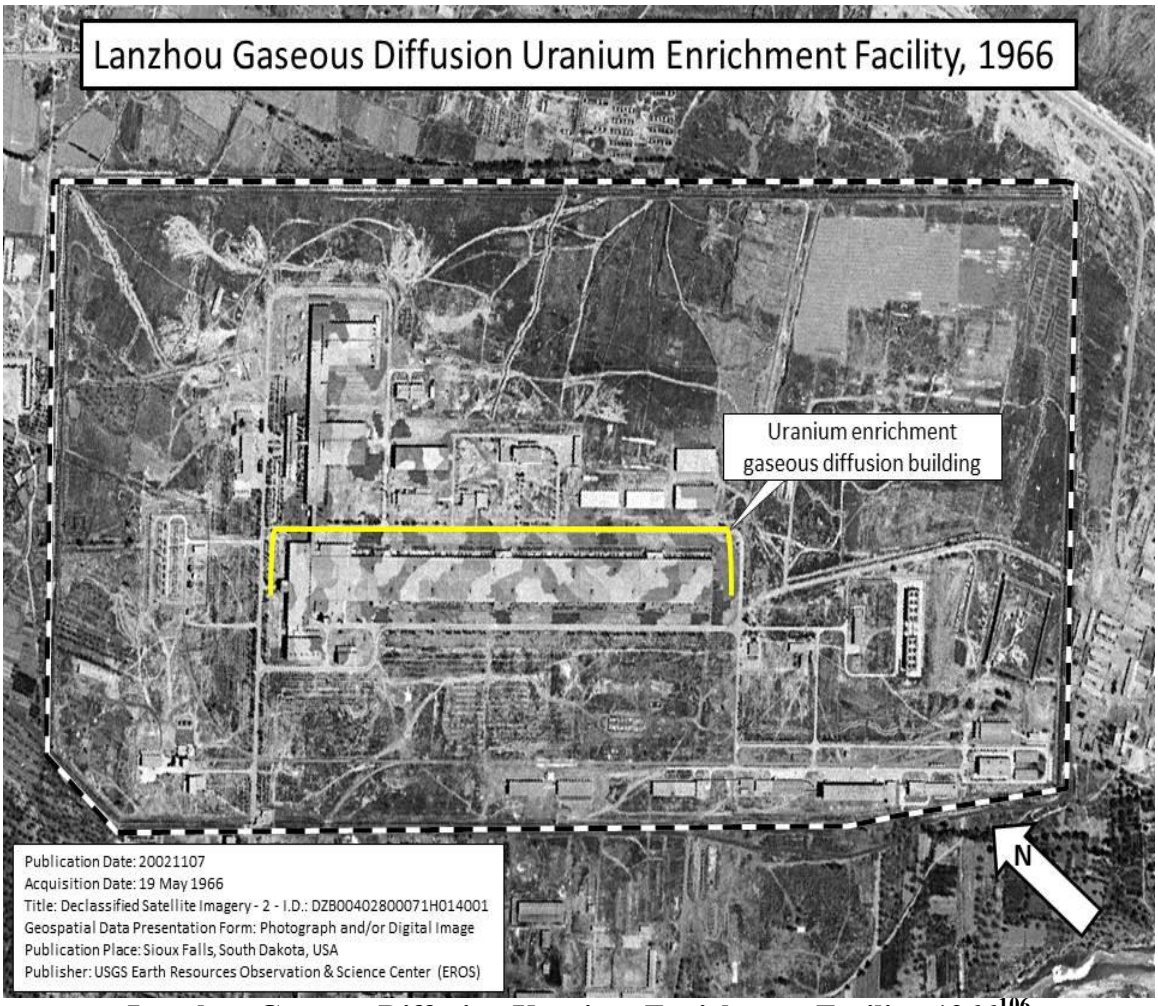
[104] *Military Developments in China*, Intelligence Report (Central Intelligence Agency, Directorate of Intelligence, March 1975), p. 6-8; see also *China's Strategic Attack Programs*, National Intelligence Estimate 13-8-74 (Director of Central Intelligence, 16 July 1974), p. 3.

periods of Third Line investment and construction activity - shows that the Lanzhou facility remains unchanged during the height of the Third Line campaign. The facility's boundaries remained the same, the gaseous diffusion building was not expanded, and no other buildings were added within the facility's boundaries. (See below graphics)



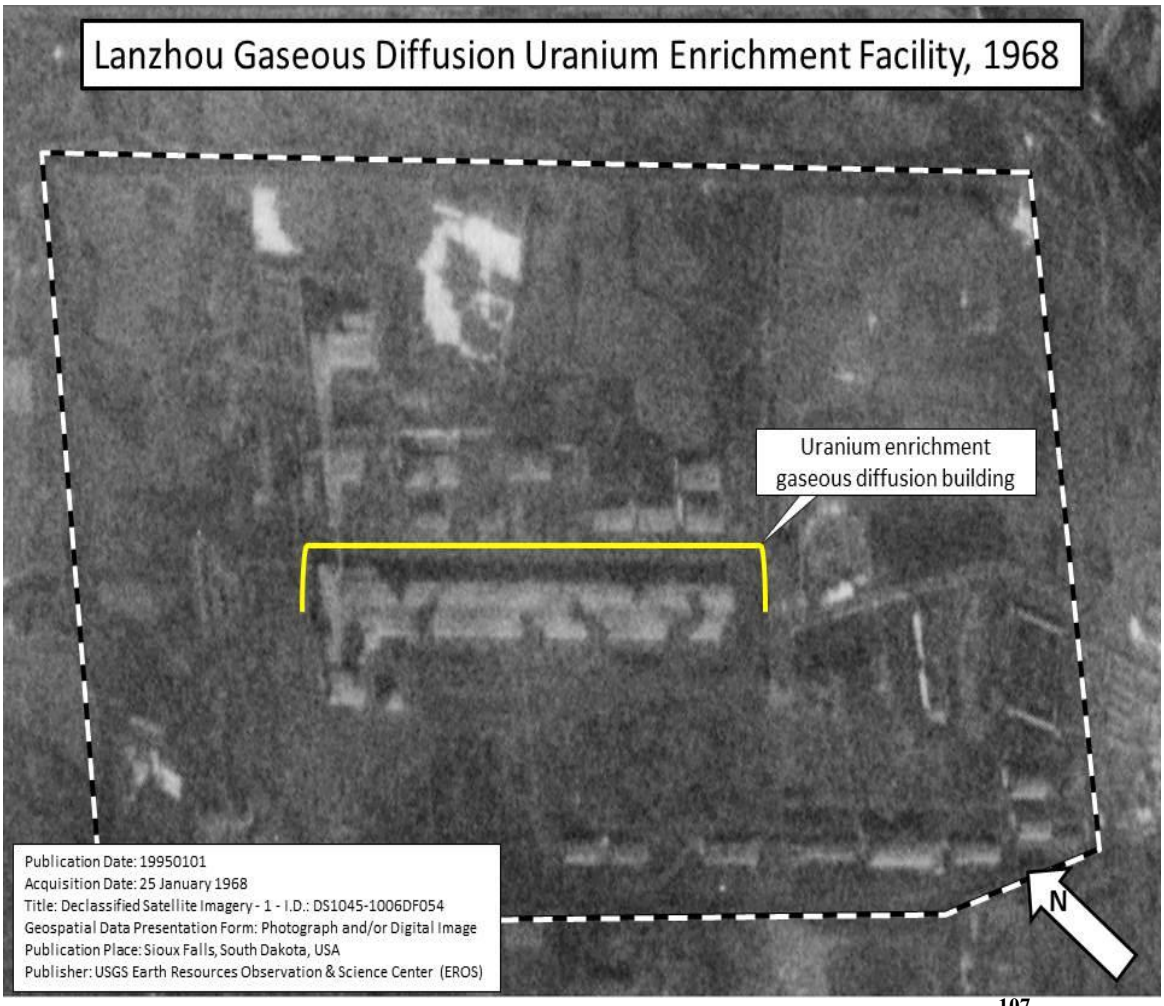
Lanzhou Gaseous Diffusion Uranium Enrichment Facility, 1965[105]

[105] Declassified Satellite Imagery - 2 - I.D.: DZB00401600055H006001, acquired 16 March 1965, published 7 November 2002.



Lanzhou Gaseous Diffusion Uranium Enrichment Facility, 1966[106]

[106] Declassified Satellite Imagery - 2 - I.D.: DZB00402800071H014001, acquired 19 May 1966, published 7 November 2002.



Lanzhou Gaseous Diffusion Uranium Enrichment Facility, 1968[107]

The Cultural Revolution, Sino-Soviet Border Clashes, and the Soviet Nuclear Strike Threat of 1969-1970

As the Third Line was gaining momentum, The Great Proletarian Cultural Revolution was a political storm brewing in Beijing that initiated People's War-inspired mass mobilization movements throughout China. The Cultural Revolution is another

[107] Declassified Satellite Imagery - 1 - I.D.: DS1045-1006DF054, acquired 25 January 1968, published 1 January 1995.

important example of how Mao's vision of the People's War defined China's overall strategic culture, and further demonstrates China's commitment to mass-mobilization politics over the dictates of strategic nuclear deterrence during the Mao era. The Cultural Revolution (CR) was a top-down, urban centered, mass-mobilized revolutionary movement initiated and led primarily by Mao Zedong and a coterie of ultra-leftist Party leaders. The main goals of this movement included damaging or destroying the Chinese government administrative bureaucracy in order to do away with political and intellectual classes, purifying Communist ideology by encouraging radical leftist Communist political views while publicly punishing moderate politicians and ideas, and strengthening Mao's political power within the Chinese state by creating a new political order out of university students called "Red Guards" whose purpose it was to support Mao while carrying out his People's War-inspired revolutionary visions.[108] The Cultural Revolution serves as the clearest example of a national commitment to mass mobilization political movements based on People's War principles during the Mao era.

The CR is commonly divided into two phases: an extraordinarily destructive active phase from 1966-1969 and the more passive phase of 1970-1976. During the active phase of the Cultural Revolution the Chinese state was barely able to function as a state, either internally[109] or externally.[110] Leaders at every level of China's political

[108] Studies of this period of history generally touch on three main rationales for why Mao began the Cultural Revolution: Soviet "revisionism;" Mao's own personal power decline within the Party; and the purity of Chinese Communist Party ideology. See the following sources for more detailed accounts of Cultural Revolution politics: Huang Jing, *Factionalism in Chinese Communist Politics*; Harry Harding, "The Chinese State in Crisis, 1966-9," in Roderick MacFarquhar, ed., *The Politics of China: 1949-1989;* Roderick MacFarquhar and Michael Schoenhals, *Mao's Last Revolution*; Roderick MacFarquhar, *The Origins of the Cultural Revolution*; Yan Jiaqi, KaoKao, Gao Gao, Danny Wynn Ye Kwok, *Turbulent Decade: A History of the Cultural Revolution*.

[109] Internally, during the active phase of the Cultural Revolution (1966-1969) the central Party leadership at times lost control of major urban areas and struggled to find reliable PLA military units to quell the anarchy. While anarchy had spread through most major urban areas by mid to late 1967, the most

system were persecuted by their subordinates, resulting in widespread anarchy throughout urban areas. In a reflection of the anti-intellectual spirit of the movement, universities were closed throughout China, severely limiting China's scientific and technical workforce development. China's Foreign Ministry building was overrun and occupied by self-proclaimed "revolutionaries," resulting in the severance of China's communication with other states. Mao moved to stabilize China's situation in 1969, and the administration of China's foreign ministry was restored to foreign affairs professionals as Mao moved to stabilize the state's foreign relations, thus beginning the passive phase of the Cultural Revolution. Yet despite this restoration of a modicum of order Mao continued certain CR policies through the year of his death in 1976, and Cultural Revolution ideology remained in official use throughout the 1970s to develop economic policy, determine certain bureaucratic administration methods, and reinforce Mao's "People's War" principle of military organization for economic production.

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striking example of this occurred in the major transportation hub of Wuhan, where rival Red Guard units waged pitched military-style battles across the city resulting in ultra-leftist Red Guard units seizing control of major government installations. See Thomas Robinson, "The Wuhan Incident: Local Strife and Provincial Rebellion during the Cultural Revolution," for a full account of the Wuhan incident. Although Wuhan remains a particularly extreme example of domestic anarchy during the active phase of the CR, various levels of anarchy prevailed in many urban areas throughout this period, including Shanghai, Guangzhou, and many other cities (see MacFarquhar and Fairbanks, eds., *The Cambridge History of China, Volume 15, The People's Republic Part 2*, and MacFarquhar and Schoenhals, *Mao's Last Revolution*).

[110] In terms of external relations, the Cultural Revolution severely compromised China's ability to function as a state vis-a-vis other states in the international system. For example, in early 1967 Red Guard groups seized power in China's foreign ministry; Foreign Minister Chen Yi was temporarily ousted from power; and Red Guards began using the foreign ministry to send revolutionary messages to foreign governments (MacFarquhar and Fairbanks, eds., *The Cambridge History of China, Volume 15, The People's Republic Part 2*, pp. 236-237; MacFarquhar and Schoenals, *Mao's Last Revolution*, pp. 228-229). By the end of 1968 China was almost completely isolated diplomatically, there were almost no state instruments left intact to implement a foreign policy (even if Beijing had developed one), and there was concern among China's leadership that other countries might take advantage of China's internal disorder to invade; contributing to this sentiment among the CCP leadership was a marked increase in the frequency and severity of border clashes with the Soviet Union, including a major clashes in Xinjiang in China's western region and at Zhenbao Island along China's northeastern border. (MacFarquhar and Fairbanks, eds., *The Cambridge History of China, Volume 15, The People's Republic Part 2*, pp. 248-249; MacFarquhar and Schoenhals, *Mao's Last Revolution*, pp. 312-313).

The active phase of the CR disrupted both ongoing nuclear weapon development and Third Line investment. Mao's CR propaganda was debated by staff at nuclear facilities across China, delaying test deadlines and threatening to ground the nuclear program. The CR directly interfered with the development of China's first hydrogen bomb in 1966 when a Red Guard faction arrived at the Lop Nur Nuclear Weapon Test Base to confront military units there; they were subsequently arrested in an effort by base commanders to maintain order within China's strategic weapons program, although political conflict continued at the Lop Nor base throughout 1966 and 1967.[111] In 1968, Red Guard organizations attacked the (newly resurrected) SLBM program research academy, killing one of the leading experts in charge of the JL-1 program; CR politics continued to disrupt the program into the 1970s, periodically delaying and even scuttling JL-1 ejection tests.[112] Third Line work also slowed in late 1966 until 1969, when Sino-Soviet border clashes reignited Mao's fears of invasion and a second phase of Third Line investment was undertaken.[113]

China and the Soviet Union engaged in periodic border clashes in China's northwest Xinjiang and northeast Heilongjiang areas throughout the 1960s; these increased in frequency and severity during the Cultural Revolution, culminating in 1969 with the Chenbao island incident that resulted in over 800 Chinese casualties.[114] This incident transformed relatively minor border skirmishes into a full-scale confrontation

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[111] John Lewis and Xue Litai, *China Builds the Bomb*, pp. 202-206.
[112] John Lewis and Xue Litai, *China's Strategic Seapower*, pp. 146-147.
[113] John Lewis and Xue Litai, *China's Strategic Seapower*, p. 92.
[114] Roderick MacFarquhar and John Fairbank, *The Cambridge History of China: Volume 15, Part 2: Revolutions within the Chinese Revolution, 1966-1982*, pp. 254-261. For detailed reviews of the Sino-Soviet border conflicts in 1969, see John Lewis and Xue Litai, *Imagined Enemies*, pp. 48-55; Roderick MacFarquhar and Michael Schoenhals, *Mao's Last Revolution*, Chapter 18, "War Scares;" Roderick MacFarquhar and John Fairbank, *The Cambridge History of China: Volume 15, Part 2: Revolutions within the Chinese Revolution, 1966-1982*, pp. 254-275, and Lyle Goldstein, "Return to Zhenbao Island: Who Started Shooting and Why it Matters."

between Moscow and Beijing, and during 1969 through 1970 China was mobilizing for general war with the Soviet Union. During this period, Chinese leaders perceived that the Soviet Union threatened China with a nuclear first strike.[115] This caused the issuance of the highest possible nuclear alert for the first and only tine in the history of the PRC, wherein China's limited nuclear arsenal remained on "immediate launch" alert status and China's military and political leadership periodically lived in nuclear blast shelters through mid-1970.[116]

Fear of Soviet invasion and even nuclear attack caused China to re-establish its defensive, geographically focused policy of defense industry reorganization rather than increase nuclear weapon production capacity. As the excesses of the Cultural Revolution were brought under control, from 1969 through 1971 China again heavily invested in developing a complete industrial sector in China's interior region according to Third Line planning. In terms of nuclear planning, industrial survivability was emphasized over mass production of nuclear weapons. Construction began on two new fissile material production facilities during this period[117] that were intended as a strategic redundancy for China's nuclear weapons program, but otherwise China's fissile material production capacity remained unchanged.[118] This is supported by imagery analysis of the Lanzhou Gaseous Diffusion Facility during this period that shows the gaseous diffusion building did not expand, the facility's boundaries remained the same, and it is

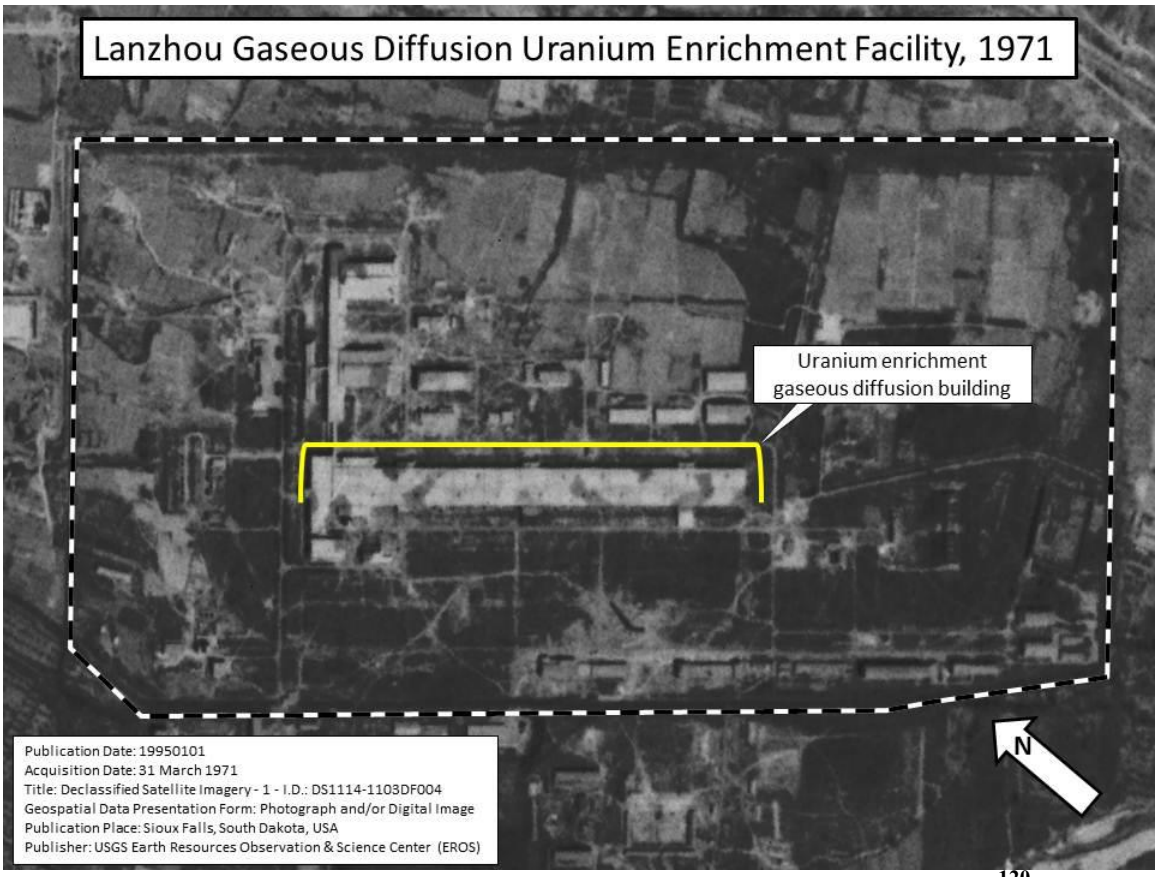
[115] John Lewis and Xue Litai, *Imagined Enemies*, pp. 63-68. Lewis and Xue note that Russian historians disagree about whether a formal nuclear threat was expressed, but the authors employ a variety of authoritative Chinese sources to support this claim.

[116] John Lewis and Xue Litai, *Imagined Enemies*, pp. 63-68.

[117] These were the Guangyuan plutonium production reactor and the Heping gaseous Diffusion Facility. [See Figure One.]

[118] These facilities did not begin operation until the very end of the Mao era, and they did not appreciably expand China's fissile material production capability; additionally, China's Lanzhou HEU production facility remained unchanged during this period.

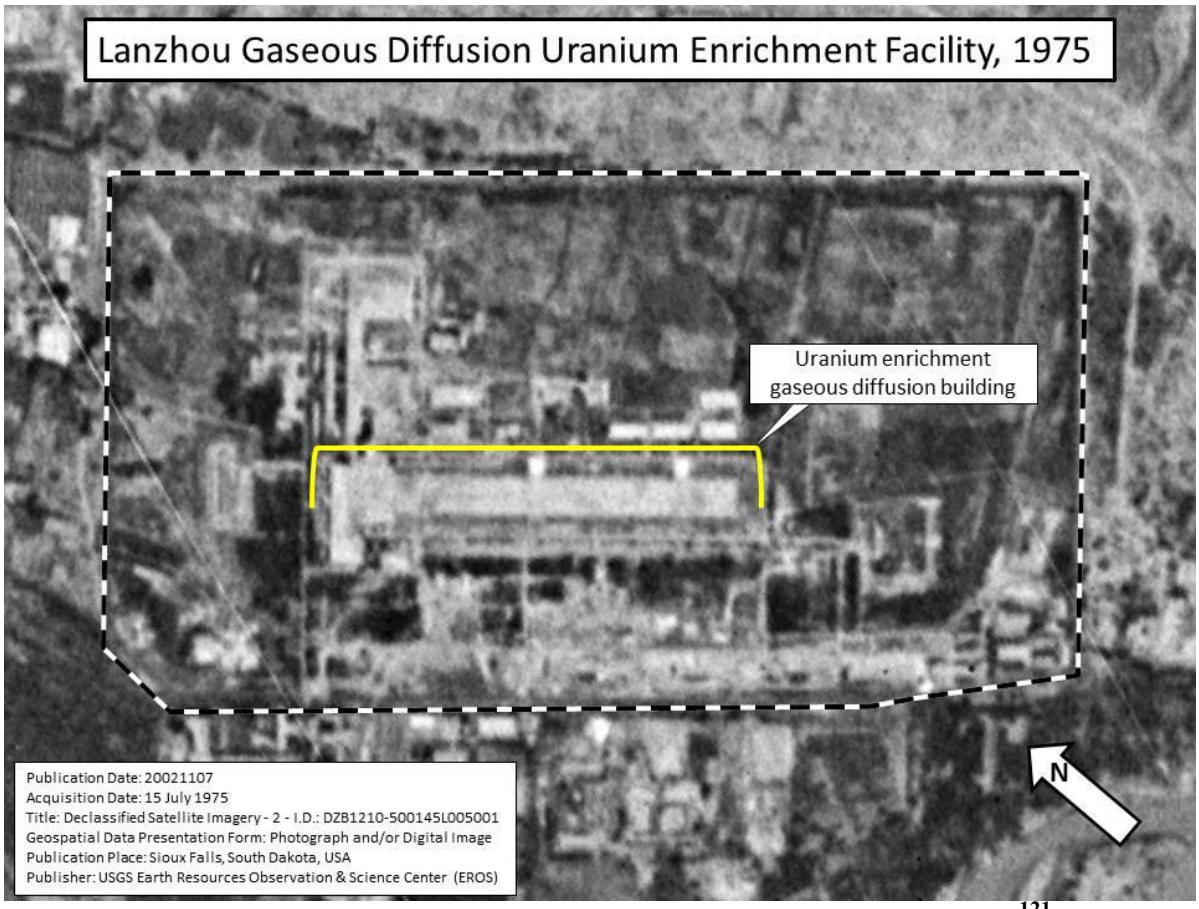
likely that no other buildings were added within these boundaries.[119] (See below graphics)



Lanzhou Gaseous Diffusion Uranium Enrichment Facility, 1971[120]

[119] *Communist China's Weapons Program for Strategic Attack*, National Intelligence Estimate 13-8-71 (Director of Central Intelligence, 28 October 1971), p. 12. This report asserts China had "ample" fissile material and aimed to develop a large nuclear weapon stockpile; however there is little evidence supporting this assertion.

[120] Declassified Satellite Imagery - 1 - I.D.: DS1114-1103DF004, acquired 31 March 1971, published 1 January 1995.



Lanzhou Gaseous Diffusion Uranium Enrichment Facility, 1975[121]

Conclusion

This section has shown how the timing of certain historical events affected the development of China's nuclear weapons program, and shown that China's primary fissile material production facility did not expand throughout the Mao era despite the various political pressures of the Cold War, to include the threat of a Soviet nuclear strike in 1969. Why did China not develop a strategic nuclear deterrent to compete with the US or the Soviet Union during the Mao era? In the next section I argue that China's

[121] Declassified Satellite Imagery - 2 - I.D.: DZB1210-500145L005001, acquired 15 July 1975, published 7 November 2002.

prevailing strategic culture at the time, i.e. the "People's War," constrained the initial scope and subsequent development of China's nuclear weapons program. The next section details this strategic culture explanation.

Part Three: People's War and Nuclear Weapons

Introduction

This section explains *why* China's nuclear weapon force remained small during the Mao era, arguing that China's People's War-based strategic culture was incommensurate with strategic nuclear deterrence concepts and that this ultimately constrained the development of its nuclear weapons program. To advance this argument, the following section begins by establishing that "the People's War" did in fact exist as a dominant military-political philosophy during the Mao era. Then, this section contrasts People's War ideas with other, more conventional military doctrines of the period by chronicling the rise of People's War within circles of military strategic thought during the Mao era. Last, this section compares People's War with nuclear deterrence ideas of the period, showing how it was incommensurable with notions of strategic nuclear deterrence concepts.

People's War: A Conceptualization

Historically, the phrase "People's War" denotes a set of political-military ideas that emerged among Chinese Communist Party (CCP) military leaders during China's civil war period during the 1930s and 1940s. Early in China's civil war, the CCP was a decentralized political party with an extremely limited industrial base fighting better

equipped and more centrally organized military forces. During this period, while Mao Zedong emerged as the foremost political and military leader of the CCP, *de facto* leadership of CCP forces was based locally, and there developed approaches to fighting that combined military strategy with local political governance. These political-military strategies became intertwined as the CCP progressed toward victory in the late 1940s and later became known as the People's War doctrine.[122]

The People's War doctrine is a political blueprint for inferior military forces to defeat larger and better-equipped forces. A properly organized political party could propagate political ideas within a rural area or "base," draw support that could be developed into a fighting force, and then proceed through phases of military conflict and political development to overthrow a more powerful conventional military force and seize political power in a given area.[123] Through proper political organization and discipline, this "people's army" would engage in a protracted war of "attrition and annihilation" wherein guerrilla forces work with local populations for support against the enemy.[124] Strategically, political mobilization often entailed local redistribution of

[122]Lorenz Luthi, *The Sino-Soviet Split*, pp. 25-26. Luthi cites the 1930s, and especially the CCP's shared experience of the Long March in 1935, as that period wherein Mao gained prominence within the CCP and there developed what Luthi refers to as a "mythology" of the People's War. Luthi argues that, due to various material circumstances after the 1930s, the CCP did not *militarily* employ People's War principles during either the CCPs resistance against the Japanese during the early 1940s or during the civil war resolution against the KMT from 1945-1949. Lorenz thus labels People's War ideas as "myths" that were promoted by Mao for politically self-serving purposes throughout his reign, especially during the Great Leap Forward and the Cultural Revolution. Unfortunately, Luthi's characterization of the People's War as self-serving mythology contradicts his early assertion that the members of the CCP genuinely believed the ideology they promulgated (page 9), undercuts his overall thesis that genuine ideological differences between the Soviet Union and China caused the Sino-Soviet split, and altogether ignores the political dimension of People's War principles.

[123]Ralph Powell, "Maoist Military Doctrines," p. 250; Morton Halperin, "Chinese Attitudes toward the Use and Control of Nuclear Weapons," pp. 137-138; see also Alice Hsieh, "Communist China and Nuclear Force," especially pp. 161-162; Alice Hsieh, *Communist China's Strategy in the Nuclear Era*, pp. 9-14; Arthur Huck, *The Security of China*, pp. 53-61; Zhang Shuguang, *Mao's Military Romanticism*, Chapter Two.

[124] Ralph Powell, "Maoist Military Doctrines," p. 250-252.

social and economic power in exchange for ideological support;[125] tactically, mobilized forces would live off the land, engage in combat in favorable situations, withdraw during unfavorable circumstances, and trade land for time to continue the political mobilization of local populations.[126] Weapon technology was important, but human willpower was paramount; reliance on technology to win wars was considered foolhardy, and instead proper political organization and mass mobilization was seen as key to any strategic victory.[127] Intellectual and technical expertise was de-emphasized (and even distrusted) in favor of mass involvement and enfranchisement within a political movement.[128]

These People's War principles emerged to define China's strategic culture by the early 1960s, addressing each of the key aspects of strategic culture as previously defined: that warfare and conflict are permanent features of the human experience; a variety of states, to include the U.S. and the Soviet Union, seek to use "modern weapons" to threaten China; and that manpower and ideological commitment are most important factors in preparing and waging warfare in order to mitigate these threats and enhance

[125]Tang Tsou makes this point as part of broader reflections on mass mobilization politics of the Mao era, wherein he compares the CCP's expansion of socioeconomic enfranchisement of China's poorest classes with class-coalition state-making efforts in the West (Tang Tsou, *The Cultural Revolution and Post-Mao Reforms*, pp. 276-277).

[126] Ralph Powell, "Maoist Military Doctrines," pp. 251-252. See also 毛泽东选集第二卷, pp. 439-518, for Mao's discussion of these strategies and tactics in the context of the war of resistance against Japan; dated from 1938, this writing does not highlight the phrase "People's War" but does describe many of the political conditions and military tactics later ascribed to the People's War doctrine.

[127]Academy of Military Science, "My Military's Combat Regulations are a Product of Mao Zedong's Military Thought," pp. 7-8; for secondary source interpretations of these themes, see Ralph Powell, "Maoist Military Doctrines," p. 251; and Morton Halperin, "Chinese Attitudes toward the Use and Control of Nuclear Weapons," pp. 137-138.

[128]Mao's general distrust of intellectuals was clearly exhibited through his creation of such political campaigns as the Anti-Rightist Campaign of 1956 and the Great Proletarian Cultural Revolution of 1966-1976. See also: Lowell Dittmer, *China's Continuous Revolution: The Post-Liberation Epoch, 1941-1981*, p. 33; Richard Solomon, *Mao's Revolution and the Chinese Political Culture*, p. 271. For a comparative study of the treatment of industrial elites in Maoist China, see Constance Squires Meaney, *Stability and the Industrial Elite in China and the Soviet Union*.

China's security.[129] Following is an overview of how this People's War strategic culture emerged from several alternatives to dominate China's national security-related decision-making during the Mao era.

People's War Development and Implementation

Mao's People's War doctrine developed into China's strategic culture in contraposition with other, more conventional military doctrines during China's civil war as part of a debate concerning the military utility of People's War principles for national defense strategy and the political-economic efficacy of using the military to implement mass political campaigns. This debate revolved around Maoist ideas of expanding the role of the PLA into Chinese social and political spheres according to People's War principles versus professionalization of the PLA through increased specialization and incorporation of improved military technology,[130] themes that were constantly in tension in both military and political circles throughout the Mao era despite the eventual domination of People's War principles.[131] People's War principles were not always applied in a tactical military environment; for example, Lorenz Luthi asserts that during China's civil war CCP military forces periodically used conventional military tactics to attack, siege, and pursue the KMT, especially during the resolution of the war from 1945

[129] Ralph Powell offers an overview of this perspective in his article "Maoist Military Doctrines;" see also Sun Xiangli, "An Analysis of China's Nuclear Strategy Nature and Characteristics," p. 28.

[130] John Gittings, "China's Militia," p. 107.

[131] The following sources describe aspects of this debate: Alice Hsieh, *Communist China's Strategy in the Nuclear Era*, pp. 34-49; Arthur Huck, *The Security of China*, p. 57; Ralph Powell, "Maoist Military Doctrine," p. 256; Evan Feigenbaum, *China's Techno-Warriors*, pp. 21-31 (Feigenbaum outlines these debates from the perspective of Chinese "technocrats" pushing for modernization reforms within the military); Li Xiaobing, *A History of the Modern Chinese Army*, pp. 177-178; John Lewis and Xue Litai, *China Builds the Bomb*, p. 127.

through 1949.[132] These tactics required a degree of specialization and hierarchical command structure within the CCP's fighting forces, somewhat at odds with the tenor of People's War strategic principles stressing egalitarian mobilization of the masses.[133] Even after the civil war, some leaders believed that People's War strategies were outmoded; for example, Peng Dehui was a clear proponent of professionalizing China's armed forces and improving conventional military weapon technology, ideas that were especially salient after China's experiences during the Korean War.[134] Politically, after resolution of the civil war Maoists sought to implement People's War principles within Chinese society to mobilize participation in socioeconomic development programs. Yet this sparked a debate about the role of the PLA in Chinese society and the use of mass mobilization politics as a spur for economic development. For example, Deng Xiaoping sought to stabilize China's sociopolitical environment through reducing mass mobilization campaigns, limiting the role of the military in Chinese society, and encouraging some market-oriented economic (re)construction of the state.[135] Indeed, the early period of the People's Republic of China was dominated by debates concerning the role of People's War ideology in military, political, and economic development.

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[132]Lorenz Luthi, *The Sino-Soviet Split*, p. 25-26.

[133]Nevertheless, the CCP continued their political strategy of land redistribution and encouragement of local populations to rebel against the KMT throughout the final phases of the civil war, in accord with People's War strategic principles (Xiaobing Li, *A History of the Modern Chinese Army*, p. 74).

[134] During the Korean War, a People's War strategy was not always applicable since Chinese forces were fighting in unfamiliar territory and were under pressure for a quick victory. Even in victory the PLA suffered tremendous losses at the hands of a smaller, better equipped, and more organized U.S. military force. Additionally, to some extent People's War principles and conventional military modernization programs were combined; for example, China's military did become increasingly specialized with more access to improved military technology in the wake of the Korean War even as People's Militias continued their development throughout the country. For example, Li Xiaobing argues that the Korean War ushered in an era of reform for the PLA, transforming it into a more professional and better equipped fighting force despite ongoing elite debates between proponents of People's War versus military modernization (Li Xiaobing's *A History of the Modern Chinese Army*).

[135]Evan Feigenbaum, *China's Techno-Warriors*, p. 15; see also Alice Hsieh, *Communist China's Strategy in the Mao Era*, especially pp. 41-42, for debates about economic construction and military modernization.

Ultimately, Mao's vision of the People's War developed from these debates concerning the role of the military in China's political and social spheres, and by the early 1960s it had emerged as the dominant strategy guiding China's political-military development, defining China's strategic culture during the Mao era.[136] The eventual dominance of People's War strategic culture can be observed through the adoption of People's War principles within Chinese military strategy and socio-political culture, according to military documents and academic cultural studies of Mao-era Chinese society. Militarily, by 1961 the People's Army and the People's War were characterized in *Bulletin of Activities* as the foundation of Chairman Mao's military strategy.[137] Politically, aspects of People's War strategy became integrated with governing principles as Mao sought to continue the political-ideological aspects of China's revolution within Chinese society, a process that some scholars have termed "continuous revolution."[138] This involved using public criticism meetings to deepen politicization of the "masses,"

[136]Arthur Huck, *The Security of China*, pp. 60-61; Ralph Powell, "Maoist Military Doctrines," pp. 239-240. People's War principles were eventually coupled with a strategic nuclear deterrent, although domestic political mobilization against the threat of foreign invasion developed into the primary focus of China's mainland defense strategies. In particular, Powell describes China's post-1949 defense doctrines as Maoist in nature, and separates inwardly focused homeland defense doctrines incorporating People's War principles and nuclear deterrence from outwardly focused doctrines concerning the spread of revolutionary movements worldwide. See also: Academy of Military Science, "My Military's Combat Regulations are a Product of Mao Zedong's Military Thought."

[137]"The People's Army and the People's War are starting points of Chairman Mao's military line" ("人民军队，人民战争是毛主席军事战线的根本出发点..." (Academy of Military Science, "My Military's Combat Regulations are a Product of Mao Zedong's Military Thought." p. 7). See also Chester Cheng, ed., *The Politics of the Chinese Red Army*, p. 731.

[138]For more on the continuous revolution interpretation as applied to Mao-era domestic politics, see Richard Solomon, *Mao's Revolution and the Chinese Political Culture*; Lowell Dittmer, *China's Continuous Revolution: The Post-Liberation Epoch, 1941-1981*; and Lorenz M. Luthi, *The Sino-Soviet Split.* (Luthi implies that the "continuous revolution" concept is an actual policy implemented by the Party through Mao in the late 1950s as a prelude to the Great Leap Forward, but this is the only source I have read that states "continuous revolution" was a concrete policy.) For extensions of this argument into China's Mao-era foreign policy, see Chen Jian's *Mao's China and the Cold War* and Thomas Christensen's *Useful Adversaries*.

especially in rural areas;[139] the use of mass mobilized political movements to hasten implementation of national development projects such as the Great Leap Forward, as opposed to an "engineering" approach of steady, controlled development;[140] and the expansion of "People's Militias" across China as both defense strategy against national invasion and an organizational method for local economic development.[141]

In particular, one of the clearest indications of the emergence of People's War as strategic culture during the Mao era was through the widespread mobilization of Chinese citizens into militarily organized social units called "People's Militias." The People's Militia was one aspect of Mao's People's War strategy that was implemented nationwide during the "everyone's a soldier" campaign in the early stages of the Great Leap Forward in 1958.[142] The *Min Bing* campaign was defined as the creation of local militias throughout China using military organizational methods to mobilize local citizenry for engaging in political campaigns and economic projects, which in turn extended the influence of the PLA into the local economic sphere.[143] Another aspect of the *Min Bing*

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[139]For example, Richard Solomon describes CCP use of "speaking bitterness" campaigns during both the civil war and post-1949 reconstruction as a political mobilization tool (Solomon, *Mao's Revolution and the Chinese Political Culture*, p. 196). Solomon describes this campaign as fostering inter-personal conflict in accordance with Mao's views that conflict and tension were essential for political and social development within a socialist system.

[140]Lowell Dittmer frames internal CCP political debates in terms of struggles among leaders between Maoist "storming" and more moderate "engineering" approaches (Dittmer, *China's Continuous Revolution: The Post-Liberation Epoch, 1941-1981*, Chapter One, especially p. 6). See also Richard Solomon, *Mao's Revolution and the Chinese Political Culture*, especially page 271.

[141] Ralph Powell, "Maoist Military Doctrines," p. 243; Richard Solomon, *Mao's Revolution and the Chinese Political Culture*, pp. 341-342; Arthur Huck, *The Security of China*, p. 59; Lorenz M. Luthi, *The Sino-Soviet Split*, pp. 86-87.

[142]John Gittings, "China's Militia," p. 103. Gittings explains that People's Militias were also established during the civil war period as a political-military mobilization method in some select localities, but it was only during 1958 that this became a nationwide campaign. For a village-level account of political campaigns that include the 1958 "Everyone's A Soldier" movement, see Edward Freidman, et al.'s *Chinese Village, Socialist State*, Chapter 9, "A Life and Death Struggle," (especially page 219) describing militaristic mobilization of peasantry for domestic political-economic aims at the beginning of the Great Leap Forward.

[143]Richard Solomon, *Mao's Revolution and the Chinese Political Culture,* pp. 341-342.

during this period was to prepare local citizenry to resist and deter foreign invasion,[144] supporting Mao's vision of national defense as founded on politically motivated masses over the vision of China's military as professionalized with more access to military technology. Indeed, the implementation of the "Everyone's a Soldier" campaign appears to have culminated debates among military elites concerning the future of the PLA and the role of the military in Chinese politics.[145]

Even after the well documented failures of the Great Leap Forward, the *Min Bing* campaign continued through the 1960s, albeit in a moderated form. According to *Bulletin of Activities*, the *Min Bing* campaign was continued throughout China as a practical implementation of People's War principles. In an article authored by the PLA's Chief of Staff Luo Ruiqing, PLA commanders were encouraged to continue the work of the *Min Bing*, defining it as a "strategic issue," "the foundation of the People's War," and a vital force protecting the shores of the nation from invasion:

> "Chairman Mao...views People's Militias as a strategic issue," "People's Militias are the foundation of the People's War," "My country's coastline is more than 10,000 kilometers long, and coastal defense depends upon the masses, People's Militias, public security, and the regular army integrating as four areas of strength."[146]

The article goes on to make explicit the link between military and politics in Mao-era China, explaining that the *Min Bing* system is a concrete implementation of Socialism according to China's particular local circumstances and further links *Min Bing* to

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[144]John Gittings, "China's Militia," p. 105; John Lewis and Xue Litai, *China's Strategic Seapower*, p. 97.
[145]John Gittings, "China's Militia," pp. 107-108.
[146]"毛主席...把民兵看成一个战略问题," "民兵是人民战争的基础," "我国海岸线有一万多公里长，沿海防御依靠群众，民兵，公安部门和正规军四个力量的结合..." (Luo Ruiqing, "Firmly Establishing the Work of the People's Militia," p. 1). For a comparative translation, see Chester Cheng, ed., *The Politics of the Chinese Red Army*, p. 559.

economic production methods.[147]

In terms of elite national security decision-making, the clearest example that Mao's vision of the People's War defined China's strategic culture is the Third Line campaign that began in 1965; it serves as a policy example of how the dominance of People's War strategic culture directly shaped China's national security decision-making during the Mao era. Why did the People's War emerge to dominate China's strategic culture during the Mao era? An answer can be found in an even earlier military-political debate concerning the strategic value of nuclear weapon technology versus political mobilization methods for prosecuting military campaigns. As the next section details, this debate began in 1945 with the explosion of atomic weapons over Japanese cities and continued periodically throughout the Mao-era.

Incommensurability: Nuclear Weapons and the People's War

Even before the end of World War Two, as Communist forces in China continued their revolutionary movement against the Nationalist forces, Chinese Communist Party (CCP) leaders faced a stern test of their People's War strategic outlook. When the U.S. dropped atomic bombs on Hiroshima and Nagasaki in 1945, news traveled to the CCP revolutionary base in Yanan, creating an existential debate concerning the future of China's revolutionary doctrine wherein a politically organized people's army mobilizing according to a People's War strategy could defeat a larger and more technologically advanced military force.[148] The creation of a new, devastatingly powerful weapon

[147]Luo Ruiqing, "Firmly Establishing the Work of the People's Militia," pp. 3-4.

[148]This debate centered on the relationship between advanced military technology and politically motivated mass mobilized revolutionary movements (Morton Halperin, "Chinese Attitudes toward the Use and Control of Nuclear Weapons;" see also Mark Ryan, *Chinese Attitudes Towards Nuclear Weapons*,

caused questions among military leaders about the long-term efficacy of a People's War revolutionary doctrine; could a politically organized, People's War mobilized military force be defeated by this new weapon?[149] This debate was existential because Mao and his followers had cast People's War strategy as being based on objective laws of political and military history, and atomic weapons represented new evidence that arguably reflected a change in these laws. Thus, at stake in this debate was the continuation of China's revolution and the ideological relevance of Mao's People's War strategy.

As a result of this debate, Mao developed an initial response to the invention of nuclear weapons that reflected – and reinforced - his understanding of the People's War strategy's historical development during China's civil war. Mao argued that despite the atomic bomb's awesome destructive power, people remained the most important element of warfare, and thus a properly organized and politically motivated fighting force could still defeat an opponent armed with nuclear weapons.[150] This perspective is famously reflected in statements such as the following from Mao's interview with Anna Louise Strong:

> "The birth of the atom bomb...was the beginning of the death of the American imperialists. For they began to count on the bomb and not on the people. In the end, the bomb will not destroy the people. The people will destroy the bomb."[151]

Chapter 1; Alice Hsieh, *Communist China's Strategy in the Nuclear Era*, pp. 1-2; Hsieh's brief account of Mao's early reaction to nuclear weapons does not include reference to debates between Chinese leaders concerning the effect of nuclear weapon technology on China's People's War strategic principles).

[149]Mark Ryan, *Chinese Attitudes Towards Nuclear Weapons*, pp. 13-23; Morton Halperin, "Chinese Attitudes toward the Use and Control of Nuclear Weapons," pp. 137-139. As Mark Ryan notes, Halperin offers no citations for his description of the debate that took place in the caves of Yanan.

[150]Morton Halperin, "Chinese Attitudes toward the Use and Control of Nuclear Weapons," pp. 139-140.

[151]Quoted from Mark Ryan, *Chinese Attitudes Towards Nuclear Weapons*, p. 17. See also Alice Hsieh, *Communist China's Strategy in the Nuclear Era*, p. 2.

And this quote, apparently from Mao's later recollection of this same interview:

> "The atom bomb is a paper tiger [yi zhi zhi laohu] with which the U.S. reactionaries try to terrify the people. It looks terrible but in fact is not. Of course, the atom bomb is a weapon of mass destruction [da guimo tusha de wuqi], but the outcome of war is decided by the people, not by one or two new weapons."[152]

Mao had concluded that atomic bombs were antithetical to the principles of his People's War revolutionary strategy, establishing the incommensurability of these perspectives.[153] Whereas nuclear weapons fit into the well-established doctrine of strategic bombardment for U.S. military planners,[154] for Mao in 1945 nuclear weapons were just another advanced technology that could be overcome through properly mobilized human willpower.[155] In 1949 Mao's strategic vision was "proven" correct as the CCP defeated the Nationalists to win China's decades-long civil war;[156] however, Mao's views on nuclear weapons would change with China's periodic confrontations with the U.S. during

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[152]Quoted from Mark Ryan, *Chinese Attitudes Towards Nuclear Weapons*, p. 17. See also John Lewis and Xue Litai, *China Builds the Bomb*, pp. 6-7.

[153]Alice Hsieh suggests that the CCP adopted this perspective out of necessity to boost internal morale while working to develop a "modest" nuclear capability (Alice Hsieh, "Communist China and Nuclear Force," in Richard Rosecrance, ed., *The Dispersion of Nuclear Weapons*, pp. 168-169). Alternatively, I argue that People's War principles were incommensurable with the dictates of strategic nuclear deterrence and fundamentally constrained the development of China's nuclear weapons program during the Mao era.

[154]For more on the relationship between strategic aerial bombardment in WWII and the first nuclear weapons, see Lawrence Freedman, *The Evolution of Nuclear Strategy*, especially pp. 21-23.

[155]See Harry Gelber, "Nuclear Weapons and Chinese Policy," p. 18 for another interpretation of Mao's "man over weaponry" People's War philosophy.

[156]Yet another way of viewing Mao's initial reaction to nuclear weapons is to consider the effects of historical differences in material context on the development of military strategic doctrine. China's civil war was not the same "total war" experience of the U.S. during WWII in part because the Communists had a very limited industrial base with which to produce military equipment, and access to the latest military technology favored the Nationalists. In particular, the Communists had almost no air force, had limited access to motorized vehicles, weapons, and ammunition, and periodically relied on pure manpower for transportation of resources. Given these material conditions, instead of relying on new technology and mass industrialization of military equipment to prosecute their revolutionary goals, the CCP developed a "People's War" strategy emphasizing the use of Communist ideology to mobilize local populations for support while explicitly downplaying the importance of technology for achieving the political goals of seizing and maintaining state power.

the early 1950s, and in 1955 Chinese leaders decided to create their own nuclear weapons program with assistance from the Soviet Union.

Yet the decision to begin a nuclear weapons program did not entail fully accepting nuclear weapons into China's military strategy or doctrines, and debates between military modernization versus the dominance of People's War strategic culture unfolded throughout the establishment of China's nuclear weapons program.[157] Mao eventually won these debates, and the resulting dominance of China's People's War strategic culture limited the development of China's nuclear doctrine throughout the reign of Mao Zedong.[158] This is not to say that China did not understand the basic implications of nuclear weapons on strategic formulations; as early as 1955 Chinese military leaders were openly discussing some strategic aspects of nuclear weapons. For example, in 1955 Peng Dehuai discussed the possibility of a nuclear "sudden attack" against China, and in 1957 PLA chief of General Staff Su Yu seemed to acknowledge the potentially devastating effects of a nuclear first strike against China.[159] Later, a 1961 editorial in the secret *Bulletin of Activities* acknowledged U.S. Kennedy administration nuclear policy shifts in some detail, characterized this shift in terms of an overall expansion of U.S. nuclear forces, and asserted that the U.S. sought to expand its influence in the Pacific while waiting for an opportune time to wage a nuclear and conventional war

[157]Alice Hsieh details debates among China's military leaders during the 1950s revolving around the strategic significance of nuclear weapons within China's overall military strategy, although she perhaps over-emphasizes the modernization side of this debate (Alice Hsieh, *Communist China's Strategy in the Nuclear Era*, Chapter Two). See also John Lewis and Xue Litai, *China Builds the Bomb*, p. 127.

[158]Ralph Powell briefly asserts a similar point in his article "Maoist Military Doctrines" (p. 240); see also John Lewis and Xue Litai, *China Builds the Bomb*, pp. 65-72; 190-196; and John Lewis and Xue Litai, *Imagined Enemies*, p. 207.

[159]Alice Hsieh, *Communist China's Strategy in the Nuclear Era*, pp. 37 (Peng Dehuai reference) and 66 (Su Yu reference); see also Alice Hsieh, "Communist China and Nuclear Force," pp. 165-167.

against socialist countries.[160] Thus it seems clear that Chinese military leaders acknowledged some of the potential "first strike" strategic aspects of nuclear weapons, followed U.S. nuclear policy and nuclear weapon expansion, and interpreted U.S. foreign policy as expansionist and threatening to socialist countries (including China).

Despite the acknowledgment of an essential aspect of nuclear strategy and an assessment of the U.S. as a nuclear-armed rival threatening China's national security, the People's War doctrine emerged from military and CCP leadership debates as China's dominant political-military strategy, ultimately subsuming ideas about nuclear deterrence and creating "People's War nuclear deterrence". According to an article in *Bulletin of Activities* by the Military Science Academy concerning PLA military doctrines, at a strategic level "the people" were considered the most important aspect of warfare and would defeat foes relying on materialism (i.e. high technology weaponry).[161] This carried into campaign and tactical level discussion of national defense; it was asserted that the People's Militia's would combine with regular military forces to fight aggression[162] and People's War tactics such as night fighting and close quarters combat could lessen the effects of nuclear attacks against China:

> "Close-quarters combat and night fighting are my army's specialty, and in past conflicts were an essential factor in enabling my army to defeat technologically superior foes from an inferior position; under modern conditions, night fighting and close-quarters combat are not only important methods for annihilating the enemy, but also can to a great degree reduce the losses incurred by the enemy's

[160]"America's New President Kennedy's Speech on Expanding the Military and Preparing for War," pp. 30-33.

[161]Academy of Military Science, "My Military's Combat Regulations are a Product of Mao Zedong's Military Thought," pp. 7-8. While mastering new weaponry was cited as important, this philosophical emphasis on people and human willpower over weaponry and technology identifies the PLA strategy and tactics discussed in this article as belonging to the People's War category.

[162]Academy of Military Science, "My Military's Combat Regulations are a Product of Mao Zedong's Military Thought," p. 7.

> use of atomic weapons, and can more easily bring into play my army's close-quarters combat military power." [163]

Maoist military leaders had come to a consensus that use of nuclear weapons against China would be combined with a conventional military invasion, and that the People's War doctrine continued to be the best strategy for protecting China's mainland defense against foreign occupation.[164]

Even by 1970, Mao still was neither committed to building many nuclear weapons nor preparing for their use, despite his overall strategic assessment that another great power induced world war was indeed possible. According to the Chinese scholar Sun Xiangli, in 1970 Mao stated: "The possibility exists that great powers will start a world war, and just because (they) have a few nuclear bombs, everyone does not dare to make a first move."[165] This statement reveals both that Mao considered the threat of world war as a possibility – true to China's overall strategic culture during the Mao era - and that only a small number of nuclear weapons was sufficient for deterring major war not just for China, but for all great powers. Sun Xiangli quotes Mao as further stating: "Our country may in the future produce a small number of atomic bombs, but will not prepare

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[163]"如指出近战，夜战是我军的特长，是我军再过去的战斗中能以劣势技术装备战胜优势技术装备的敌人的一个重要因素；在现代条件下夜战，近战不仅仍是歼敌的重要手段，而且还可以大量地减少敌人原子武器的损害，更便于发挥我军的近战威力" (Academy of Military Science, "My Military's Combat Regulations are a Product of Mao Zedong's Military Thought," p. 10; for a comparative translation, see Chester Cheng, ed., *The Politics of the Chinese Red Army*, p. 732). Interestingly, in this section there is also mention of defending against atomic, chemical, and biological attack (for reference to this section, see Alice Hsieh, "Communist China's Evolving Military Strategy and Doctrine," p. 51).

[164]Harry Gelber, "Nuclear Weapons and Chinese Policy," pp. 17-18; Alice Hsieh, *Communist China's Strategy in the Nuclear Era*, Chapter Two, especially pp. 66-67; Ralph Powell, "Maoist Military Doctrines," p. 244. Alice Hsieh in particular details debates about threat perceptions in relation to China's Five Year Plan budgeting of the mid-1950s. According to Hsieh, although many military leaders favored investments in new military technology and expanded conventional military hardware, most ultimately settled on a bifurcated strategy of nuclear strategic deterrence and People's War defense of the mainland.

[165] Sun Xiangli, "An Analysis of China's Nuclear Strategy Nature and Characteristics," p. 28.

for their use…we will use them as defensive weapons," implying that China viewed a small number of nuclear weapons as sufficient for achieving strategic deterrence.[166] Indeed, simply demonstrating the capability to produce and detonate a nuclear weapon met much of this objective.

Mao's vision of People's War emerged to dominate China's strategic culture landscape, combining with – and ultimately subsuming – ideas about nuclear weapons to form People's War Nuclear Deterrence (PWND). Thus was born a bifurcated defense strategy: a strategic nuclear deterrent would combine with People's War doctrine to defend China from aggression. This bifurcated national defense strategy reflected an uneasy partnership between incommensurable strategic philosophies requiring quite different systems of support for their implementation. Over time, as Mao's People's War emerged to dominate China's dominant strategic culture, this circumscribed the development of strategic nuclear deterrence theory; China's defense industry became directed by People's War principles; its nuclear weapon production infrastructure remained limited in its capacity to produce nuclear weapons; and while China developed the technical capability to produce and detonate fission and fusion nuclear weapons, it produced very few weapons relative to its primary geostrategic rivals during the Mao era.

Conclusion

According to nuclear deterrence theory and the US-Soviet Cold War historical experience, vulnerability to nuclear attack should cause a state to expand its nuclear deterrent capability. This chapter has established that, contrary to these expectations, China did not expand its strategic nuclear deterrent after developing a basic nuclear

[166] Sun Xiangli, "An Analysis of China's Nuclear Strategy Nature and Characteristics," p. 28.

weapon production and deployment capability. Instead, even when faced with threat of nuclear attack, China expanded the Third Line campaign, demonstrating that China's People's War strategic culture dictated national security decision-making during the Mao era in a manner that circumscribed notions of strategic nuclear deterrence, limited the expansion of its nuclear strategic deterrent, and greatly limited China's overall nuclear weapon production capacity.

China's lack of commitment to strategic nuclear deterrence during the Mao era is demonstrated by its lack of investment in its fissile material production infrastructure on the one hand and its massive investment in developing an intentionally redundant military industrial capacity between 1965 and at least 1971 - the "Third Line"-on the other. China's primary fissile material production facility in Lanzhou never expanded – in fact, never changed its exterior configuration at all – throughout the Mao era. On the other hand, the Third Line was a massive, geographic reorganization of China's military industry inspired by People's War principles that were fundamentally antithetical to nuclear deterrence strategy.[167] Amazingly, fear of Soviet invasion and nuclear attack caused China to *reinvest* in this military industry reorganization during the early 1970s rather than expand nuclear weapon production capacity. Instead, People's War principles dominated elite decision-making and defined China's strategic culture through

[167]As will be explained later in this chapter, the Third Line was intended as a defensive bulwark against a conventional and nuclear attack on China's mainland through relocation of industry to remote areas of the country. Designed as a national security program, the Third Line was guided by a strategy that favored factors of distance and geography as a defense against nuclear attack - just the factors that some Western theorists have argued nuclear weapons obviate (see Bernard Brodie, *The Absolute Weapon*; see especially Daniel Deudney's *Bounding Power*, Chapter Nine, for discussion of relationships between nuclear weapon technology, geography, and political systems). China spent approximately 10 times as much capital on the Third Line campaign as it did on the construction of its nuclear weapons program. Indeed, China's lack of attention to developing its nuclear arsenal could not have been due to economic constraint, since between 1965 and 1971 China was spending the equivalent of tens of billions of Yuan on the Third Line – more than enough to fund expansion of nuclear weapon production facilities.

the end of the Mao era, and nuclear deterrence as a strategic theory of adversarial interaction never truly developed among China's military leaders.

People's War principles and nuclear deterrence concepts were each grounded within incommensurable perspectives, representing distinct strategic objectives that required quite different resources, methods of organization, and political support for their implementation.[168] People's War principles emphasized human willpower, ideological mobilization of the population, and the strategic use of geography to expand the flow of space and time in military campaigns. This stood in stark contrast with nuclear deterrence principles emphasizing the use of nuclear warhead and ballistic missile technologies to contract the flow of time and space during military campaigns. Further, the technical expertise required for China to build an indigenous nuclear weapons program demanded high levels of education, workforce specialization within a nuclear technical infrastructure, and a stable political bureaucracy to effectively administer this exceedingly technical industrial program. This was at odds with the domestic application of People's War strategic principles stressing egalitarianism, economic development of primary industrial inputs (such as steel),[169] and ideological struggle against class boundaries within the political bureaucracy that periodically downgraded the authority of technicians in specialized areas (as was exhibited during the Cultural Revolution).[170]

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[168] I borrow the idea of incommensurability from Thomas Kuhn's exploration of paradigm development in the natural sciences; Kuhn defines paradigms as a world-view centered on principles ultimately mutually exclusive with other world-views (Kuhn, *The Structure of Scientific Revolutions*).

[169] Shambaugh gives a brief overview of China's Mao-era defense industry that mentions favoring steel production over other industries in line with the People's War strategic culture of the era (David L. Shambaugh, "China's Defense Industries: Indigenous and Foreign Procurement," pp. 44-49.)

[170] Constance Squires Meaney gives a general discussion of this practice during the CR in his comparative study of the status of industrial technicians during the Mao and Stalin eras (*Stability and the Industrial Elite in the Soviet Union and China*, p. 79).

China's People's War strategic culture configured its nuclear weapons program in a manner that restricted its nuclear weapon infrastructure and inculcated the notion that demonstration of a nuclear technical capability was sufficient for achieving nuclear deterrence. These aspects of China's nuclear weapons program became institutionalized, persisting into the Deng Xiaoping era even as China's strategic culture changed with the death of Mao and the rise of Deng Xiaoping during the 1980s. The following chapter will define China's strategic culture of the opening reform era, and assess the influence of this transformed strategic culture on China's nuclear weapons program.

Chapter Four: Strategic Culture and China's Nuclear Program, 1976-1992

Introduction

Throughout the development of its nuclear weapons program, China's strategic culture has defined the size and disposition of its nuclear weapon force and path dependent development patterns have reinforced these prescriptions. During the Mao era, China believed demonstrating the capability to build and detonate a nuclear weapon to be sufficient for achieving strategic nuclear deterrence as it remained committed to People's War principles. This restrained its nuclear program, relegating it to a disconnected compartment within the PLA that was ill-prepared to respond to demonstrable strategic threats to the Chinese state. This pattern of restraint continued during the subsequent period of 1976-1992, as China's nuclear weapons program remained remarkably constrained in comparison with its geostrategic rivals of the Cold War era, against the expectations of both nuclear deterrence theory and Cold War historical experience. During the Deng Xiaoping era, China did not appreciably expand its numbers of deployed nuclear weapons as it converted its nuclear industry for civilian applications and internationalized its nuclear program by acceding to a series of nuclear-related international treaties, reinforcing the overall the restrained development pattern of China's nuclear weapons program.[1] Part one of this chapter illustrates this by providing an overview of China's strategic nuclear deterrent after the death of Mao Zedong,

[1] In this chapter I refer to the period of 1976 to 1992 as the "Deng Xiaoping era." While Deng Xiaoping was never officially either president of the PRC state bureaucracy or chairman of the CCP, he is widely considered to have ruled informally from about 1978 through the early 1990s , and was chairman of the Central Military Commission (CMC), one of the highest positions of political authority in the PRC.

including a summary of weapon deployments between 1976 and 1992, a review of China's nuclear weapon production infrastructure, and an introduction to China's accession to a series of nuclear-related treaties.

However, a shift in China's strategic culture caused China's nuclear weapons program to undergo some important changes during the Deng Xiaoping era. During China's post-Mao leadership transition, China's strategic culture transformed, and this caused improvements to its nuclear second-strike security in ways unrelated to weapon and deployment system production. Part two of this chapter shows how this led to an unprecedented integration of China's nuclear weapons program within the PLA, reflected by improvements in the areas of nuclear deterrence strategic theory development, nuclear weapon command and control, and nuclear weapon unit deployment training.[2] Taken together, this section shows how variance in China's strategic culture caused some change to its nuclear weapons program within a context of path dependent restraint for the program as a whole.

Part three of this chapter then explains *why* China improved the second-strike security of its nuclear force while its nuclear weapons program remained restrained in terms of its nuclear weapon deployments and nuclear infrastructure. I argue that China's leadership competition during 1976-1978 became an historical critical juncture for the state's strategic culture and, ultimately, aspects of its nuclear program. To show this, I first explain how the resolution of China's post-Mao leadership competition in favor of Deng Xiaoping caused changes in China's strategic culture, which in turn caused changes in its nuclear weapons program that improved its nuclear force second-strike

[2] John Lewis and Xue Litai briefly discuss the Second Artillery's 1980s training regimen and theory development in their book *Imagined Enemies: China Prepares for Uncertain War*.

security without increasing its number of deployed nuclear weapons. Then, I show how changes to China's nuclear weapons program occurred within a context of path dependent restraint for the program as a whole by explaining how the path dependent effects of Mao-era material constraints for China's nuclear weapons program formed significant ideational and material parameters for post-Mao decision-makers. Further, I show how aspects of China's strategic culture transformation reinforced the restrained development pattern for the nuclear weapons program.

Part One: Nuclear Weapon Deployments, Nuclear Industry, and Nuclear-related Treaties

Nuclear Deployments: 1976 to 1992

China's nuclear weapon force underwent some limited change during the 1980s, however it did not appreciably expand during this period. While China's overall nuclear deterrent materially improved with initial trial deployments of an ICBM capable of targeting the US for the first time in late 1980, China's total number of ICBMs remained low relative to its nuclear force structure as a whole.[3] In one of the only publically available declassified US government estimates of China's nuclear weapon force during the Deng Xiaoping era, a 1984 Defense Intelligence Agency (DIA) report estimated that China had 355 total nuclear warheads in its stockpile as of 1984.[4] This report projected a steady increase in China's deployed missile systems over a ten year period according to the following chart:

[3] Lewis and Hua, "China's Ballistic Missile Programs," p. 18.
[4] Defense Intelligence Agency, *Defense Estimative Brief: Nuclear Weapon Systems in China*, p. 1.

TABLE 1
NUCLEAR WARHEADS

	1984	1989	1994
CSS-1	25	5	0
CSS-2	110	120	120
CSS-3	8	31	32
CSS-4	2	9	16
SLBM	0	24	48
Solid ICBM	0	0	2
MR/IRBM Follow-on	0	17	28
Bombs	165	200	230
ADM's	50	50	50
SRBM	0	0	12
ASM	0	130	250
Follow-on Systems	0	0	30

Source: Defense Intelligence Agency, *Defense Estimative Brief: Nuclear Weapon Systems in China* (April 1984), p. 4.
Original classification: Secret
Declassification information: Obtained under the Freedom of Information Act by Hans M. Kristensen (03-043H)

In analyzing the above chart, CSS-1 through CSS-4 missile systems[5] are the most important categories to consider for assessing China's nuclear deterrent during the 1980s, considering that China had not developed SLBM or solid fuel ICBM systems and any inventory of nuclear gravity bombs would not pose a significant strategic nuclear deterrent to either the Soviet Union or the US during this period.[6] Of note, according to the above estimate, by 1984 China had deployed 145 total nuclear armed missiles, with

[5] CSS-1 is the western designation of the DF-2, a single-stage 20-meter-long ballistic missile with a range of 1050 kilometers; CSS-2 is the western designation of the DF-3A, a single stage 24-meter-long ballistic missile with a range of 2650 kilometers; CSS-3 is the western designation of the DF-4, a two-stage, 28-meter-long ballistic missile with a range of 4,750 kilometers; CSS-4 is the western designation of the DF-5, a two-stage, 33-meter-long ballistic missile with a 12,000 kilometer range (Lewis and Hua, "China's Ballistic Missile Programs," pp. 9-10).

[6] Jeffrey Lewis makes similar assertions regarding assessing estimates of deployed weapon systems. Further, Lewis argues that China's inventory of nuclear gravity bombs has never been verified to exist (Jeffrey Lewis, *The Minimum Means of Reprisal*, p. 54).

only two ICBMs capable of targeting the U.S. (the CSS-4 missile).

Although the above table shows that DIA projected a steady increase in China's nuclear missile forces through 1994,[7] Jeffrey Lewis argues that China's nuclear forces actually decreased during the 1980s and early 1990s, falling from about 145 nuclear-armed missiles in 1984 to about 65 nuclear-armed missiles by 1994.[8] This assessment of decreased force totals appears based on a comparison of the 1984 DIA nuclear estimate with a different, originally classified Congressional report from 1993 stating that by the early 1990s China deployed approximately 65 nuclear-armed missiles (10 CSS-4, 10 CSS-3, and 45 CSS-2), with no operational SLBMs nor any air assets known to be tasked with delivering nuclear gravity bombs.[9] It is unclear whether comparing the 1984 DIA estimate (145 total nuclear-armed missiles) with the estimates provided in the 1993 Congressional report (65 total nuclear-armed missiles) represents a real decrease in China's nuclear missiles over the course of the 1980s or simply different estimates from different parts of the US government.[10] Further, China's SLBM program – the JL-1 project – faced budget constraints throughout the Deng era due to a reassessment of

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[7] These DIA estimates form much of the basis of Jeffrey Lewis' analysis of US intelligence reporting on China's nuclear developments, and Lewis highlights DIA's estimate of overall increase from 148 missiles to 220 missiles by 1994 as an example of how US intelligence overestimated China's actual nuclear forces during this period.

[8] For example, Jeffrey Lewis has assessed China's nuclear weapon "total force levels declined from nearly 150 missiles in 1984 to less than seventy a decade later" (Jeffrey Lewis, *The Minimum Means of Reprisal*, p. 70), and cites only the following report to Congress as support for this assessment: National Security Council, *Report to Congress on Status of China, India and Pakistan Nuclear and Ballistic Missile Programs* (cited in Jeffrey Lewis, *The Minimum Means of Reprisal*, pp. 69-70, fn. 55).

[9] National Security Council, *Report to Congress on Status of China, India and Pakistan Nuclear and Ballistic Missile Programs*. It should be noted that the provenance of this report is not clear. The only available copy of this report is from the Federation of American Scientists' (FAS) website (http://www.fas.org/irp/threat/930728-wmd.htm), where it is described as an originally classified report obtained through a Freedom of Information Act by Paul Pineo of the "FAS Fund." It is unknown who (i.e. what agency) originally delivered this report to Congress.

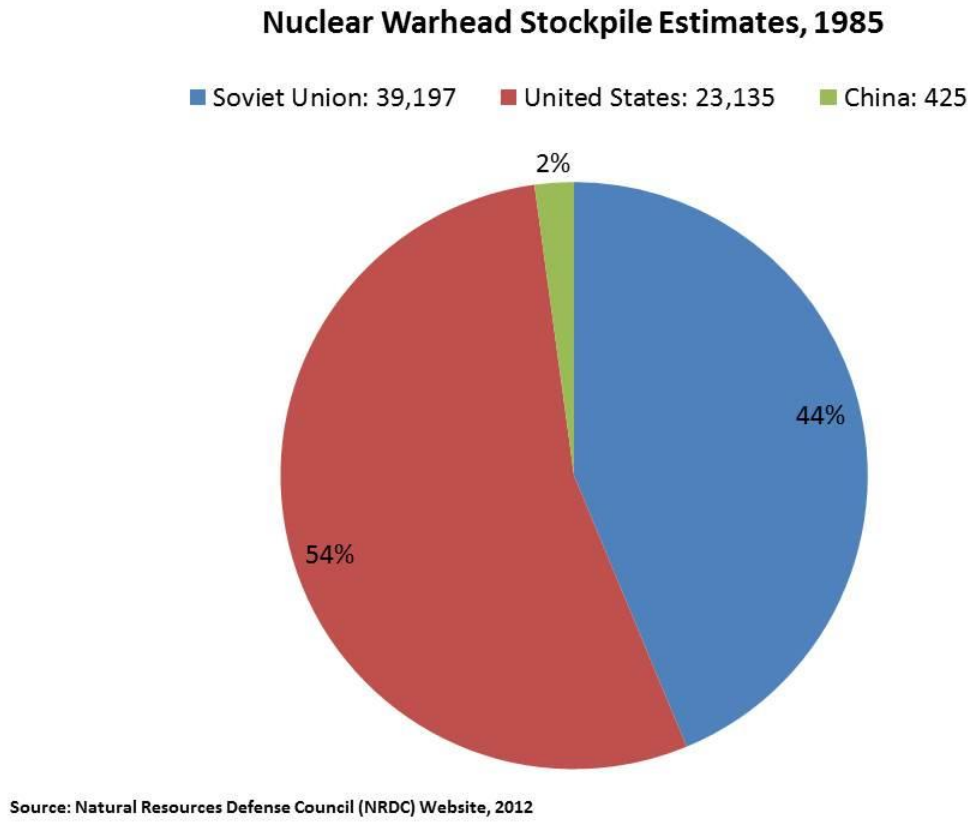
[10] It seems premature to conclude that there was a reduction in China's nuclear missile force during the 1980s based solely on a comparison of two US government sources dated nine years apart, especially when one of these sources is of uncertain origin.

strategic priorities in the early 1980s; although China successfully launched a JL-1 missile from *Golf*-class submarines in 1982 and 1988, and began sea trials of a new SSBN class of submarine in 1981 (the *Xia*), there is no evidence any SLBM-capable submarine was ever operationally deployed, supporting the notion that the program was never prioritized during either the Mao or Deng eras.[11]

According to alternative accounting methods focusing on nuclear warhead totals, Natural Resources Defense Council (NRDC) estimates that China's total nuclear warhead stockpile amounted to a fraction of those built by the U.S. and Soviet Union during the 1980s. According to the NRDC, by 1985 China had approximately 425 total nuclear warheads in its stockpile, where stockpile entails any assembled and stored warhead with any type of delivery vehicle, from gravity bombs to missiles. By contrast, in 1985 the U.S. and Soviet Union had approximately 23,135 and 39,197 stockpiled nuclear warheads, respectively (see below chart).[12]

[11] John Lewis and Xue Litai, *China's Strategic Seapower*, pp. 100-101 (budgetary constraints related to strategic reassessments); 72-73, 102 (successful JL-1 missile launches); Jeffrey Lewis, *The Minimum Means of Reprisal*, p. 70; Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, pp. 79-80.

[12] I do not integrate 1985 nuclear weapon stockpile data for the United Kingdom (300) or France (360) into this analysis since they relied upon the U.S. "extended deterrence" security policy applied to NATO member states, whereas China has never been protected by another state's nuclear force. Data source: Natural Resource Defense Council (NRDC) Website, 2012. For a recent analysis of the U.S. extended deterrence policy, see Steven Pifer et. al., "U.S. Nuclear and Extended Deterrence."



Source: Natural Resources Defense Council (NRDC) Website, 2012

Although accounting methods differ between sources of estimated nuclear weapon force numbers, all available estimates of China's nuclear forces during the Deng Xiaoping era of 1976-1992 indicate that China's nuclear weapon force remained quite limited. During this period China likely had no more than approximately 425 total stockpiled nuclear warheads that included 145 total nuclear-armed missiles, with only a handful of ICBMs capable of striking the US mainland, perhaps slightly more nuclear-armed missiles capable of striking deep into the Soviet Union (i.e. the CSS-4 and CSS-5 systems), and no operationally deployed sea-based nuclear deterrent. Remembering that China began its nuclear weapons program in 1955 and first successfully tested an indigenously produced nuclear fission device in 1964, it is striking that 20 years later it had still only produced a fraction of the nuclear warheads produced by its two main Cold

War rivals. The apparent material constraint of China's nuclear forces is reflected within the industry that produced these weapons; to show this, following is an overview of China's nuclear industry during the Deng Xiaoping era.

Economic Reform, China's Nuclear Industry, and the PLA

Deng Xiaoping asserted in 1980 that China faced a peaceful international environment with a low likelihood of any great power conflict, and the PLA began reforming from Mao's People's War model emphasizing mass-mobilized manpower to a smaller, more professional force trained to use modern equipment under Deng Xiaoping.[13] This shift was linked to broader economic reforms during this period, as China began shifting state investment away from the military and towards civilian industry. As part of this transition, the PLA was downsized by one million soldiers and China's military regions were reduced from eleven to seven.[14] China's military bureaucracy was periodically reorganized as civilian leadership took a greater role in policy development.[15] Overall military spending declined for most of the decade,[16] and China's industry began demilitarizing and expanded into civilian markets as state funding

[13] Central Intelligence Agency, "Defense Modernization in China," pp. 7-8; John Lewis and Xue Litai, *China's Strategic Seapower*, p. 100; see also Deng Xiaoping's1981 speech introducing modernization reforms for the PLA (*Deng Xiaoping Wen Xuan,* pp. 394-395).

[14] Yitzhak Shichor, "The Dialectics of PLA Troop Reduction," pp. 336, 340; 346; John Lewis and Xue Litai, *China's Strategic Seapower*, p. 100. For more on PLA troop reductions during the 1980s, see also John Frankenstein and Bates Gill, "Current and Future Challenges Facing Chinese Defence Industries," p. 395; Xiaobing Li, *A History of the Modern Chinese Army*, pp. 246-247; and James Mulvenon and Andrew Yang, *The People's Liberation Army as Organization*.

[15] Michael Swaine, "The PLA and Chinese National Security Policy: Leaderships, Structures, Processes."

[16] According to Shaoguang Wang, although publically available information on China's military spending mostly show increases throughout the 1980s, these increases were far outpaced by the rate of inflation during this period leading to an overall decline in purchasing power for the PLA through at least 1989 (Shaoguang Wang, "Estimating China's Defence Expenditure: Some Evidence from Chinese Sources," pp. 893-894). Additionally, Lewis and Xue likewise note that China's military budget declined as a share of its GDP throughout the 1980s (Lewis and Xue, *China's Strategic Seapower*, pp. 100-101). See also Evan Feigenbaum, *China's Techno-Warriors*, pp. 94-97 for a discussion of China's defense budget decline during the 1980s that includes a variety of different estimates.

decreased.[17] China's nuclear weapon production industry reflected many of these broader reform trends affecting the PLA.

China's nuclear weapons program reflected these trends in microcosm, and from 1978 through 1992 China's nuclear industry remained constrained in size while undergoing progressive de-militarization and commercialization.[18] This began a series of self-reinforcing processes that extended the constrained development pattern of China's nuclear weapon infrastructure well into the 1990s. As part of this process, in 1982 China established the civilian-controlled Ministry of Nuclear Industry, which later became the China National Nuclear Corporation, whose mandate was to "combine military and civilian uses" for China's nuclear industry.[19] This top-down administrative reorganization was not smooth; it was overshadowed by reorganization in other energy industries during the early 1980s and initially lacked a clear development objective. Further, the planned dispersal of China's Mao-era nuclear industry during the late 1960s and early 1970s - emphasizing decentralization and strategic redundancy in accordance with Mao's Third Line campaign – established a development pathway that was economically inefficient and slowed corporatization efforts during the 1980s and 1990s.[20] Nonetheless, China's nuclear industry slowly adapted to civilian production applications, with the conversion of fissile material production facilities following this administrative reorganization.

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[17] John Frankenstein and Bates Gill, "Current and Future Challenges Facing Chinese Defence Industries." See also: Arthur Ding, "China's Defence Finance: Content, Process, Administration" and Evan Feigenbaum, *China's Techno-Warriors*, pp. 74-75.

[18] Indeed, China's nuclear weapon production infrastructure apparently did not even operate at full capacity during this period; according to a DIA report from 1984, China's nuclear weapon production capacity exceeded DIA estimates of deployed nuclear weapon systems, possibly due to due to strategic choice (Defense Estimative Brief, "Nuclear Weapon Systems in China," p. 3).

[19] Yun Zhou, et al., "Is China Ready for Nuclear Expansion?," p. 772; John Frankenstein and Bates Gill, "Current and Future Challenges Facing Chinese Defence Industries," p. 400.

[20] Yun Zhou, et al., "Is China Ready for Nuclear Expansion?," p. 772.

Fissile material production infrastructure shifted towards civilian production as part of the broader trend of civilianizing China's military defense industries. China's uranium and plutonium fissile material production facilities were converted from military to civilian applications during the late 1970s and 1980s, and military control of fissile material production facilities ended no later than the early 1990s.[21] Regarding China's HEU producing facilities, The Lanzhou gaseous diffusion uranium enrichment facility stopped production of HEU in 1980 and shifted to producing low-enriched uranium (LEU) for export to the international market.[22] The Heping gaseous diffusion uranium enrichment facility stopped production of HEU in 1987, and was probably converted for production of other materials such as fluorine.[23] Over the course of the lifetime of these two facilities, it is estimated that they produced approximately 16-20 tons of weapons-grade HEU,[24] enough to supply fissile material for up to 1,000 nuclear warheads;[25] however, China's HEU stockpile was likely applied for several other uses, including the construction of secondary components for thermonuclear devices and fuel for various types of nuclear reactors.[26]

Similarly, China's two plutonium producing nuclear reactors likely ceased production of Plutonium during the 1980s. The Soviet-assisted Jiuquan reactor began operations in 1966, and after extensive operational difficulties, was finally closed in

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[21] International Panel on Fissile Material, "Banning the Production of Fissile Materials for Nuclear Weapons: Country Perspectives on the Challenges to a Fissile Material (Cutoff) Treaty," p. 8.
[22] International Panel on Fissile Material, *Global Fissile Material Report: 2010*, "China," pp. 98-100.
[23] International Panel on Fissile Material, *Global Fissile Material Report: 2010*, "China," pp. 98-100.
[24] Hui Zhang, "China's HEU and Plutonium Production and Stocks," p. 68; International Panel on Fissile Material, *Global Fissile Material Report: 2010*, "China," p. 100.
[25] International Panel on Fissile Material, "Banning the Production of Fissile Materials for Nuclear Weapons: Country Perspectives on the Challenges to a Fissile Material (Cutoff) Treaty," p. 7.
[26] International Panel on Fissile Material, "Banning the Production of Fissile Materials for Nuclear Weapons: Country Perspectives on the Challenges to a Fissile Material (Cutoff) Treaty," pp. 7-8.

1984.[27] The Guangyuan reactor, a Third Line facility that began operating in 1973 at roughly the same capacity as Jiuquan, is estimated to have closed in 1989.[28] Estimates of total Plutonium production at these reactors range between two and five tons (metric);[29] according to the International Panel on Fissile Material's own estimates, two tons of weapons-grade plutonium could supply fissile material for up to 500 nuclear warheads.[30]

The Internationalization of China's Nuclear Program: Treaties as Self-reinforcing Mechanisms

As China began de-militarizing its industrial sector, leaders also decided that integration with the international system was an important method for improving China's national security. With the formal diplomatic recognition of the U.S. in 1978, China began a period of unprecedented engagement with the international system; this eventually directly affected its nuclear program as China began membership within a variety of nuclear-related international agreements. During the Deng era, China acceded to five nuclear-related arms control agreements: Convention on Assistance in Case of Nuclear Accident (1986), Conventional on Early Notification of Nuclear Accident (1986), South Pacific Nuclear Weapons-Free Zone (1987), Convention on the Physical Protection

[27] David Wright and Lisbeth Gronlund, "Estimating China's Production of Plutonium for Weapons," 65; International Panel on Fissile Material, *Global Fissile Material Report: 2010*, "China;" p. 97.
[28] David Wright and Lisbeth Gronlund, "Estimating China's Production of Plutonium for Weapons," 66; International Panel on Fissile Material, *Global Fissile Material Report: 2010*, "China.," p. 97.
[29] David Wright and Lisbeth Gronlund, "Estimating China's Production of Plutonium for Weapons," 75; International Panel on Fissile Material, "Banning the Production of Fissile Materials for Nuclear Weapons: Country Perspectives on the Challenges to a Fissile Material (Cutoff) Treaty," p. 7.
[30] International Panel on Fissile Material, "Banning the Production of Fissile Materials for Nuclear Weapons: Country Perspectives on the Challenges to a Fissile Material (Cutoff) Treaty," p. 7.

of Nuclear Material (1989), Non-Proliferation Treaty (1992).[31] Many of these agreements required periodic reporting of China's nuclear-related actions to international legal regimes; these requirements became concrete mechanisms that reinforced the overall material restraint of China's nuclear infrastructure by developing a level of transparency for China's nuclear program among a community of fellow participant states. These self-reinforcing mechanisms furthered the restrained development trajectory of China's nuclear industry, a trajectory that later continued during the 1993-2011 era.

Conclusion

A combination of industry demilitarization, accession to international treaties, and an overall lack of expansion of nuclear missile weapon systems altogether reinforced a long-established development pattern of restraint for China's nuclear weapons program during the Deng Xiaoping era. However, China's nuclear weapons program did undergo several significant changes between 1976 and 1992, specifically concerning the areas of nuclear deterrence strategic theory development, nuclear weapon command and control systems, and nuclear weapon launch unit training. Advances in these areas reflected unprecedented integration of China's nuclear deterrence force within PLA planning and military preparedness, leading to a more secure second-strike capability without increasing the number of its deployed nuclear weapons. The following section details these changes.

Part Two: Changes in Second Artillery's Command and Control, Strategic Theory

[31] Alastair Iain Johnston, *Social States*, p. 36.

Development, and Unit Training[32]

China's nuclear weapons program underwent important changes during the Deng Xiaoping era. China authorized the development of an educational curriculum for China's nuclear-weapon related organizations, the systematic reorganization of its nuclear weapon command and control structure, and regular training of units for mobilizing and launching nuclear counterstrikes under a variety of conditions. These changes resulted in an unprecedented integration of China's nuclear weapon arsenal with PLA planning and military preparedness; as the rest of this section details, they were implemented through China's Second Artillery organization, the military branch of the PLA in command of China's missile forces.[33]

Nuclear Deterrence Theory Development

The rise of Deng Xiaoping brought widespread changes to military theory development for the PLA, to include nuclear strategic theory. These changes reflected a profound cultural shift within the PLA, and led to deeper integration of the Second Artillery with China's overall military-political bureaucracy. For the first time in the history of China's nuclear weapons program, the PLA organized conferences, developed a new branch of military study leading to the publication of myriad nuclear strategy-related materials, and established an educational system devoted to promoting the study of nuclear warfare issues.

In 1978 the Second Artillery organized its first ever "warfare conference"

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[32] This section refers to the Second Artillery's 2004 edition of *Second Artillery Campaign Studies* (edited by Yu Jixun), a classified Chinese manual describing the role of the Second Artillery within China's overall military preparedness.

[33] Yu Jixun, *Second Artillery Campaign Studies*, p. 11.

concerning the history of Second Artillery and resulted in a series of publications.[34] In 1983, the Second Artillery held a conference on developing battlefield engineer experience in support of nuclear launch operations, resulting in increased educational exchanges between nuclear weapon support units.[35] In 1982 and 1984, the Second Artillery hosted conferences on military reform efforts initiated by Deng Xiaoping in 1981; these conferences were intended to facilitate the sharing of organizational experience regarding such areas as improved standards for training, leadership, and equipment quality.[36] Conferences like this continued throughout the 1980s and formed a foundation for training reforms within the Second Artillery for China's nuclear weapon deployment units.

In 1984 the PLA began publishing a variety of books and training manuals in order to establish a foundation for the Second Artillery's organizational education and theory development. In 1984 the PLA published *The Second Artillery's Warfighting Regulations*, *The Second Artillery's Command Levels Work Regulations*, *The Second Artillery's Missile Detachment Launch Group Warfighting Regulations*, and *The Second Artillery's Military Language*.[37] Then, in 1985 the State Council approval of "Campaign Studies" as an official branch of military science, leading to the publication

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[34] The publications generated from this first conference include the following titles: *Views Concerning the Second Artillery's Strategy Building and Warfare Problems* [关于第二炮兵战略建设和作战问题] and *Views on Warfare Arrangements and the Establishment of Military Preparedness Planning* [作战布局与战备建设规划的意见] (Yu Jixun, *Second Artillery Campaign Studies*, pp. 10-11).

[35] Zhang Aiping, et. al., *China's People's Liberation Army, Volume One* (*Zhongguo Renmin Jiefang Jun*, *Di Yi Ban*), p. 115.

[36] This was in response to Deng Xiaoping's 1981 edict regarding PLA reform that began the process of troop reductions, increased specialization, and improved training and education for the PLA. This reform process was encapsulated in a slogan intended to create an appropriate political-cultural context for these reforms: "We must build a strong, modernized, and regularized revolutionary army" ("必须把我军建设成为一支强大的现代化，正规化的革命军队") (Zhang Aiping, et. al., *China's People's Liberation Army, Volume One* (*Zhongguo Renmin Jiefang Jun*, *Di Yi Ban*), p. 116).

[37] Zhang Aiping, et. al., *China's People's Liberation Army, Volume One* (*Zhongguo Renmin Jiefang Jun*, *Di Yi Ban*), p. 122.

of materials related to military theory, to include nuclear strategic theory.[38] The PLA subsequently published the first in a series of books titled *Second Artillery Campaign Studies* analyzing nuclear counterstrike theory and the prosecution of nuclear war at the campaign level, including warfare principles, the divisions of various campaign stages, campaign preparation, and carrying out campaign-level warfare.[39] This coincided with a new directive guiding the development of the Second Artillery during the 1980s that emphasized improved force protection and counterstrike capability for China's nuclear forces.[40]

Then, in the late 1980s the Second Artillery redeveloped its educational system with the goal of improving the training of its organizational members. In 1987 the Second Artillery Command College established the *Second Artillery Campaign Studies* major and began building a teaching staff dedicated to researching and teaching Second Artillery Campaign Studies theory, and by 1989 the Second Artillery had published specialized teaching manuals dedicated to teaching *Second Artillery Campaign Studies* as a major.[41] These educational changes established a professional education system devoted to theory development, training, and inter-organization communication and learning. Taken altogether, the establishment of conferences, publication of books and manuals, and redesigned educational system reflected deeper integration of the Second

[38] This represented the first formal departures from People's War military theory within the PLA. As a result, Chinese military science now divides the study of warfare into three spheres: overall strategy, campaign/theater, and battlefield tactics. The strategic sphere is a holistic perspective of how a state makes war within the international system, incorporating economic, social, and cultural factors into analysis of warfare's general principles. The campaign/theater level is focused upon analyzing the war itself, and mixes strategic principles with war planning at the regional level. Battlefield tactics involve specific plans for military engagements as part of a broader military campaign.

[39] Yu Jixun, *Second Artillery Campaign Studies*, pp. 11-12; Zhang Aiping, et. al., *China's People's Liberation Army, Volume One* (*Zhongguo Renmin Jiefang Jun*, *Di Yi Ban*), p. 122.

[40] Yu Jixun, *Second Artillery Campaign Studies*, p. 11.

[41] Yu Jixun, *Second Artillery Campaign Studies*, p. 12.

Artillery with the PLA as a whole. Further, this provided a foundation for reform of the Second Artillery's command and control structure and training regimen; following is an overview of changes in these other areas.

Command and Control: China's Second Artillery

Before the creation of China's Second Artillery organization, China's missile bases and groups were created and administered through regional military commands with no unified structure for providing a coordinated missile attack. In 1959 there were only three garrisons with missile-related functions in China, with no training capability.[42] In 1964 China created its first missile base, and by 1966 it had created six missile bases with 12 missile groups or units. Each base was administered by its respective military region's artillery command, with no unified military command structure across regions:

> "Because each missile base was in the early phase of its establishment, none of them possessed an organizational training capability for their units; because of this, before the establishment of the Second Artillery each missile group was separated by their respective school and military region artillery management, and each group [separately] introduced their own technology and training without a [broader] campaign-level training capability [for the missile groups as a whole]."[43]

China's initial missile command and control structure was decentralized according to regional military authorities. To address this, China's Second Artillery was established in 1966 to provide centralized military preparedness for - and control of- missile bases spread across China. China's command and control of its nuclear forces began at the

[42] Yu Jixun, *Second Artillery Campaign Studies*, p. 53.

[43] "由于由于各导弹基地还处于初建阶段，不具备组织部队训练的能力，因此，在归建第二炮兵之前，各导弹团分别由有关院校和军区炮兵代管，各自进行导弹技术和战术训练，尚未形成开展战役级训练的能力" (Yu Jixun, Second Artillery Campaign Studies, p. 53).

local level, and the extent of its centralization remained limited for much of the Mao era. China first established the Second Artillery organization in 1966 as a branch of the PLA in order to improve national-level command and control of deployed missile forces. While this organizational innovation increased national-level control of China's nuclear weapons, centralization remained limited due to a lack of integration of nuclear strategy within China's overall military doctrine in conjunction with a lack of national-level training for the Second Artillery's missile groups during the Mao era.[44]

Centralization of control over China's nuclear forces increased again with the death of Mao and the Rise of Deng Xiaoping as leader of China by 1978. The Second Artillery underwent major changes during the early stages of the Deng Xiaoping era as China strengthened its national-level command and control of nuclear weapon storage and bases. For example, in 1979 the Second Artillery was placed in authority over all of China's nuclear warhead storage facilities (*dantou jidi*, 弹头基地),[45] centralizing command and control of its nuclear weapon stockpile. The role of nuclear weapon storage facilities within the Second Artillery's overall nuclear preparedness is discussed in *Second Artillery Campaign Studies* (2004):

> "In order for the Second Artillery to succeed within an expanding nuclear retaliation campaign, since missile bases' usual nuclear warhead stockpile is limited, the nuclear warhead storage facility must provide warheads to the missile bases in order to ensure that the missile bases nuclear retaliation (mission) is smoothly implemented. During this coordination phase, there should be timely transshipments and warhead assembly (activity) between missile bases and the

[44] Yu Jixun, *Second Artillery Campaign Studies*, p. 53.

[45] One of these nuclear storage facilities is located in Taibai County in the Qinling mountain range; the facility is called the Taibai nuclear weapon storage facility in US academic publications and is known as 22 Base in Chinese sources (Mark Stokes, "China's Nuclear Warhead Handling System," pp. 3-4). There are likely multiple nuclear warhead storage facilities spread throughout China; see Yu Jixun, *Second Artillery Campaign Studies*, p. 202 for a general discussion on these facilities.

> warhead storage facility; when providing warheads, the warhead storage facility must not affect the missile bases' scheduled fulfillment of nuclear retaliation responsibilities, and should also avoid having…nuclear warheads at battlefield launch sites for too long."[46]

According to this passage, China's nuclear warhead storage facilities are part of a control system designed to store most of China's nuclear warheads separately from missile bases. The Second Artillery controls coordination between these storage facilities, missile bases, and missile groups at launch sites; not only must storage facilities provide warheads for mating with missiles in a timely manner, but they must also ensure that nuclear warheads are not left in the field longer than is necessary. The establishment of the Second Artillery as the primary organization of authority over storage facilities in 1979, to include primary responsibility for coordination among different functional groups, increased the centralization of command and control over China's nuclear weapon force.

In addition, China reorganized the authority structure of the Second Artillery throughout the 1980s with the intent of professionalizing the organization.[47] In 1982 the Second Artillery leadership body authorized changing the Second Artillery's command structure from the standard PLA ground force model to an independent authority system organized according to the strategic objectives of the Second Artillery. In 1985 the Second Artillery continued reorganization by cutting engineering units, expanding missile

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[46] "第二炮兵遂行较大规模的核反击战役，由于导弹基地平时的弹头储备有限，必须由弹头基地向导弹基地提供合格弹头，才能保证导弹基地核反击的顺利实施。协同过程中，导弹基地与弹头基地之间应及时转运、交接合格弹头，弹头基地提供合格弹头既要不影响导弹基地按时完成核反击作战任务，又要避免核材料或测试完成的核弹头在发射阵地待机时间过长" (Yu Jixun, *Second Artillery Campaign Studies*, p. 202).

[47] The Second Artillery apparently remains a "service arm" rather than a "service branch" on par with its army, navy, and air force; this is a slightly lower bureaucratic rank than the other service branches (Mulvenon and Yang, eds., *The People's Liberation Army as Organization: Reference Volume v1.0*, p. 520).

units, and improving overall unit combat safety. Within units, overlapping roles were phased out and unnecessary levels of command were cut. Taken together, these changes reorganized the authority structure of China's Second Artillery, offering it a level of independence on par with other branch services while attempting to increase its overall efficiency. Many of these organizational changes were concretized through an increased training regimen implemented during the early 1980s by the Second Artillery.[48]

Second Artillery Unit Training

By the early 1980s China began developing an efficient, well-trained corps of strategic rocket units, reflected in the Central Military Commission (CMC)'s formal announcement of this goal in 1984.[49] In support of this objective, throughout the 1980s and 1990s the Second Artillery conducted centrally organized launch training exercises of various types. For example, in 1977 the Second Artillery conducted its first tactical mobile warfare exercise resulting in the launch of four intermediate-range missiles, and in 1978 it conducted a timed launch preparation experience for its intermediate-range ballistic missile forces.[50] Training of this type was intended to develop national-level command and control of China's nuclear missile base and launch units by practicing inter-regional, independently organized launch training exercises. According to *Second Artillery Campaign Studies* (2004):

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[48] Information in this paragraph is drawn from Zhang Aiping, et. al., *China's People's Liberation Army, Volume One* (*Zhongguo Renmin Jiefang Jun*, *Di Yi Ban*), p. 112 .

[49] The announcement was as follows: "Build an elite and efficient strategic missile unit with Chinese characteristics" (建设一支具有中国特色的精干而有效的战略导弹部队) (Zhang Aiping, et. al., *China's People's Liberation Army, Volume One* (*Zhongguo Renmin Jiefang Jun*, *Di Yi Ban*), pp. 111-112).

[50] Zhang Aiping, et. al., *China's People's Liberation Army, Volume One* (*Zhongguo Renmin Jiefang Jun*, *Di Yi Ban*), p. 111-112; James Mulvenon and Andrew Yang, eds., *The People's Liberation Army as Organization*, p. 519.

> During the Second Artillery's second decade of existence, under the guiding spirit of the CCP's Third Plenary Session of the Eleventh Central Committee, Second Artillery units started an unprecedented training surge, and taking as central the establishment of a complete system of launch bases as a foundation, (the units) diligently practiced technology and military tactics to obtain comprehensive and integrated drill experience. During 1982, for the first time the Second Artillery successfully achieved the independent organization and implementation of "206" and "83-01"campaign exercises in a self-reliant manner. The "206" and "83-01" campaign drills and exercises are a significant expression of the Second Artillery's nuclear counterstrike campaign (development), and soon afterward it successfully organized a series of campaign exercise activities to include "86-01 Campaign Exercise," "91-10" campaign assembly and exercise, and "94-01" campaign assembly and exercise, all of which comprehensively tested the Second Artillery's leadership organization's command and control of its nuclear warfare counterstrike capability, and centralized its extensive practical experience (in this area).[51] [52]

Interestingly, the above paragraph identifies the CCP's official initiation of its opening reform policies in 1978 (the Third Plenary Session of the Eleventh Central Committee) as context for understanding the implementation of the Second Artillery's new training goals;[53] this historically significant era will be detailed in Part Three of this chapter. It is also important to note that these exercises are described as having improved the Second Artillery's counterstrike capabilities, in part due to the improvement of national-level command and control of missile launch bases. The Second Artillery's unprecedented

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[51] This historic Third Plenary Session of the Eleventh Central Committee was held in December 1978 and is widely cited as the point at which China's political leaders officially initiated the opening reform program under the leadership of Deng Xiaoping.

[52] "当第二炮兵建设进入第二个 10 年，在党的十一届三中全会精神指引下，第二炮兵部队掀起了空前的练兵热潮，在进行以发射营为中心的配套建设基础上，苦练技术和战术，取得了较丰富的合成训练经验. 并于 1982 年首次依靠自身的能力，独立地成功组织实施了"206"和"83-01"战役演习，可以说，"206"和"83-01"战役训练和演习，是第二炮兵核反击战役产生的重要标志，随后，又成功地组织了"86-01 战役演习"，"91-10"战役集训和演习，"94-01"战役集训和演习等一系列战役演习活动，全面检验了第二炮兵领率机关组织指挥核反击作战的能力，集累了丰富的实践经验." (Yi Jixun, *Second Artillery Campaign Studies*, pp. 53-54).

[53] Zhang Aiping's edited volume makes a similar statement regarding the importance of this Party meeting on developments in the Second Artillery (Zhang Aiping, et. al., *China's People's Liberation Army, Volume One* (*Zhongguo Renmin Jiefang Jun*, *Di Yi Ban*), p. 112).

launch preparation training exercises of the 1980s and early 1990s began the practical integration of China's nuclear forces into overall PLA planning and military preparedness, and improved the counterstrike efficacy of China's nuclear forces.

The identification of strategic nuclear launch exercise code names such as "206" and "83-01" is unprecedented in academic studies of China's nuclear forces. While little is known about the specifics of these exercises, "206" may refer to any military exercise conducted under post-nuclear attack training conditions. For example, in November of 2006 a state media news report detailed a military exercise in Shandong province named "206 exercise," wherein military units trained under the conditions of a "complex electromagnetic environment" while integrating electronic warfare into battlefield actions.[54] While there was no explicit mention of nuclear weapon training in this media report, the article's description of a "complex electromagnetic environment" is also described in *Second Artillery Campaign Studies* as one aspect of a post-nuclear attack environment within which the Second Artillery must be prepared to operate.[55] Thus the term "206" may refer to any type of large-scale military exercises practicing the integration of new units, equipment, or strategy within a post-nuclear attack environment.

"83-01" likely refers to more specific nuclear weapon-related exercises, with the first number probably referring to the year during which the exercise was conducted. One article published in the Chinese journal *Modern Military Affairs* gives an overview of a nuclear counterstrike exercise conducted in 1994 by China's strategic rocket forces, possibly the "94-10" exercise referred to in the quote from *Second Artillery Campaign*

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[54] "Vangaurd-206 Exercise Reveals Complex Electromagnetic Environment as Simulation of Future Warfare," *China Defence Post*, 11/22/2006 (via *Ifeng.com*; http://news.ifeng.com/mil/200611/1122_235_36869.shtml).

[55] Yu Jixun, *Second Artillery Campaign Studies*, p. 299.

Studies above.[56] The exercise was designed to enhance China's land-based strategic missile forces' survivability under conditions of nuclear war, and the article describes several phases of response by Second Artillery units after a simulated surprise nuclear strike against China. Engineering units deploy to battlefield areas to measure radiation levels, treat wounded, and decontaminate select areas and equipment. Next, several "specialized vehicles" – probably missile transport vehicles – damaged by the simulated nuclear attack were targeted for repair within a specific timeframe, and engineering teams were dispatched to repair them in the field. Once repaired, these specialized vehicles took position on the battlefield, ready for battle. The author also travels into one of the Second Artillery tunnels used during the exercise, describing it as set into the mid-slope of a mountain with a spacious, bright, white interior housing Second Artillery personnel and equipment.[57] It was described as containing a generator room, a command center, and general living quarters for hundreds of personnel, with specialized air filtration systems designed to clean and circulate air within the tunnel. This tunnel is portrayed as representing underground areas wherein Second Artillery units are planning to survive a nuclear attack, and from which nuclear counterattack forces are trained to emerge.[58]

This section has detailed important changes to China's nuclear weapons program during the Deng Xiaoping era that resulted in improved credibility for China's nuclear deterrent. The next section explains why these changes occurred by identifying the process of the post-Mao leadership competition as a critical juncture for China's nuclear

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[56] Zhang Jiajun, et al., "'Mushroom Cloud' Trials: Notes from the Second Artillery's First Battlefield Survival Exercise." Descriptions in the paragraph are drawn from this article. See also Mulvenon and Yang, eds., *The People's Liberation Army as Organization: Reference Volume v1.0*, p. 519.

[57] The Second Artillery's tunnel system was likely begun during the mid-1960s as China established the Second Artillery's command and control infrastructure (Zhang Aiping, et. al., *China's People's Liberation Army, Volume One* (*Zhongguo Renmin Jiefang Jun*, *Di Yi Ban*), p. 114).

[58] Zhang Jiajun, et al., "'Mushroom Cloud' Trials: Notes from the Second Artillery's First Battlefield Survival Exercise," pp. 26-27.

weapons program, and how the subsequent strategic culture shift led to both change and path dependent reinforcement within China's nuclear weapons program.

Part III: Post-Mao Leadership Change, China's Strategic Culture, and Nuclear weapons program Development

Critical Juncture: The Post-Mao Leadership Change and the Emergence of a New Strategic Culture[59]

The death of Mao Zedong was a critical juncture in China's political history that resulted in dramatic change throughout all aspects of Chinese society. Tracing the process of the post-Mao leadership competition – ending with the normalization of diplomatic ties with the U.S. - shows how this period of political history served as a critical juncture for China's strategic culture in a manner that caused important changes

[59] China's reform period refers to two types of polices adopted during the late 1970s: diplomatic opening to other states and domestic economic reforms. This period marks a dramatic change in China's political culture, spawning a huge scholarly literature across several social science fields attempting to explain these dramatic changes. Much of this literature focuses on the economic reform side, explaining the adoption of domestic economic reforms commonly identified with the official recognition of the household responsibility system in 1980 and then later with TVE and state-owned enterprise (SOE) reforms during the early 1980s. Explanations of China's "opening" - i.e. its new foreign policy orientation towards western advanced industrialized states – have also been explained in terms of economic rationales. For example, Thomas Moore's *China in the World Market* and Susan Shirk's *The Political Logic of Economic Reform in China* (specifically pp. 47-51) both explain China's Open Policy in terms of engagement in the international political economy. While China's domestic economic reforms did indeed incorporate an international political economy dimension, I argue that this is distinct from China's foreign policy opening. This opening constituted a unique *political* shift that deserves its own special attention because this was a radical change for the Chinese state, while the initial set of economic reforms – i.e. rural agricultural production reorganization - was not. For example, similar versions of domestic rural agricultural reforms were implemented at least two separate times earlier during the Mao era in various forms, first in 1957 and again in 1961; their re-emergence in the late 1970s marked a continuation of policy shifts between radical leftist and moderate pragmatist visions of the state that had come to define China's political landscape during the Mao era and that continued after his death in 1976 (Fewsmith, *Dilemmas of Reform in China*, pp. 23-26). It was China's foreign policies of co-binding engagement with Western advanced industrial states that reflected its transforming strategic culture; these policies were rooted in a newly developed group of cultural symbols that redefined how China perceived its place in the international system.

to nuclear weapons program. As defined in Chapter One's overview of path dependence theory, critical junctures are contingent events "characterized by the adoption of a particular institutional arrangement from among two or more alternatives" that sets in motion a self-reinforcing process, where contingency is defined as the "inability of theory to predict or explain...the occurrence of a specific outcome."[60] Just so, China's post-Mao leadership change was a competition between two alternative strategic visions for the Chinese state. One strategic vision was the Maoist perspective led by Mao's handpicked successor Hua Guofeng, who possessed a background in agricultural economic planning. The other vision was the moderate alternative that sought measured reform of China; it was led by Deng Xiaoping, a periodic ally and rival of Mao with a foreign policy background. The eventual victory of Deng Xiaoping by January of 1979 – identified with China's normalization of ties with the U.S. in that year - marked the ascension of the moderate strategic vision, resulting in the adoption of new institutional arrangements based on an open foreign policy of co-binding engagement, scientific exchange, and limited economic reforms.[61]

China's post-Mao leadership change began with Mao's death in 1976 and ended with China's normalization of ties with the U.S. in January of 1979. When Mao passed

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[60] James Mahoney, "Path Dependence in Historical Sociology," pp. 513-514 (Mahoney identifies two types of path dependent outcomes following critical junctures: reactive sequences and self-reinforcing processes; I focus here on self-reinforcing processes). See also: Paul Pierson, *Politics in Time*, pp. 50-51 and Kathleen Thelen, "Historical Institutionalism in Comparative Politics," pp. 387-396.

[61] "Co-binding engagement" is employed as a concept here to emphasize the character of China's engagement with advanced industrial capitalist states as placing certain reciprocal requirements on the Chinese state that it had not previously accepted. That China changed its foreign policy so dramatically towards interdependence, in the absence of foreign pressure and as a result of an internal leadership change, should be of direct interest to scholars of international relations in general, and Waltzian neorealists in particular. Further, it is no accident that China's opening foreign policies of the late 1970s occurred at the same time as the regime's leadership succession competition; I argue that it was the Party's leadership competition that caused China's foreign policy opening. Then, China's normalization of ties with the U.S. reflected these new institutional arrangements for China, anchoring China's new strategic culture and balancing against the prospect of any return to Maoism.

away in September of 1976, an emergent CCP leader named Hua Guofeng was named the Party Chairman and State Premier, positions he retained until 1980. As Hua assumed leadership of the Chinese state, reform of China's Mao-era strategic culture was by no means a certainty given that Hua's political legitimacy rested on his connection to Mao Zedong.[62] For example, one of Hua's first acts was to establish a Mausoleum commemorating Mao Zedong in Tiananmen Square whereupon he promulgated a memorial speech that called for fulfilling Mao's "deathbed request" to "continue taking class struggle as the base, continue the Party's basic (established) line, and continue the revolution under the dictatorship of the proletariat,"[63] all of which was classic Maoist political rhetoric. Further, Hua's continuation of Maoist ideals would become enshrined in Hua's guiding political principle that defined his political career: the "two whatevers," which meant that the Party was to be guided by whatever Mao had said and whatever Mao had done in the past,[64] including continued support for Mao's most recent purge of

[62] To argue that China's opening reform period was not a certainty after the death of Mao differs from mainstream accounts of China's opening reform period. For example, some Chinese scholars argue that the opening reform period was historically inevitable given the "difficult lessons" of the CR. According to these interpretations, the failures of the Mao era were self-evident to most Party members and it was only a matter of time before radical changes came to the Party's management of the economic and political systems (see Liu Dejun, ed., *The History of China's Opening Reforms: A Research Review*, pp. 1-3, for one overview of Chinese scholars positions on China's opening reforms). Other scholars highlight the economic necessity of China's opening reforms given the state of the economy in 1976 (for example, see Susan Shirk, *The Political Logic of Economic Reform*, p. 47, and Xie Chun Tao, ed., *China in Transition: 1976-1982*, pp. 184-187). Still others argue that the threat of the Soviet Union caused China to enact opening reforms (for example, see Robert Ross' "International Bargaining and Domestic Politics"). Different from these various accounts, I argue that there was a highly contingent period of uncertainty surrounding the death of Mao in 1976 during which the Hua-Deng leadership competition emerged; the unfolding of the competition ultimately had radical implications for China's strategic culture.

[63] Of the many periodicals that printed Hua Guofeng's speech concerning the establishment of Mao's Mausoleum, I cite the following "Chairman Hua Guofeng's Important Speech," *Fudan Daxue Bao* (*Fu Dan University Paper*), 1976 Z1.

[64] Leng Rong,and Wang Zuoling, *The Life of Deng Xiaoping, Volume One*, p. 155; see also Huang Jing, *Factionalism in Chinese Communist Politics* and Xie Chun Tao, ed., *China in Transition: 1976-1982* (pp. 2-4) for more on the establishment of the "Two Whatevers."

Deng Xiaoping from political power in November of 1975.[65]

During this period Deng Xiaoping had his own designs on returning to power, and Deng was brought back into formal Party meetings in May of 1977 on the condition that he not directly challenge Hua at an upcoming meeting of the Central Committee of the Politburo.[66] Despite this condition, there soon emerged a competition for leadership between Hua and Deng within the CCP and state bureaucracy, and it is clear that neither wanted the other involved in Party leadership.[67] For example, Hua's adoption of the "two whatevers" guiding principle was in part motivated by a desire to keep Deng out of power, while Deng Xiaoping used his own "seek truth from facts" idea to stake out a clear position against Hua's "two whatevers" and, in a 1979 Central Party military committee speech, formally stated his opposition to the "two whatevers" slogan.[68] Despite having recently been purged from the Party, Deng Xiaoping still had a significant presence within the Party leadership and the government bureaucracy, especially within

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[65] Some have downplayed the rivalry between Hua and Deng; for example, Zhang Baijia claims there was no true rivalry between them (Zhang Baijia interview, 07.2009). However, this is contradicted by others such as Huang Jing, who claims there was an intense rivalry reflected in each leaders' political vision (interview, Huang Jing, 05.2009). According to this perspective, Hua Guofeng sought to maintain his status among Maoists as Party leader and actively blocked Deng from returning to power. Indeed, Hua's speech at Mao's Tiananmen memorial service reflects this position, as Deng is mentioned along with Liu Shaoqi and Lin Biao as "anti-revolutionary revisionists" ("Comrade Hua Guofeng's Memorial Speech," *Tuliao Gongye*). See Huang Jing, *Factionalism in Chinese Communist Politics*, chapters One and Two for more on these issues.

[66] Huang Jing, *Factionalism in Chinese Communist Politics*, pp. 353-354.

[67] Interestingly, some scholars at the time simply assumed that Hua was in complete control of the state and attributed aspects of Deng's work to Hua. For example, see the opening paragraph of Chalmers Johnson's article "The New Thrust in China's Foreign Policy," where he describes Hua's need to emphasize stability in the wake of Mao's reign (Chalmers Johnson, "The New Thrust in China's Foreign Policy," p. 125). In fact, it was Deng's definition of stability – i.e. political stability as being achieved through eschewing ideologically based political campaigns – that was being propagated by Deng's political faction in direct competition with Hua's desire to continue the Cultural Revolution under Mao's guiding political principle of class conflict (i.e. Hua's "two whatevers"). Throughout the article Johnson makes no mention of Deng, and he did not seem to know that at that time Deng had reemerged and was in competition with Hua for leadership within the Party.

[68] Huang Jing, Factionalism in Chinese Communist Politics, p. 351-360; interview, Huang Jing, 05.2009; *Deng Xiaoping Wen Xuan Di Er Juan*, pp. 38-39 (Deng's reaction to Hua's "two whatevers"), 113-114 (introducing Deng's "seek truth from facts"), and 190 (formally stated opposition to "two whatevers"); Leng Rong and Wang Zuoling, eds., *The Life of Deng Xiaoping* , 1975-1997, pp. 319-321.

the area of foreign policy; after being restored to power in mid-1977 Deng completely took over the Chinese state's foreign policy as its sole "decision-maker and implementer."[69] He would later use foreign policy decision-making as an instrument to develop domestic constituencies as a balance against ultra-leftist (i.e. Maoist) factions within the Party.[70]

The reemergence of Deng Xiaoping in the late 1970s set the stage for a competition between Hua and Deng's alternative strategic visions regarding the future of the Chinese state, and the US-China normalization process became the ultimate battleground for this emergent competition. Deng Xiaoping propagandized about the need for China to "open" to the world to learn from and receive the latest technology.[71] Hua Guofeng, on the other hand, sought to continue China's Socialist foreign policy of aligning with Third World states and was much more reserved about establishing ties with the U.S.[72] Deng directly acted to implement his strategic vision by initiating talks with the U.S. regarding diplomatic normalization; in contrast, Hua pursued his Maoist

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[69] Zhang Baijia," Chinese Politics and Asia-Pacific Policy," in Ezra Vogel et. al. ed., *The Golden Age of the U.S. - China – Japan Triangle*, p. 45. See also Li Xiangqian, "U.S. - China Normalization and the Shifting of Strategic Focus of CCP Work;" interview, Huang Jing, 05.2009; interview, Zhang Baijia, 07.2009. Deng's involvement in foreign affairs during his second purge gave him a base of political support from which to develop his eventual challenge to Hua Guofeng (interview, Huang Jing, 05.2009).

[70] *Chinese Communist Party Record of Major Historical Events: 1919.5 – 2005.12*, p. 282; Huang Jing, *Factionalism in Chinese Communist Politics*; interview, Huang Jing, 05.2009. Deng's foreign policy influence came after Mao stripped Deng of all official political responsibilities except those concerning foreign affairs in November 1975; he worked in the foreign ministry and developed allies there before emerging as a Party leader after the death of Mao.

[71] See the publicly released portion of Deng's 10/10/1978 speech to a German Federal Republic news delegation wherein he calls for China to "study and receive help from the international system...introduce the latest international technology and equipment as the basis for China's development" (*Deng Xiaoping Wen Xuan,* pp. 132-133).

[72] Carol Lee Hamrin asserts that Hua not only did not seek better ties with the West, but specifically was reticent about establishing formal ties with the U.S. (Hamrin, "Competing 'Policy Packages' in Post-Mao China," p. 494). Hua perhaps did not realize the importance of the issue of U.S. - China normalization, absorbed as he was with planning China's agricultural sector; however Deng was well suited for this battle given his experience within the government and especially the Foreign Ministry (interview, Huang Jing, 05.2009).

strategic vision based on domestic economic planning and was uninvolved in the U.S. – China normalization negotiations.[73] During 1978 Deng Xiaoping was in control of U.S. - China normalization talks, making key decisions throughout the process. For example, during negotiations between China and the U.S., the issue of arms sales to Taiwan remained the largest obstacle to normalization.[74] Deng himself made the decision to put off resolving the issue of arms sales to Taiwan in order to ensure normalization would occur smoothly, and he made this decision without any consultation with Hua Guofeng.[75] The Hua-Deng leadership competition effectively ended in 1979 with the diplomatic resolution of the Taiwan arms sale issue and subsequent normalization of ties with the U.S. Just as the very process of U.S. – China normalization reflected a competition between two very different strategic visions for the Chinese state, so the resolution of this process demonstrated the ascendancy of Deng Xiaoping's vision of China's strategic culture.

U.S.-China normalization of diplomatic ties reflected a transforming strategic culture and marked a formal departure from the isolationist mass politics of the Mao era.

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[73] Li Xiangqian, "U.S. - China Normalization and the Shifting of Strategic Focus of CCP Work;" interview, Huang Jing, 05.2009. This is remarkable considering Hua was the official leader of the PRC and normalization of ties with the U.S. was one of the most important concrete foreign policy events in the post-1949 history of China; further, the person making key decisions about these issues during the normalization process (i.e. Deng Xiaoping) was not only not the formal leader of the Party or government bureaucracy, but also was not in any substantive manner *involving* the formal leader of the Party and state at that time (i.e. Hua Guofeng).

[74] Interview, Huang Jing, 05.2009.

[75] Li Xiangqian, "U.S. - China Normalization and the Shifting of Strategic Focus of CCP Work;" interview, Huang Jing 05.2009. Although Hua did espouse general conditions for U.S. - China talks over Taiwan while using the Taiwan issue to attack Deng (Robert Ross, "International Bargaining and Domestic Politics," pp. 266, 270), he was uninvolved in the direct negotiations regarding the Taiwan issue. It is remarkable that Hua Guofeng was uninvolved with negotiating the Taiwan issue during the normalization process, considering that management of the Taiwan issue has always constituted an essential test of leadership within China. Further, the time line of normalization talks closely coincided with two major CCP conferences spanning November through December of 1978, strongly suggesting that Deng linked normalization of ties with the U.S. to his own domestic political goal of ousting ultra-leftists from leadership positions within the Party.

The diplomatic resolution of the Taiwan arms-sale issue is especially symbolic of this shift, considering that dispute over Taiwan between the U.S. and China during the Korean War is widely considered to have contributed to China's initial decision to initiate a nuclear program. Developing formal diplomatic relations with its historic rival through compromising on a fundamental national security issue reflected a radical reformulation of how China's leaders viewed the role of military within international affairs, revealing an important change in China's strategic culture. This shift in strategic culture presaged changes in China's nuclear weapons program that were detailed in part two of this chapter. At a general level, the close timing of China's cultural changes followed by reforms within its nuclear weapons program support links between these areas. However, at a more detailed level, the substance of China's transformed strategic culture was reflected within specific reforms to China's nuclear weapons program, providing further support for links between these areas. Indeed, as China's strategic culture changed to incorporate military and education reforms, concrete policies were implemented within China's nuclear weapons program in the areas of education, training, and theory development. Following details just how China's strategic culture changed during China's opening reform period of the Deng Xiaoping era, and how these changes affected China's nuclear weapons program.

China's New Strategic Culture and its Reflection within the Nuclear weapons program

China's strategic culture changed dramatically after Deng became the de facto leader of China in the late 1970s. Chapter two defined strategic culture as the historically patterned way in which the state and state elites "think about the use of force

for political ends;"[76] it is a "'system of symbols (e.g. argumentation structures, languages, analogies, metaphors) which acts to establish pervasive and long-lasting strategic preferences by formulating concepts of the role and efficacy of military force in interstate political affairs.'"[77] In the case of China's post-Mao leadership change, Deng Xiaoping and other leaders changed their thinking regarding the role of the military in achieving China's political ends. Specifically, Deng Xiaoping asserted that the threat of major war was drastically reduced; the threat that China and the Soviet Union might become involved in a major war was very low; and that diplomatic international engagement, economic reform, scientific education, and bureaucratic professionalization were effective methods for China to enhance its security within the international system.[78]

In support of China's strategic culture transformation, a set of phrases and analogies was designed to reformulate preferences regarding the role of the PLA in interstate affairs. This began with the introduction of the phrases "seek truth from facts" (实事求是, shishi qiushi) and "opening" (开放, kaifang) within leadership meetings and conferences as new political ideas created as expressions of China's new strategic culture, and leaders aligned with Deng Xiaoping formally promulgated these phrases through the state media.[79] These phrases became cultural-linguistic reflections of China's Deng-era

[76] Alastair Iain Johnston, *Cultural Realism*, p. 1.
[77] Alastair Iain Johnston, "Thinking about Strategic Culture," p. 46.
[78] John Lewis and Xue Litai, *China's Strategic Seapower*, p. 100.
[79] The fact that the Chinese government formally promulgated the phrases "seek truth from facts" and "opening" through Chinese state media is well established as a truism of China's political history. For example, by early 1978 a new magazine entitled *Qiu Shi* (*Seeking Truth*) was being published in Beijing containing articles promulgating support for "seek truth from facts" as Deng's guiding principle. Further, my assertion that these phrases were created and promulgated by Deng Xiaoping's political faction with the goal of reshaping China's political culture is in keeping with Huang Jing's historical account of Chinese Communist political history in *Factionalism in Chinese Politics* and other classic scholarly works that reference the role of political slogans in Chinese political culture, including Lowell

strategic culture transformation; they were linguistic symbols that embodied the set of new strategic preferences of China's dominant military and political leadership during the Deng era. They provide links between China's transformed strategic culture and changes within its nuclear weapons program; I trace these links below.

Seek Truth from Facts

The phrase "seek truth from facts," also known as the "truth criterion," was the philosophical foundation for political ideas designed to move China's domestic political landscape away from the mass mobilization politics of the Mao era. It was introduced by Deng Xiaoping in 1978 as a conceptual shift towards using practical results as the basis for assessing the success of policies, rather than Maoist ideological criteria.[80] "Seek truth from facts" formed the basis of many reform policies, to include the PLA's reform of leadership qualifications in general and the overhaul of the Second Artillery's command and control structure in particular.[81] While China's PLA reform efforts during the Deng era followed long-term debate patterns for the PLA between ideological commitment versus professionalization that date back to the Korean war, Deng used linguistic symbols to reframe this debate as a choice between the truth criterion ("seek truth from facts" as the basis for evaluating performance) and Maoist cult of personality politics ("whatever Mao did and whatever Mao said" as the basis for evaluating

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Dittmer's *China's Continuous Revolution*; Joseph Fewsmith's *Dilemmas of Reform in China* and Roderick MacFarquhar's edited volume *The Politics of China: 1949-1989*.

[80] *Deng Xiaoping's Collected Works, Volume 2*, pp. 113-119; see also Leng Rong and Wang Zuoling, eds., *The Life of Deng Xiaoping* , 1975-1997, pp. 319-321; and Lowell Dittmer, *China's Continuous Revolution*, pp. 233, 239.

[81] This reform process included aforementioned troop reductions (see part one of this chapter), and was encapsulated in a slogan intended to create an appropriate political-cultural context for these reforms: "We must build a strong, modernized, and regularized revolutionary army" ("必须把我军建设成为一支强大的现代化，正规化的革命军队") (Zhang Aiping, et. al., *China's People's Liberation Army, Volume One* (*Zhongguo Renmin Jiefang Jun*, *Di Yi Ban*), p. 116).

performance). After Deng won the post-Mao leadership competition, "seek truth from facts" became the cultural foundation upon which subsequent reform – to include PLA modernization and integration of the nuclear weapons program within the PLA - was established.

There are a variety of links between the establishment of "seek truth from facts" as a linguistic symbol of China's changed strategic culture and the subsequent initiation of its nuclear weapons program reforms. To begin, the timing of these changes is significant. "Seek truth from facts" was established just prior to PLA and nuclear weapons program reforms, suggesting a causal process beginning with changes to cultural norms and symbols and ending with subsequent policy changes.[82] Further, the concept of "seek truth from facts" was periodically mentioned in speeches given by Deng Xiaoping relating specifically to education and military reform. For example, Deng referred to "seek truth from facts" in a speech advocating educational reform at all levels in the wake of the Cultural Revolution, when Chinese leaders were still debating the class role of intellectuals within Chinese society.[83] Later, Deng explicated "seek truth from facts" during a speech at a military-wide conference concerning the import of PLA reforms in June of 1978, and then linked this concept to the initiation of PLA reforms:

> "This instance of the military-wide political work conference seeks to resolve what question? From the perspective of a military unit's enduring problems and its actual current situation, the most important issue is how to- under new historical conditions - both return to and further develop our best political traditions while also improving our military's fighting capability. This is according to comrade Mao's "seek truth from facts" teaching to research and analyze actual situations and resolve actual problems."[84]

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[82] See Paul Pierson, *Politics in Time*, Chapter Two, for more on the importance of timing and sequencing for explanations of socio-political phenomena.

[83] *Deng Xiaoping's Collected Works, Volume 2*, pp. 66-67.

[84] "这次全军政治工作会议要着重解决什么问题呢？从部队存在的问题和实际情况来看，最重要的，

Even now, "seek truth from facts" remains a relevant cultural symbol; in the 2004 edition of *Second Artillery Campaign Science*, the phrase is periodically referenced in relation to improving the Second Artillery's theoretical and research knowledge base.[85] Taken together, the causally significant timing of the establishment of "seek truth from facts" as a new cultural symbol with subsequent military reforms, the explicit linking of this phrase within speeches related to military and education reform, and the periodic citation of this phrase within a Second Artillery primary source published in 2004, altogether supports the assertion that Deng's new strategic culture symbol "seek truth from facts" was significantly linked to subsequent nuclear weapons program reforms. In fact, "seek truth from facts" formed the foundation for a broad set of mutually reinforcing political ideas emphasizing not just military reform, scientific education, and technological development, but also opening to the outside world. As such, it was additionally linked to China's opening, referred to as "kaifang."

Opening (Kaifang)

The word "opening" is my abbreviation for several cultural phrases referring to economic and diplomatic opening policies that were a dramatic shift from Mao's general foreign policy isolationism and towards the Chinese state's deeper integration with the

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就是要研究和解决在新的历史条件下，怎么恢复和发扬政治工作的优身传统，提高我军战斗力的问题。这就是按照毛泽东同志关于实事求是的教导，研究分析实际问题，解决实际问题。" (*Deng Xiaoping's Collected Works, Volume 2*, p.119.) Although the quote links Mao to the phrase "seek truth from facts," this was just an attempt at framing a radically new political philosophy (i.e. "seek truth from facts") within historically accepted political terms; in fact, Maoists (correctly) interpreted this as an affront to Hua Guofeng's "two whatevers."

[85] Yu Jixun, *Second Artillery Campaign Studies*, pp. 24, 32, 130.

international system.[86] Economically, ideologically-based economic planning gave way to military industrial reforms, and subsequent civil-military economic partnerships defined the process of commercialization for China's nuclear facilities. In terms of foreign policy, in the absence of interstate threat or domestic revolution, Deng Xiaoping shifted China away from a relatively isolated foreign policy highlighted by periodic confrontations with superpowers and towards deepened international economic and diplomatic interdependence with other states. China's "opening," inaugurated by normalization of diplomatic ties with the U.S., presaged a period of rapid integration with other states in the international system across a variety sectors.

The concept of "opening" was directly linked to Deng's scientific education and training reforms for the Chinese state in a manner that ultimately affected China's nuclear program. For example, in 1980 Deng Xiaoping spoke to a German Federation news delegation about the need for China to open to the world and learn from the most advanced countries. The speech, titled "Implement the Opening Policy, Study the World's Foremost Science and Technology," discussed the need for China to adopt new policies in response to a new historical situation, and to use opening policies to introduce new technology to China.[87] Soon after this speech, and others like it, China began unprecedented scientific education and training exchanges with Western states, including a series of exchanges with U.S. nuclear institutions during the 1980s.[88]

Further, China's opening to co-binding relationships with other states transformed the perceived role of the Chinese military for pursuing its national interest; military force

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[86] These phrases include "opening reforms" (gaige kaifang) and "opening policies" (kaifang zhengce).
[87] *Deng Xiaoping's Collected Works, Volume 2*, p.132-133.
[88] For example, in their chapter about China, Thomas Reed and Danny Stillman describe scientific exchanges between Chinese and American nuclear facilities (Reed and Stillman, *The Nuclear Express*, Chapter Seven).

became one of many other tools for the Chinese state as it pursued its national interest within the international system. International confrontation was replaced with diplomatic engagement and the accession to myriad international treaties and organizations.[89] In particular, China acceded to a variety of nuclear-related international agreements that created reporting mechanisms reinforcing restraint for China's nuclear weapons program overall. This expansion of diplomatic engagement with other states in the international system reduced the overall role of the PLA, corresponding to the continued constraint of China's nuclear weapon force and its limited nuclear weapon production infrastructure. Indeed, "opening" - and the cultural symbols that refer to China's opening - reflects a deep reformulation of Chinese leader's conception of the role of military force in interstate affairs.[90]

Together, "seek truth from facts" and "opening" reflected a new strategic culture for China that redefined the role of the Chinese state *qua* state within the international system. This affected China's nuclear weapons program in terms of scientific education, professionalization, economic reform, and international engagement, leading to an improved nuclear second-strike capability within a context of reinforced material restraint of China's nuclear force overall. As China's strategic culture was reshaped to emphasize military and education reform, this filtered into the Second Artillery in the form of educational exchanges (e.g. conferences), the unprecedented publication of training manuals for nuclear weapons military units, an educational system dedicated to the

[89] Alastair Iain Johnston documents China's growing participation with international institutions during the 1980s in his book *Social States*, and further shows that the rate of participation within these institutions actually increased into the 1990s (Alastair Iain Johnston, *Social States*, pp. 33-36).

[90] In another example of this reformulation, China went from acceding to just 25% of their total eligible arms control treating in 1977 to approximately 65% by 1992 under Deng Xiaoping (Alastair Iain Johnston, *Social States*, p. 35).

Second Artillery organization, and unprecedented training exercise for nuclear units. This integrated China's nuclear force within the PLA. Applying the truth criterion to China's political bureaucracy augured PLA reforms towards increased professionalization, which led to a reorganized command and control structure for China's Second Artillery. Together, these specific reforms improved the overall credibility of China's nuclear second-strike capability.

Change within a Context of Continuity: Path Dependence and the Reinforcement of Restraint

While China's transformed strategic culture caused certain changes within its nuclear weapons program, this occurred within a context of continued restraint for the program as a whole. China's nuclear weapons program remained restrained during the Deng era for two reasons. First, inherited material conditions from the Mao era influenced China's decision-makers to continue the restrained development trajectory of the program. Second, aspects of China's strategic culture transformation caused certain polices that further reinforced this restraint. Exploring the effects of these inherited conditions establishes the historical material context within which China's post-Mao leadership made decisions regarding China's nuclear weapons program, and the combination of inherited material condition and reinforced restraint explains why China's nuclear weapon force remained small and vulnerable during the Deng era.

China's post-Mao leadership inherited a nuclear program that was constrained in terms of numbers of nuclear weapons and in terms of the infrastructure used to produce these weapons. As chapter three established, by 1976 China had approximately 30 each

of CSS-1 (range 1050 KM) and CSS-2 (range 2650 KM) missiles, totaling approximately 60 total strategic nuclear weapons. This is a generous characterization; China's nuclear arsenal was not truly strategic since the CSS-2 - China's longest range missile at that time - could not reach Moscow from Chinese territory. Despite not meeting the basic theoretical requirements of strategic deterrence, the consistently low number of strategic nuclear weapons reflected Maoist "People's War nuclear deterrence," i.e. the notion that the demonstration of a nuclear detonation by itself served as a strategic nuclear deterrent. China's low numbers of nuclear weapons throughout the Mao era then had a lasting effect on the post-Mao leadership. When Mao died in 1976, this approach to nuclear weapons had been reinforced by 12 years of successful deterrence employing only a small number of nuclear weapons. This includes the 1969-1970 Sino- Soviet nuclear standoff, wherein the Soviet Union threatened China with a nuclear strike and China put its nuclear forces on their highest level of alert to date. For China's post-Mao leaders, this earlier period of successful deterrence reinforced the notion that strategic nuclear deterrence could be achieved without building a large, highly differentiated nuclear force. Post-Mao leaders inherited this pathway, and demonstrated their acceptance of its efficacy throughout the Deng era by keeping the overall numbers of China's nuclear weapon force low.

Further, China's post-Mao leadership inherited a nuclear program that was constrained in terms of the infrastructure used to produce these weapons, representing a sunk investment that reinforced the restrained development trajectory of China's nuclear program in a path dependent manner. From the beginning of the program, achieving technical breakthroughs and sustaining overall program continuity through strategic redundancy was emphasized over expanding production capacity. Thus, China's nuclear

production infrastructure was organized in a redundant, geographically dispersed manner that emphasized security over production efficiency. This was first exhibited through the building of both a gaseous diffusion and plutonium-producing reactor for producing fissile material, and was later reinforced through Mao's Third Line campaign, which established two additional, redundant fissile material production facilities in geographically dispersed areas of the country. This physical configuration of China's nuclear industry could not be easily changed by post-Mao leadership without further significant investment. Indeed, even after the post-Mao leadership authorized the reorganization of the nuclear industry in the 1980s towards civilianization, the industry's Mao-era "strategic redundancy" pattern of organization hindered these reorganization efforts throughout the period.[91] Altogether, the inherited conditions of China's nuclear weapons program presented China's post-Mao leadership with a decade-long reinforcement of strategic deterrence using low numbers of nuclear weapons and a geographically dispersed, redundant production infrastructure.

In addition, aspects of China's strategic culture transformation caused certain polices that further reinforced the restrained development trajectory of China's nuclear weapons program. Specifically, policies promoting de-militarization, commercialization, and internationalization further reinforced the constrained development trajectory of China's nuclear program. China's state-led economic reforms applied downward pressure on military budgeting, leading to changes in China's nuclear industry that included the development of a civilian market for low-enriched uranium. As China began de-militarizing and commercializing aspects of its nuclear weapon

[91] Yun Zhou et. al. make this point in their analysis of China's nuclear power industry (Yun Zhou, et al., "Is China Ready for Nuclear Expansion?").

production infrastructure, they ceased producing military-grade fissile material at their key production facilities. As China began deepening engagement with the international system, it acceded to a variety of nuclear-related treaties that have acted as mechanisms reinforcing the constrained development trajectory of China's nuclear program. Taken together, these reforms further reinforced the constrained development trajectory of China's nuclear industry and weapon program.

In particular, China's accession to nuclear-related international agreements during the Deng era created self-reinforcing mechanisms that furthered the restrained development trajectory of China's nuclear weapons program. Self-reinforcing mechanisms refer to sequences wherein "initial steps in a particular direction induce further movement in the same direction such that it becomes difficult…to reverse direction."[92] For example, China's accession to the Non-Proliferation Treaty in 1992 entailed agreeing to "safeguards" as a treaty verification mechanism regarding fissionable material:

> "Each Non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency in accordance with the Statute of the International Atomic Energy Agency and the Agency's safeguards system, for the exclusive purpose of verification of the fulfillment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices. Procedures for the safeguards required by this Article shall be followed with respect to source or special fissionable material whether it is being produced, processed or used in any principal nuclear facility or is outside any such facility. The safeguards required by this Article shall be applied on all source or special fissionable material in all peaceful nuclear activities within the territory of such State, under its jurisdiction, or carried out under its control anywhere."[93]

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[92] James Mahoney, "Path Dependence in Historical Sociology," p. 512.

[93] International Atomic Energy Agency, "Treaty on the Non-Proliferation of Nuclear Weapons," Article III, part one.

"Safeguards" are a separately negotiated verification mechanism requiring periodic reporting of nuclear industry-related information to the monitoring agency, in this case the International Atomic Energy Agency (IAEA). For example, states must provide "a general description of and information specifying the location of nuclear fuel cycle-related research and development activities" and information regarding quantities and location of nuclear material according to various annual reporting requirements stipulated within a document referred to as the "Model Protocol."[94] Given these requirements, China must report to the IAEA the state of its nuclear-related research and its production of fissionable material; this has imposed a level of transparency on China's nuclear industry that has reinforced the restrained development pattern of its nuclear weapons program.

Conclusion

This chapter has shown that the post-Mao leadership transition led to a shift in China's strategic culture, which in turn caused important changes within China's nuclear weapons program. China's strategic culture shift led to changes in Second Artillery education, command and control, and training readiness, all of which improved China's nuclear second-strike capability without any expansion of its nuclear weapon force. Further, the *manner* in which China's strategic culture changed dictated specific types of change to China's nuclear weapons program, while fitting within prevailing path dependent material constraints. A cultural emphasis on scientific education and training led to just these types of changes in China's nuclear weapons program, as a conception of

[94] International Atomic Energy Agency, "Model Protocol Additional to the Agreement(s) Between the States and the International Atomic Energy Agency for the Application of Safeguards."

increased diplomacy and a reduced role for the military within interstate affairs corresponded with the various path dependent material constraints that reinforced low numbers of nuclear weapons for China's nuclear weapons program.

However, this change occurred within a context of overall restraint for the program as whole, as certain ideational and material inherited conditions constrained Chinese leaders' decision-making while aspects of China's strategic culture transformation reinforced restraint of the program path dependent manner. The Mao-era organization of China's nuclear industry promoted production inefficiency and hindered efforts at reform, and the idea that China could achieve nuclear deterrence with a small number of nuclear weapons continued throughout the Deng era, as seen through the continued low numbers of nuclear weapons deployed during this period. De-militarization and commercialization of China's fissile material production facilities thus progressed slowly, yet initiated a new series of self-reinforcing processes that further restrained key aspects of China's military-controlled nuclear weapon production infrastructure, restraint that extended through the 1990s. Increased international engagement resulted in China's accession to several nuclear-related international treaties; these agreements became nascent self-reinforcing mechanisms restraining the development of aspects of China's nuclear weapons program.

The next chapter will explore how China's deepening international engagement led to joining international treaties related to nuclear weapons and nuclear material handling, including the Convention on Assistance in Case of Nuclear Accident (1986), Convention on Early Notification of Nuclear Accident (1986), South Pacific Nuclear-Weapons Free Zone (1987), Convention on the Physical Protection of Nuclear Material

(1989), and the Non-Proliferation Treaty (1992).[95] This led to greater transparency for China's nuclear weapons program. In addition, we will see the Second Artillery's role transformed within the PLA to include new conventional military responsibilities, both reducing the role of nuclear weapons within China's military apparatus as it increased the overall responsibility of the organization overseeing China's nuclear arsenal.

[95] Alastair Iain Johnston, Social States, p. 36.

Chapter Five: Reinforcement of the Deng-Era Development Trajectory, 1993-2011

Introduction

The previous chapter defined China's domestic political transition from Mao to Deng Xiaoping as a critical juncture for China's nuclear weapons program, wherein China's strategic culture transformation caused some changes to China's nuclear weapons program within a context of ongoing restraint for the program as a whole. This chapter shows that China's nuclear weapons program development trajectory continued according to this development pattern that was established during the Deng era. The program remained constrained in terms of its deployment of nuclear weapon systems and its nuclear industry; continued incremental modernization of key deployment systems; continued Second Artillery training and education programs; and the increased the integration of its nuclear forces with the PLA. Further, China's accession to nuclear-related treaties continued, expanding the number of self-reinforcing mechanisms institutionalizing China's nuclear weapons program development trajectory Taken together, even as China's nuclear weapons program continued incremental improvement of its overall counterstrike capability during this period, this occurred within a context of overall restraint of its nuclear weapons program that was in keeping with the long-term development trajectory of the program.

To show this, part one of this chapter delineates China's nuclear weapon force structure, nuclear infrastructure, and China's continued accession to international agreements related to its nuclear weapons program and domestic nuclear industry.

China's nuclear forces remained remarkably constrained in terms of overall force numbers when compared those of the U.S. and Russia, although there remained incremental modernization efforts for certain missile deployment systems during the 1993-2011 period. China's nuclear weapon research and development infrastructure also incrementally expanded to a new area during the late 1980s through the 1990s, and its civilian nuclear power industry slowly expanded as China continued to de-militarize its nuclear industry, continuing Deng-era trends. China's accession to nuclear-related international agreement accessions increased during this period, representing institutionalized expectations for China's nuclear weapons program that constituted self-reinforcing mechanisms of restraint regarding nuclear weapon development. Taken together, this supports an essential premise of this dissertation: China's nuclear force remained historically small in comparison with the U.S. and Russia, against the expectations of nuclear deterrence theory yet in accordance with the dominant strategic culture established during the Deng era emphasizing incremental development, counterstrike credibility, and internationalization.

Part two of this chapter explains how China's nuclear weapons program continued its integration with PLA forces in terms of nuclear doctrine and deployment between 1993 and 2011. While China remained committed to a NFU policy entailing a second-strike countervalue targeting nuclear weapon doctrine, it also integrated aspects of nuclear and conventional strategic missile deployments and began emphasizing mobility as key for the survivability of all land-based systems. Additionally, the Second Artillery integrated nuclear and conventional missile brigades to an extent that was unprecedented. In terms of deployment, China emphasized feinting strategic intent through dispersal of

its road-mobile land-based missile systems, combining units to emphasize speed and deception according to the situation, and developing a variety of transportation routes from garrison to launch site that include overlap with civilian areas. Overall, this reflects the extent to which China's nuclear weapons program has become integrated within the PLA as a whole, with mobile land systems the key area of overlap between these two types of units; this continues the Deng-era development trajectory for China's nuclear weapons program.

Part three explains why China's nuclear weapon organization – the Second Artillery - expanded to include integration with conventional missile forces between 1993 and 2011, even as China's nuclear weapons program remained restrained overall. As China's domestic political environment stabilized throughout the 1990s, China's military and political leaders became more responsive to international events. The breakup of the Soviet Union in the early 1990s indirectly affected China's nuclear program by changing the distribution of power within the international system, and the 1991 Persian Gulf War led to a refinement of China's military doctrine towards planning for localized conflicts under the conditions of high technology. This shift reflected a refinement in how China's political and military leaders assessed the future of China's military threats, leading to an expansion of the Second Artillery to include conventional missile forces. Taken together, as China's nuclear weapons program remained constrained in terms of weapon totals, China expanded the role of the Second Artillery to include conventional missiles in a manner that deepened integration with conventional PLA forces to an unprecedented extent, reinforcing the Deng-era trend of increased integration and force preparedness for China's Second Artillery within a context of ongoing restraint.

Part One: China's Nuclear Force Structure, Nuclear Infrastructure, and Nuclear-related International Commitments

China's Nuclear Force: 1993-2011

Most publically available sources estimate that China had between 200 and 400 nuclear weapons and/or warheads in its national stockpile between 1993 and 2010. According to a declassified CIA report dating from 1996, US intelligence agencies estimated China had between 200-300 total nuclear weapons, probably including both deployed and separately stored nuclear warheads.[1] According to a different accounting method that focuses on nuclear warhead totals, the Natural Resources Defense Council (NRDC) estimates that China's total nuclear warhead stockpile amounted to a fraction of those maintained by the U.S. and Russia during the 1990s, even as the effects of various arms control treaties dramatically reduced their nuclear forces from previous Cold War highs of the mid-1980s. According to the NRDC, by 2002 China had approximately 400 total nuclear warheads in its stockpile, where stockpile entails any assembled and stored warhead with any type of delivery vehicle, from gravity bombs to missiles. By contrast, in 2002 the U.S. and Russia had approximately 10,640 and 8,600 stockpiled nuclear warheads, respectively, presented in chart form below to provide a statistical comparison.[2] (See below chart)

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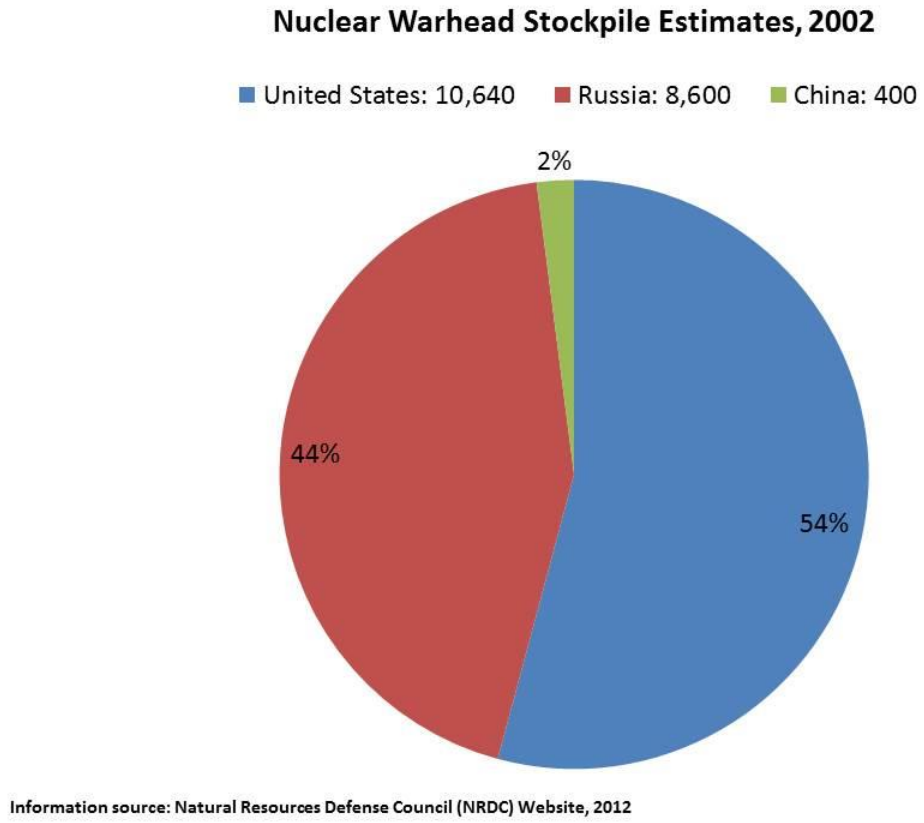
[1] *Proliferation Digest*, Directorate of Intelligence, March 1996.

[2] I do not integrate 2002 nuclear weapon stockpile data for the United Kingdom (200) or France (350) into this analysis since they relied upon the U.S. "extended deterrence" security policy applied to NATO member states, whereas China has never been protected by another state's nuclear force. Data source: Natural Resource Defense Council (NRDC) Website, 2012. For a recent analysis of the U.S. extended deterrence policy, see Steven Pifer et. al., "U.S. Nuclear and Extended Deterrence."



China's deployment of strategic nuclear weapons has relied almost exclusively on land-based silo and road-mobile missile systems. In 2007, Jeffrey Lewis assessed that China's nuclear forces number approximately 80 operationally deployed nuclear warheads assigned to (and stored separately from) liquid fueled ballistic missile delivery systems that are stored unfueled, with more warheads possibly stored separately from deployment systems.[3] Lewis estimated that China had deployed approximately 18-20 nuclear-armed ICBMs with a range capable of striking the continental United States (the

[3] Jeffrey Lewis, *The Minimum Means of Reprisal*, p. 25-31. For Lewis, operational deployment numbers are the best gauge of China's nuclear deterrence attitudes. Lewis notes that the U.S. intelligence community believes China has less than 100 operationally deployed nuclear warheads assigned to ballistic missiles, but more nuclear warheads in storage. Other delivery systems do not factor into China's assessment of its nuclear weapon capability as China relies solely on ballistic missiles for its strategic nuclear force

CSS-4, or DF-5, range approximately 8,000 miles or 12,900KM);[4] about 12 nuclear-armed intermediate range ballistic missiles (IRBMs, range approximately 3,400 miles or 5,500km); a small number of submarine launched ballistic missiles (SLBMs) that remain undeployed, and about 44 nuclear-armed "theater" ballistic missiles with variable lesser ranges.[5] In keeping with China's overall nuclear deployment history, its bomber fleet has remained aging and likely incapable of penetrating modern air defense systems;[6] their submarine launched ballistic missiles (SLBMs) are intended for loading onto a nuclear ballistic missile launching submarine (SSBN) that has never been verifiably deployed on a strategic deterrence mission;[7] and, according to Lewis, China likely has not had deployed tactical nuclear weapons.[8]

A more recent 2011 Bulletin of the Atomic Scientists report concluded China's nuclear weapon force has incrementally expanded since the mid-2000s, estimating that its nuclear warhead stockpile totaled about 240 warheads, with approximately 140-190 total deployed nuclear warheads.[9] Of these, approximately 140-150 are assigned to land-based ballistic missiles; perhaps as many as 40 are assigned to various aircraft; and an unknown number are SLBMs assigned to a Jin-class submarine that has probably never conducted deterrence patrol missions.[10] According to this report, about 85% of China's

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[4] Jeffrey Lewis, *The Minimum Means of Reprisal*, pp. 31-32. The CSS-4 is a liquid fueled ICBM based in silos that Chinese leaders likely believe is vulnerable.

[5] Jeffrey Lewis, *The Minimum Means of Reprisal*, pp. 30-31.

[6] Jeffrey Lewis, *The Minimum Means of Reprisal*, pp. 39-40; Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, Executive Summary p. 2.

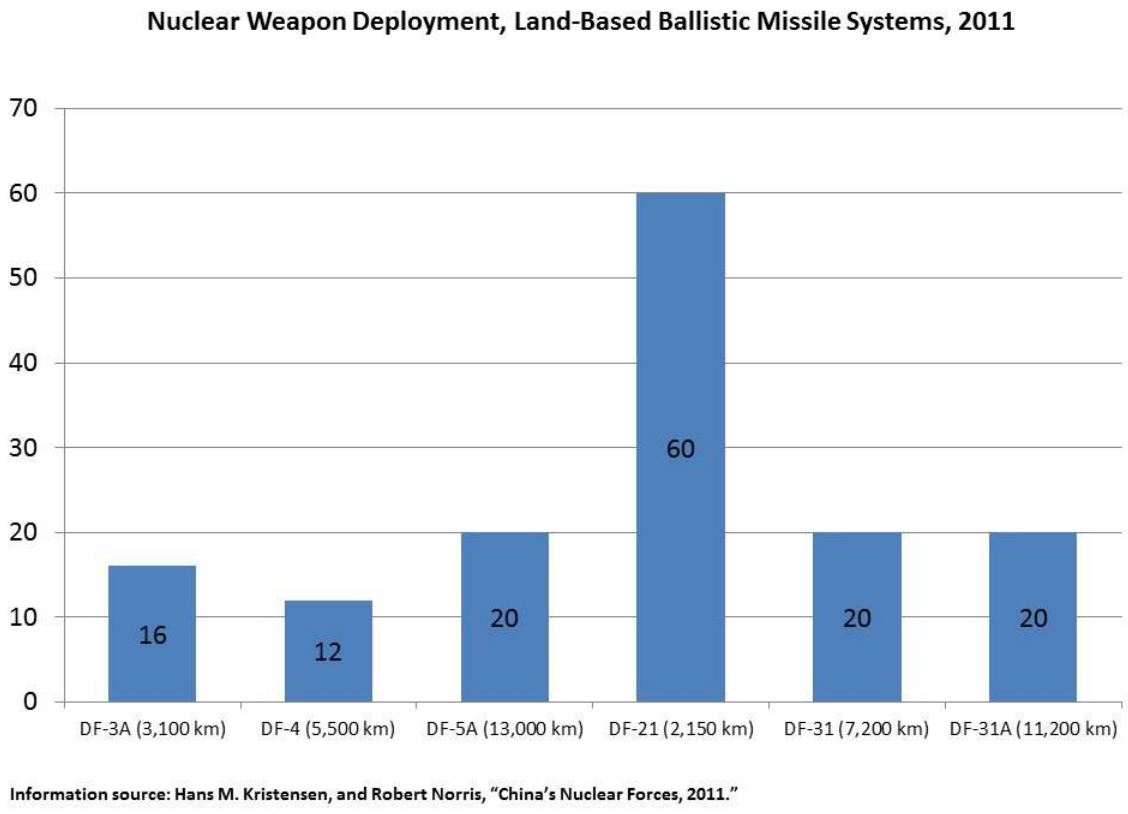
[7] Jeffrey Lewis, *The Minimum Means of Reprisal*, p. 36; Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, Executive Summary p. 2. Indeed, as of 2013 China still has no verified nuclear ballistic missile launching submarine capability despite beginning development of this system in the 1980s.

[8] Jeffrey Lewis, *The Minimum Means of Reprisal*, p. 44.

[9] Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, Executive Summary p. 2; see also p. 59.

[10] Hans M. Kristensen and Robert Norris, "Chinese Nuclear Forces, 2011."

deployed land-based strategic nuclear ballistic missile force may be considered road-mobile, and is distributed as follows: 16 DF-3A road mobile medium range ballistic missiles (MRBM), range 3,100 kilometers (km); 12 DF-4 road mobile intermediate range ballistic missiles (IRBM), range 5,500 km; 20 DF-5A silo-based intercontinental ballistic missiles (ICBM), range 13,000 km; 60 DF-21 road mobile short range ballistic missiles (SRBM), range 2,150 km; as many as 20 DF-31 road mobile IRBMs, range 7,200 km; and as many as 20 DF-31A road mobile ICBMs, range 11,200 km.[11] (See below chart)



[11] Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, p. 46-47. See also: Mulvenon and Yang, eds., *The People's Liberation Army as Organization: Reference Volume v1.0*.

Note that more than half of China's estimated nuclear ballistic missile force is apportioned to missiles with a range between 2,500 km and 3,100 km. While the short range of these systems may suggest a possible tactical function, there is no evidence that China has changed its NFU policy or its counter-value targeting strategy. Historically, China developed a short-range nuclear missile force targeting cities in the Soviet Union close to China's northern border; currently, given that India and Pakistan are both demonstrated nuclear powers in close geographic proximity to Chinese borders, it is likely that these short ranged systems are designed for strategic deterrence missions against Russia, India, and Pakistan targets nearby China's borders.

China's SLBM program remained in a research and development phase during this period, with no clear indication of operational deployment. China redesigned the *Xia*-class SSBN between 1995 and 1998, and while it is possible that during the 1990s the *Xia* periodically deployed the JL-1 SLBM with a range of approximately 1,700km, this SSBN/SLBM combination experienced technical problems throughout its lifespan and there is no indication China conducted regular deterrence patrols.[12] By 2004 China had launched the first in a new class of SSBN, the *Jin*-class submarine, designed to carry 12 JL-2 SLBMs with a range of approximately 8,000km.[13] While there has been periodic mention of the *Jin*-class submarine in relation to China's JL-2 missile development in academic sources, such as reference to commercial satellite imagery from 2006 of an apparent Chinese *Jin*-class SSBN submarine in the waters off China's east

[12] Jeffrey Lewis, *The Minimum Means of Reprisal*, pp. 70-71; Ta-Chen Cheng, "The Evolution of China's Strategic Nuclear Weapons," p. 249; Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, pp. 79-82.

[13] Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, pp. 82-85.

coast, this did not entail operation deployment of an SLBM capability.[14] Indeed, despite its long history of SSBN/SLBM research and development, through 2010 China still had not operationally deployed an SSBN capable of conducting regular deterrence patrols in support of a survivable second-strike nuclear capability.

While there has been debate regarding the extent to which China has been modernizing its strategic nuclear missile force, long-term modernization trends includes the development of solid-fuel missile systems, increased road-mobile systems, improved concealment for all land-based missile systems, improved strategic warning systems, and the eventual development of a deployable SLBM capability.[15] These modernizations have caused some to question whether China seeks to challenge U.S. nuclear superiority, however it is important to remember that these development trends follow China's Deng-era directive regarding the incremental improvement of nuclear force protection and second-strike capability.[16] China's research and development in these areas has indeed proven to be slow-paced and incremental in nature; for example, China's SSBN/SLBM research and development began in the early 1960s, and by at least 2010 China had still not verifiably deployed an operational SSBN system. Further, there is some indication that China has favored improving the survivability of its land-based missile systems,

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[14] Michael Chase, Andrew Erickson, and Chistopher Yeaw, "Chinese Theater and Strategic Missile Force Modernization and its implications for the United States," pp. 78-80. Regarding the identification accuracy of this imagery reference, the authors assume that there has been correct identification of a shape on an image as being a *Jin*-class submarine, and apparently rely on a Federation of American Scientist blog for this interpretation. However, this could be an incorrect identification, a possibility the authors do not entertain (Michael Chase, Andrew Erickson, and Chistopher Yeaw, "Chinese Theater and Strategic Missile Force Modernization and its implications for the United States," pp. 79, footnote 57).

[15] Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*; Li Bin, "Tracking China's Strategic Mobile Missiles;" Baohui Zhang, "The Modernization of Chinese Nuclear Forces and its Impact on Sino-U.S. Relations;" see also Avery Goldstein, *Rising to the Challenge*, pp. 62-63, although Goldstein does not discuss China's nuclear force situation or possible modernization.

[16] Yu Jixun, *Second Artillery Campaign Studies*, p. 11.

perhaps to support both nuclear and conventional missile brigades.

The development of the DF-31 exemplifies some of these modernization trends, and the Chinese scholar Li Bin, a professor at Qinghua University's International Studies Institute, offers a case study of the DF-31 road mobile ICBM system in his analysis of the survivability of this developmental missile system. The DF-31 missile is projected to have a range of between 7,000 and 8,000km; it is a road mobile transporter-erector-launcher (TEL) towed by an eight-axle semi-trailer vehicle; the missile measures 14.3-meters-long, the canister 15.4-meters-long, and the TEL vehicle 18-meters-long; and the total weight of the system is estimated to be about 55,700kg.[17] The DF-31 is designed for mobility on standard roads throughout China, and Li Bin speculates that the size and weight of the system (to include nuclear payload size) may have been reduced in order to increase its mobility.[18] Overall, the DF-31 exemplifies the extent to which mobility has been emphasized within modernization trends for Second Artillery missile forces.

Taken together, although accounting methods differ between sources of estimated nuclear weapon force numbers, all available estimates of China's nuclear forces during the Jiang-Hu era of 1993-2011 indicate that while there appears to have been incremental expansion of certain deployed nuclear weapons, overall China's nuclear weapon force has remained quite limited in comparison with U.S. and Russian force totals in keeping with the long-term historical trajectory of China's nuclear force structure during the Mao and Deng eras. During this period China likely had no more than approximately 400 total stockpiled nuclear warheads that included approximately 140-190 total operationally

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[17] Li Bin, "Tracking China's Strategic Mobile Missiles," pp. 5-7; Li notes the DF-31 is also referred to as "CSS-9," although Kristensen et al. have referred to this system as CSS-X-10 (Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, p. 46).

[18] Li Bin, "Tracking China's Strategic Mobile Missiles," pp. 7.

deployed nuclear-armed missiles, with only as many as 40 ICBMs capable of striking the US mainland (the DF-A and DF-31A) and perhaps slightly more nuclear-armed missiles capable of striking deep into Russia. In fact, most of China's deployed nuclear weapons remain assigned to short and intermediate range ballistic missile systems that cannot target the U.S. mainland. Remembering that China began its nuclear weapons program in 1955 and first successfully tested an indigenously produced nuclear fission device in 1964, it is striking that more than 50 years after its first successful nuclear test it has still only constructed a fraction of the total nuclear warheads produced by its two primary geopolitical rivals over this same period. The apparent material constraint of China's nuclear forces continued to be reflected within the industry that produced these weapons; to show this, following is an overview of China's nuclear infrastructure between 1993 and 2011 era.

China's Nuclear Infrastructure

The self-reinforcing processes of demilitarization and commercialization that began during the Deng era continued the overall restraint of China's military-related nuclear infrastructure, supporting the assertion that this infrastructure developed according to a development pathway of restraint that extended from 1980 into the 1990s. In terms of facilities associated with fissile material, china's nuclear material production/processing industry continued de-militarizing while expanding its commercial applications between 1993 and 2011.[19] First, as of 2011 there are no known 100% militarily administered nuclear enrichment facilities in China. Further, in terms of

[19] As mentioned in chapter four, China's military stock of fissile material remains approximately 16-20 tons of HEU and 1-2 tons of plutonium (Hui Zhang, China's HEU and Plutonium Production and Stocks," p. 68; International Panel on Fissile Material, *Global Fissile Material Report: 2010*).

uranium enrichment, there are no known facilities producing HEU in China, and although any LEU production facility can theoretically be converted to produce HEU, there are no indications that this is occurring. The Lanzhou uranium enrichment facility ceased production of HEU in the late 1980s, probably 1987, and was converted for LEU production for civilian export markets by the 1990s using the same gaseous diffusion method. Later, China moved from gaseous diffusion technology to the centrifuge enrichment process, and in the early 2000s the Lanzhou facility was converted - with Russian assistance - to the centrifuge process for producing LEU.[20] The Heping gaseous diffusion uranium enrichment facility stopped production of HEU in the late 1980s and was possibly repurposed for production of other materials such as fluorine by the 1990s; however, little is publically known about this facility's current production activity.[21] In terms of plutonium producing nuclear reactor facilities, China's two historical weapon-associated plutonium production facilities at Jiuquan and Guangyuan ceased producing plutonium for nuclear weapons likely during the 1980s.[22] Later, China's civilian nuclear power industry expanded during the 1990s, and by 2002 China had five operational nuclear power plants with seven total reactor units concentrated in the south of China producing electricity for the civilian energy sector.[23] These nuclear power plants have produced some plutonium as a waste by-product, and China began construction of a civilian pilot-scale plutonium reprocessing plant at the Jiuquan nuclear facility in 1997 as part of long-term plans to recycle plutonium for commercial export.[24]

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[20] International Panel on Fissile Material, *Global Fissile Material Report: 2010*, "China," pp. 99.
[21] International Panel on Fissile Material, *Global Fissile Material Report: 2010*, "China," pp. 100.
[22] International Panel on Fissile Material, *Global Fissile Material Report: 2010*, "China," pp. 102-105.
[23] International Atomic Energy Agency, *Country Profile: China*, 2002, pp. 222-224; Hui Zhang, "Rethinking Chinese Policy on Commercial Reprocessing."
[24] Hui Zhang, "Rethinking Chinese Policy on Commercial Reprocessing," pp. 2-3.

There is currently no indication that any plutonium waste by-product – also known as "irradiated" plutonium - is being reprocessed into weapons-grade fissile material; additionally, according to International Atomic Energy Agency reporting, as of 2004 China declared no stocks of civil "unirradiated" plutonium that could be directly used in the production of a nuclear weapon.[25]

China did upgrade its nuclear weapon research and development infrastructure as its nuclear industry continued civilianization and commercialization between 1993 and 2011. According to Thomas Reed and Danny Stillman, China's primary nuclear weapon research and development area moved from the Mao-era Northwest Nuclear Weapons Research and Design Academy at Haiyan in Qinghai province to upgraded facilities in Zitong and Mianyang in Sichuan Province.[26] While it is unclear whether the Mao-era research facilities in Haiyan were repurposed, it is likely that the bulk of research and development for China's nuclear weapons program shifted to Zitong and Mianyang by the 1990s. In his co-authored book *The Nuclear Express*, Stillman describes his visits to these areas in the early 1990s, offering a first-hand view of China's modernizing research capabilities in the areas of nuclear weapon design and test simulation. He describes a variety of newly constructed high-explosive test chambers, laser research facilities, and China's first supercomputers - used for nuclear warhead test simulations – all contained

[25] IAEA Information Circular, "Communication Received from China Concerning its Policies Regarding the Management of Plutonium." It should be noted that these plutonium management policies represent a multilateral agreement between the five declared nuclear powers (and several other states) to regulate civilian plutonium stores as a safeguard against proliferation; the IAEA does not have verification authority over this agreement, and both China and Russia are not willing to disclose excess military stores of plutonium (IAEA, "Guidelines for Management of Plutonium (INFCIRC/549): Background and Declarations"). For additional background information on the applications of irradiated and unirradiated plutonium, see David Albright and Christina Waldrond, "Civil Separated Plutonium in the INFCIRC/549 States – Taking Stock."

[26] Reed and Stillman, *The Nuclear Express*, p. 224.

within newly constructed research campuses.[27] While Stillman's observations of these advances revealed likely modernization of nuclear weapon-related research facilities, his very presence also reflected the extent to which aspects of China's strategic nuclear weapon research was becoming integrated with global scientific research through international political and scientific exchanges.

In summary, as China's nuclear weapon research and development infrastructure was apparently modernizing and becoming more integrated with the global scientific community in the 1990s, China's nuclear industry continued to reflect the trends of de-militarization and commercialization that began during the Deng Xiaoping era. Further, China's increased nuclear power plant construction, together with the building of a nuclear waste reprocessing facility intended for commercial applications of different parts of the nuclear fuel cycle, indicated an expansion of commercial nuclear energy within China's domestic energy sector. These trends, together with the lack of any indication of fissile material production for military purposes and the integration of China's nuclear research infrastructure with global political and scientific communities, supports a characterization of China's nuclear weapons program as remaining materially constrained between 1993 and 2011 even as its civilian nuclear energy sector expanded.

China's Defense Budgets of the 1990s and 2000s

Earlier in this dissertation state budget capacity was explored as a possible explanation for the historical restraint of China's nuclear weapons program. Chapter three showed that despite lacking reliable figures for budget-related expenditures during the Mao era, comparing general cost estimates between China's nuclear program and the

[27] Reed and Stillman, *The Nuclear Express*, p. 224-227.

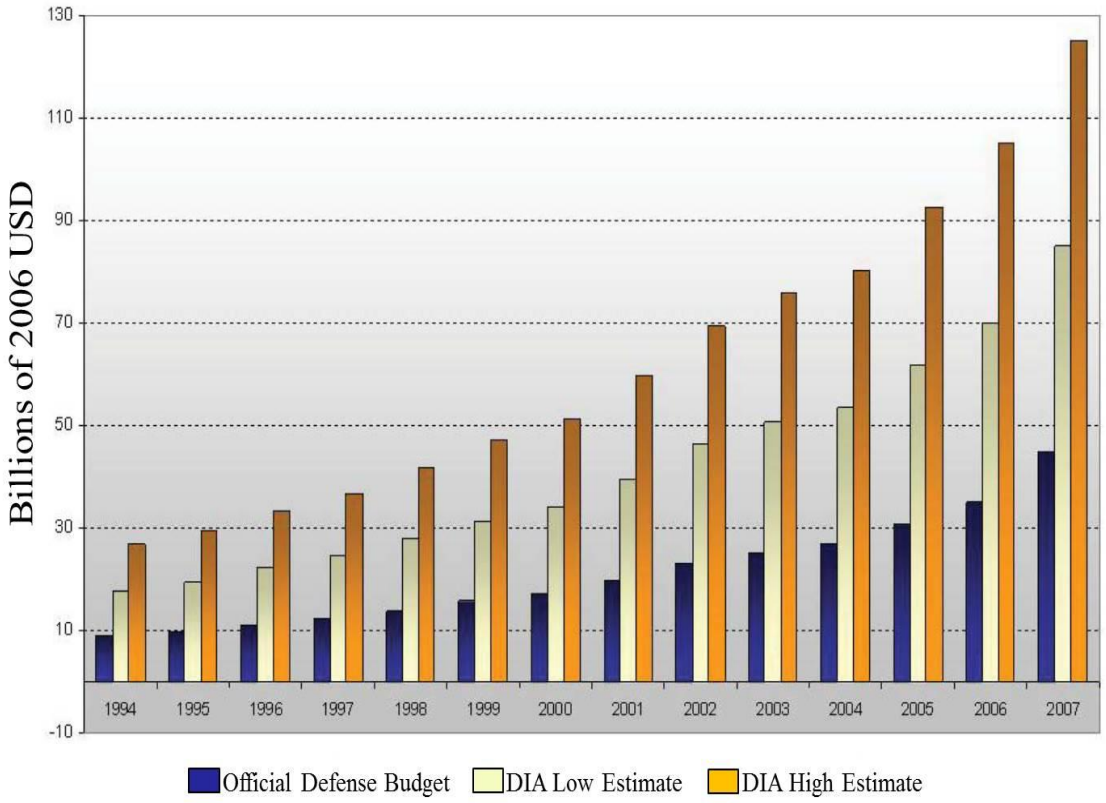
Third Line campaign revealed Chinese leaders heavily favored the Third Line over expansion of China's nuclear weapons program. During the Deng era, while China reduced overall military expenditures, various reforms initiated a period of economic expansion throughout the 1980s, indicating that China's declining defense expenditures and restrained nuclear program during this period was again a matter of strategic choice rather than cost-related constraint. Subsequent to the Deng era, China's economy dramatically expanded between 1993 and 2005; using gross domestic product (GDP) estimates as a rough indicator of economic activity, China's GDP expanded from about 440 billion USD in 1993 to approximately 2.26 trillion USD in 2005.[28] Further, China's defense spending generally increased during this period, according to both Chinese and U.S. government estimates. According to a 2007 U.S. government report, Chinese government estimates show an expansion of China's defense spending from just under 10 billion in 1994 to just under 50 billion in 2007, while the high range of U.S. government estimates show an expansion of Chinese defense spending from just under 30 billion in 1994 to just under 130 billion in 2007 (see below chart):[29]

[28] World Bank Website, last accessed March 2013.

[29] These figures are in 2006 U.S. dollars (United States Office of the Secretary of Defense, "Military Power of the People's Republic of China," Annual Report to Congress, 2007).

China's Defense Budget Estimates, 1994-2007

Source: United States Office of the Secretary of Defense, "Military Power of the People's Republic of China,", Annual Report to Congress, 2007.



Taken together, China's overall economic expansion during this period and general increase in defense spending reflects that China's continued nuclear weapons program restraint during the 1993-2011 period was a matter of strategic choice and not budgetary constraint.[30]

International Agreements and China's Nuclear weapons program

[30] However, there should be included one important caveat; China did continue to develop – albeit incrementally – new nuclear weapon deployment systems such as its SLBM and the DF-31 and DF-31A road mobile systems during this period.

During the Deng Xiaoping era China began an unprecedented period of integration within the international community marked by greater involvement with international organizations and increased accession to myriad international agreements. According to Alastair Ian Johnston, China's overall involvement with international organizations jumped from approximately 20 organizations in 1977 to about 50 organizations in 2000, a level comparable with other developing and developed states and well above the overall world average.[31] Further, China's participation within security institutions expanded through the 1990s as well; between 1992 and 1996 China acceded to seven new arms control treaties, and was negotiating an eighth.[32] Indeed, China's trend towards increased integration with the international community that was started during the Deng era continued through the 2000s.

This trend continued between 1993 and 2011, as China acceded to additional international nuclear-related arms control agreements and expanded bi- and multi-lateral nuclear-related agreements, increasing the total number of mechanisms responsible for restraining the development of China's nuclear industry. Since 1993 China has acceded to an additional four nuclear-related arms control agreements: Convention on Nuclear Safety (1994), London Convention on Nuclear Dumping (1994), Africa Nuclear Weapons-Free Zone (1996), and the Comprehensive Test Ban Treaty (1996).[33] Additionally, China negotiated 16 bilateral agreements regarding the peaceful use of nuclear energy, and throughout the 1990s further developed a host of direct agreements with the U.S. International Atomic Energy Agency (IAEA), including an agreement on privileges and immunities, an agreement and additional protocol between the PRC and

[31] Alastair Ian Johnston, *Social States*, pp. 33-34.
[32] Alastair Ian Johnston, *Social States*, pp. 35-36.
[33] Alastair Ian Johnston, *Social States*, p. 36.

the IAEA on the "Application of Safeguards in China," and agreements on safeguards inspector designations and IAEA technical assistance.[34] While these agreements do not preclude the likelihood that China's military may have been upgrading aspects of its nuclear force throughout this period, they do clearly indicate increased overall integration of China's nuclear program with the international political and scientific communities in general, and with the U.S. in particular. Further, because many of these international, bi-, and multi-lateral agreements require periodic reporting of China's nuclear-related activities to international legal regimes, this reflects concrete mechanisms that reinforce the constrained development trajectory of China's nuclear industry.

Part Two: China's Nuclear Warfare Doctrine and Deployment Strategy

China expanded reforms initiated during the Deng era related to the education and training of Second Artillery forces. In addition, Second Artillery responsibilities continued expanding as China refined its military doctrine to coincide with the newly transformed strategic culture of the Deng era. In the early 1990s China's military doctrine adjusted according to the directive "local wars under conditions of high technology," reflecting a refinement of China's Deng era strategic culture reassessment that the greatest threats facing China came not from Great Power wars, but instead from the potential of local conflicts around China's periphery that would be small-scale, fast developing, high technology military engagements. As a result of this doctrinal adjustment, China began shifting military investment towards improving command and control technological systems for its entire military. Further, China developed a robust conventional missile force under the command of the Second Artillery, and designated

[34] International Atomic Energy Agency, *Country Profile: China*, 2002, p. 233.

the Second Artillery with a primary role in any military response falling under these conditions. Given these changes, the Second Artillery's nuclear and conventional missile doctrines and deployment strategies became more fully articulated than ever before. To show this, following is an overview of China's nuclear warfare doctrine, the organization of China's missile forces, and the deployment strategy of both conventional and nuclear missile forces.

China's Nuclear Warfare Doctrine

According to a variety of academic sources, between 1993 and 2011 China's nuclear weapon forces were generally considered to be deployed according to an informal doctrine of "no first use" minimum deterrence ("houfa zhiren," 后发制人 meaning deterring or controlling through counterattack; minimum deterrence is literally translated as *zuidi weishe*, 最低威慑) characterized by a small number of operationally deployed nuclear warheads on low/no alert intended for second strike missions against counter-value targets.[35] According to Patrick Morgan, minimum deterrence is a countervalue deterrence posture relying on the uncertainty of first-strike success and the fear of the possibility of even one nuclear weapon destroying a city in retaliation; it requires only a

[35] The following sources describe China's current nuclear posture in terms of minimum deterrence: Jeffrey Lewis, *The Minimum Means of Reprisal*, pp. 1, 41-42; 52; Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, p. 30; Chu Shulong and Rongyu, "China: Dynamic Minimum Deterrence," in Muthia Alagappa, ed., *The Long Shadow*, Chapter 5; Blair and Chen, "The Fallacy of Nuclear Primacy," p. 68; Michael Chase, Andrew Erickson, and Chistopher Yeaw, "Chinese Theater and Strategic Missile Force Modernization and its implications for the United States," p. 94. John Lewis and Hua Di generally support aspects of this characterization in their historical analysis of China's ICBM force, noting that China's "first generation" of nuclear ballistic missiles (developed 1956-1981) were designed to be used for countervalue missions (John Lewis and Hua Di, "China's Ballistic Missile Programs," p. 6). Taylor Fravel and Evan Medeiros describe China's nuclear posture in similar terms, but use the label "assured retaliation" (Fravel and Medeiros, "China's Search for Assured Retaliation: the Evolution of China's Nuclear Strategy and Force Structure").

very small force and is generally stable regardless of an adversaries force structure.[36] This "minimum deterrence" characterization is derived from an analysis of China's known nuclear force capability, and thus it roughly aligns with mainstream assessments of China's nuclear force that were reviewed in part one of this chapter; a small nuclear force overall, with a small number of strategic weapon systems deployed for a retaliatory nuclear strike.

In a minor departure from the minimum deterrence consensus, Chinese scholar Li Bin - a professor at Qinghua University's International Studies Institute - argues that China's nuclear strategy is better characterized as a "counter coercion" strategy. Li asserts that China is developing its nuclear force not simply to achieve basic strategic nuclear deterrence, but also to deter aggressors from *threatening* to use nuclear weapons during a political crisis.[37] This requires developing nuclear weapon systems that are well known to be survivable, similar to basic nuclear deterrence. The main difference emphasized by Li is how China seeks to use nuclear weapons as part of a political process at the beginning of a given interstate crisis, with the goal of deterring other states from threatening China with a first strike. While this may not substantially differ from established dynamics of nuclear deterrence practice, Li's characterization resonates with China's own historical experience regarding strategic nuclear weapons, specifically when the U.S. threatened to use nuclear weapons against the PRC in the early 1950s to deter China from invading Taiwan during the Korean War and the Soviet Union threatened China with a nuclear first strike during Sino-Soviet border conflicts during 1969-1970 (both referenced earlier in this dissertation).

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[36] Patrick Morgan, *Deterrence Now*, p. 23.
[37] Li Bin, "Tracking Chinese Strategic Mobile Missiles," p. 4.

Analyzing Chinese primary source documents reveals more detail regarding China's nuclear strategy and deployment plans. According to *The Science of Military Campaigns*, a primary source outlining China's military campaign doctrine, the PLA's definition of nuclear counterstrike campaign is as follows:

> "A nuclear counterstrike campaign is the Second Artillery nuclear missile campaign organization's warfighting activity [conducted] to accomplish a specialized strategic goal or a strategic military campaign goal; it consists of a certain number of nuclear attacks conducted on the basis of unified planning and elite coordination."[38]

More specifically, *The Science of Military Campaigns* delineates the Second Artillery's overarching nuclear counterstrike campaign-level responsibilities as follows:

> "The Second Artillery's campaign-level nuclear counterstrike chief responsibilities are: in response to an enemy's overall strategy, the campaign goal is to implement a nuclear assault, paralyze their command system, weaken their war-fighting ability, frustrate their strategic plans, shake their war-fighting willpower, and contain nuclear escalation."[39]

Additionally, *The Science of Military Campaigns* highlights links between campaign-level strategy and overall national strategy during a nuclear weapon confrontation, especially when the use of strategic nuclear weapons is considered. Given this, even at the campaign level, there is tight control of any use of nuclear weapons by the highest levels of government leadership:

> "Because the Second Artillery would employ strategic nuclear weapons as part of a nuclear counterstrike campaign, in accordance with its strategic-level responsibilities, its war-making activities directly affect the state's overall strategic outlook. Therefore, this determines that when considering the deep

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[38] "核反击战役，是第二炮兵核导弹战役军团，为达成特定的战略目的或战略性战役目的，按照统一的计划和高度集中的指挥实施的若干次和突击的作战行动." (Wang Houqing and Zhang Xingye, *The Science of Military Campaigns*, p. 369).

[39] "第二炮兵核反击战役的主要责任是：对敌方重要的战略，战役目标实施核突击，瘫痪其指挥系统，削弱其战争潜力，挫败其战略企图，动摇其战争意志，遏制核战争升级." (Wang Houqing and Zhang Xingye, *The Science of Military Campaigns*, p. 369)

> ramifications of a nuclear counterstrike campaign, such a campaign must be directly controlled and commanded by the country's highest decision-making level."[40]

Finally, in a description of the Second Artillery's military campaign principles within the 2004 edition of *Second Artillery Campaign Studies*, China further links strategic nuclear deterrence with its conventional missile forces to provide a "unified" deterrence posture wherein each force supports the overall strategic aims of the military campaign.[41] In this context, while the use of nuclear weapons is discussed in terms of counterstrike options, the use of conventional missiles is described simply in terms of attacking or striking enemy forces, suggesting that conventional missiles may be employed as part of a first, sudden strike against enemy forces.

Taken together, China's nuclear warfare doctrine specifies the strategic goals of implementing nuclear assaults that degrade an enemy's strategy; links any nuclear campaign with broader strategic goals of the Chinese state during a crisis; and blends nuclear and conventional missile deterrence, reflecting a deeper integration of China's nuclear forces within overall PLA strategic planning. As part three will show, this accords with the Second Artillery's newly emergent responsibilities during localized, high-technology conflicts around China's periphery.

The Organization and Deployment Strategy of China's Missile Forces

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[40] "由于第二炮兵核反击战役使用战略导弹核武器作战，遂行战略性责任，其作战行动对国家战略全局有着直接重大的影响。因此，这就决定了核反击战役的重大作战行动，必须受国家最高决策层的直接指挥和控制." (Wang Houqing and Zhang Xingye, *The Science of Military Campaigns*, p. 370)

[41] Yu Jixun, *Second Artillery Campaign Studies*, p. 79. This also reflects Jiang Zemin's "two types of deterrence, two types of warfighting" directive for the newly expanded Second Artillery, referring to both conventional and nuclear deterrence and warfighting (Yu Jixun, *Second Artillery Campaign Studies*, p. 13).

China's missile force organization and deployment strategy reflect the integration of its nuclear forces within overall national strategic planning and the blending of nuclear and conventional missile forces. In one of the clearest indications of the implementation of these doctrines, the Second Artillery organization's overall responsibilities continued expanding throughout the 1990s. In addition to overseeing the R&D, assembly, and storage of nuclear payloads, China's Second Artillery became the primary military branch of the PLA charged with managing China's conventional and nuclear missile forces, electronic warfare units, and units responsible for the field safety of missile brigades. According to *Second Artillery Campaign Studies*, the Second Artillery is organized according to the following principles:

> "The Second Artillery's organizational campaign strength can be divided into nuclear missile units, nuclear inspection units, conventional missile units, and numerous other specialized military units. Nuclear missile units are divided according to launch range into intercontinental missile units, long range missile units, medium range missile units, and short-medium range missile units; conventional missile units are a newly emergent force within the Second Artillery missile unit structure, and are further organized according to ballistic and cruise missile types; specialized units can be divided according to defensive/protective battle units and safety units. Defensive/protective battle units include electronic countermeasure units, and in looking at their (historical) development, these units can employ ground force defensive units, computer network warfare units, psychological warfare units, and Second Artillery space warfare units. Safety units are determined by the specialized safety needs of the Second Artillery's weaponry, with a large scope and complicated composition. From the perspective of safety functions, these units are divided into warfighting safety units, logistical safety units, equipment safety units, and so on. These are the organizational principles by which the Second Artillery implements their "two types of deterrence, two types of warfighting" responsibility, and this (outlines) the chief strength of methods opposing nuclear deterrence, counter-nuclear deterrence, nuclear counterstrikes, and conventional missile attacks."[42]

[42] "第二炮兵建制内的战役力量可区分核导弹部队，核装检部队，常规导弹部队以及各种专业部（分）队等。核导弹部队，从武器射程上，可分区为洲际导弹部队，远程导弹部队，中程导弹部队和中近程导弹部队等；常规导弹部队是第二炮兵导弹部队的一支新生力量，从弹道形式上，可分为地地弹道式导弹部队和巡航导弹部队；专业部（分）队又可区分为防卫作战部（分）和保障部（分）队。防卫作战部队包括电子对抗部队，从发展看，还可能拥有地面防卫部队，计算机网络战部队，心理战部队，第二炮兵太空作战部队等。保障部（分）队是由第二炮兵武器

This indicates that China's nuclear-armed missile force is both theoretically and organizationally integrated with its conventional missile force, with at least some overlap among supporting units between nuclear and conventional forces.

In a reflection of practicing the theoretical and organizational integration of various Second Artillery units, China continued training exercises for Second Artillery forces according to principles of systems integration and specialized warfare conditions. In addition to the "94-01" training exercise described in chapter four, wherein China's Second Artillery forces trained for counterstrike missions in a post-nuclear attack environment, the Second Artillery continued training exercises to improve systems integration of a wide variety of units throughout the 1990s and 2000s. Further, Second Artillery units trained for specialized warfare circumstances, including nuclear, chemical, and biological attacks; information warfare; and situations requiring extensive mobility and unit flexibility, wherein units might be expected to repeatedly reorganize themselves as they traveled to different battlefield areas.[43] In particular, the Second Artillery appears to have built training bases for a "Blue Force" specializing in information warfare simulations in support of Second Artillery units training for deployment.[44] Taken together, this training indicates that China has continued Deng era initiatives regarding training of Second Artillery forces throughout the 1993-2011 period.

的特殊性决定的，其规模较大，结构庞杂。从保障角度划分，可区分为作战保障部（分）队，后勤保障部（分）队，装备保障部（分）队等。这是第二炮兵遂行 "双重威慑，双重作战" 任务的主体，是对敌实施核威慑于反核威慑，核反击于常规导弹突击的主要力量." (Yu Jixun, *Second Artillery Campaign Studies*, p. 142).

[43] Hu Yuming and Tian Ye, "The Second Artillery's Blue Force Training Base Establishment: Innovation and Development."

[44] Hu Yuming and Tian Ye, "The Second Artillery's Blue Force Training Base Establishment: Innovation and Development;" see also Yu Jixun, *Second Artillery Campaign Studies*, especially pp. 2-7, for an introduction to the importance of information warfare to the Second Artillery's mission.

The integration of Second Artillery units is further reinforced in research publications of Second Artillery deployment strategies. The Second Artillery deploys its forces according to principles of mobility, speed, flexible force structure, strategic feints, night movement, and concealment. Missile units from anywhere in the country may be deployed during a crisis, and multiple routes and methods will be used to transport units to the battle area. Units may be combined according to need regardless of their normal organizational structure. Deployed units may bring fake equipment, or real equipment that will not be used, to feint strategic intentions. Nighttime deployment will be emphasized, and units will deploy to concealed launch areas. According to *Second Artillery Campaign Studies*:

> Multiple route and multiple direction mobility refers to the unified wartime deployment of missile forces wherein multiple battle units quickly converge on a battle space from different areas and different directions, using different routes and methods of conveyance. This may include units bringing along decoy equipment to a predetermined area for the purpose of misleading or feinting (the enemy). This particular method, entailing long travel and dispersal (of units), requires extensive coordination, and effective command will be very difficult. First, upon accepting battle orders, campaign leaders and command groups, after diligently studying the enemy situations and formulating transportation and command planning, will submit their travel plan to the transport department and then blend in with civilian traffic for concealment. Next (comes) coordinated deployment with multiple, dispersed routes…Then (use) concealment and feigning while (working toward) the actual goal. When organizing multiple, dispersed routes for travel, there must be an emphasis on directional feints and deceptions, mixing fake with true movement, mixing true with false information, in order to make it difficult for the enemy to ascertain the (true) direction of the main force to ensure the overall safety of the mobile units. Next, it is important to feint, yet also move quickly and punctually. At the time of transport, do the best to use the cover of night to offload cargo, arrange equipment, offload trains, conceal parts of the landscape, weaponry, and decoy equipment, and then upon arriving at the battle area, quickly enter the camouflaged/concealed battle positions and then arrange the decoy concealments along with all other necessary battle preparations.[45]

[45] "多路多向机动，是指导弹部队按照统一作战部署，多个作战部队从不同场站，沿不同路线，按不同方式，同时从几个方向，以多种输送方式，迅速向作战地区移动的方法。也可包括部（分）队携带佯动器材向预定区域实施的战役佯动。此种方法，机动路线长，分布地域广，协同要求

This coincides with Chinese scholar Li Bin's assessment of China's deployment strategies for its strategic nuclear missile systems. China's road-mobile ICBM system, the DF-31 (CSS-9), is designed to be driven on existing roads throughout China, may travel through civilian populated areas given the lack of warhead mating during mobile deployments, likely travels through areas of average or higher road density, and will attempt to elude detection both during deployment patrols and upon reaching firing positions.[46] In support of these deployment strategies, the Second Artillery continues training its strategic missile units for post-nuclear counterstrike retaliation scenarios, wherein China launches counterstrikes between a period of 5-8 days.[47]

Taken together, the Second Artillery's organization and its deployment strategies and practices for its missile forces reflect a deepening of doctrinal shifts that were initiated during the 1980s. Strategically, China's missile forces have generally integrated to support a more robust conventional and nuclear deterrence posture. Tactically, this is reflected in the organic combination of field units during deployments depending on various concealment and logistical considerations. Further, mobility is integral to China's maintenance of both conventional and nuclear deterrence, and this emphasis is reflected in both the organization of the Second Artillery and in the deployment strategies and practices of Second Artillery missile forces. As we will see

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高，组织指挥困难。因此，组织实施过程中，一是严密组织计划，隐蔽机动企图。受领作战任务后，战役指挥员及其指挥机关，应认真研究敌情，迅速拟定机动计划和佯动计划，向交运部门提交，在民云活动中隐蔽进行。二是统一部署，多路分进…三是隐真示假，相互配合。在组织多路分进机动时，要加强重点方向的佯动欺骗，隐真示假，以假乱真，使敌难以判明我主力机动方向，保证重点机动部队的安全。四是要严密伪装，迅速准时。机动时应尽量利用夜暗进行装，卸载，做好装，卸载站，待蔽区域，武器装备和人员的伪装，到达作战区域后，要迅速进入待蔽阵地，做好隐蔽伪装和各项作战准备工作" (Yu Jixun, *Second Artillery Campaign Studies*, pp. 384-385).

[46] Li Bin, "Tracking China's Strategic Mobile Missiles," pp. 8-11.

[47] Li Bin, "Tracking China's Strategic Mobile Missiles," pp. 8-11.

in the next section, these trends towards strategic and tactical integration of China's missile forces were both a continuation of policies implemented during the Deng era as well as reactions to certain key historical events within the international system during the early 1990s.

Part Three: Path Dependence and the Impact of History: The Breakup of the Soviet Union and The 1991 Persian Gulf War

During the period 1993-2011, the development pathway of China's nuclear program continued the priorities established during the Deng Xiaoping era. In terms of path dependence theory, the program proceeded according to a series of self-reinforcing mechanisms while also being affected by particular historical events. Self-reinforcing mechanisms refer to sequences wherein "initial steps in a particular direction induce further movement in the same direction such that it becomes difficult…to reverse direction."[48] Self-reinforcing mechanisms affecting China's nuclear weapons program included the continuation of international treaty accession, nuclear strategic theory development, training for deployed nuclear systems, and slow-paced modernization of nuclear weapon systems. Additionally, two important historical events affected the development of China's nuclear weapons program: the breakup of the Soviet Union during 1991 and the Persian Gulf War in 1991. Following is an overview of how particular historical events deepened the Deng-era reforms of China's nuclear weapons program within a context of ongoing path dependent restraint for the program as a whole.

[48] James Mahoney, "Path Dependence in Historical Sociology," p. 512.

Continuing Deng-era Reforms within China's Nuclear weapons program

Particular historical events affected China's nuclear program in both direct and indirect ways between 1993 and 2011 in a manner that deepened China's nuclear program development trajectory. The first event with broad political and military ramifications for the Chinese state was the breakup of the Soviet Union in 1991. The second event was the 1991 Persian Gulf War, which refined Chinese military thinkers understanding of the future of warfare. The breakup of the Soviet Union and the emergence of Russia in the early 1990s caused widespread political and military repercussion within China, but the effect on its nuclear weapons program was somewhat indirect. The Soviet Union had been one of China's major geopolitical adversaries after the Sino-Soviet split of the 1960s, culminating in the nuclear standoff between 1969 and 1970 that was previously described in chapter three. Although China and the Soviet Union had been engaged in a series of diplomatic engagements aimed at developing détente between the two powers in the mid-to-late 1980s, China's nuclear program very likely still deployed missile systems targeting Soviet cities throughout the Deng era. However, the breakup of the Soviet Union in 1991 marked the end of the Cold War bipolar international system, ultimately leading to a reassessment of China's position within the international system. Unable to balance between the Soviet Union and the U.S. according to circumstance, China emerged as a potential direct rival to the U.S. in the 1990s, which had the effect of changing the geopolitical context within which China assessed its military requirements throughout the 1990s and 2000s. While the breakup of the Soviet Union did not directly affect China's nuclear program development, it did radically change the overall

geopolitical context within which China's military and political leaders made decisions between 1993 and 2011.

The 1991 Persian Gulf conflict more directly affected China's military development, and specifically the development of the Second Artillery organization, in significant ways between 1993 and 2011. At a broad level, the 1991 Persian Gulf War caused a review of China's overall military situation among political and military leaders.[49] This contributed to China's military doctrine shift in the early 1993 towards planning for "local wars under high technology conditions." The breakup of the Soviet Union and strong relations with the U.S. began this doctrinal shift by contributing to an overall assessment that the greatest threat of war for China was not any great power conflict, but rather localized wars along China's periphery. Then, in the wake of the U.S. demonstration of quick military success highlighted by precision guided munitions in the Persian Gulf War, China's military leaders decided that future wars would be localized, fast-moving conflicts requiring advanced rocket, command and control, and air technologies.[50]

This assessment directly affected China's Second Artillery organization. The military strategy text *Zhanyi Xue* lists the Iran –Iraq War along with the 1991 Persian Gulf War as the main conflicts that established the deterrent effect of ballistic missiles within modern warfare, and further, the use of ballistic missile deterrence is cited as a primary future function of the Second Artillery: "During the Iran-Iraq War and the

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[49] John Lewis and Xue Litai, *China's Strategic Seapower*, p. 101.

[50] For an overview of this doctrine, see Taylor Fravel, "China's Search for Military Power;" for secondary source discussions of how this doctrine applies to China's space program, rocket forces, and air force, see the following: Dean Cheng, "The Chinese Space Program: A 21st Century 'Fleet in Being'?", in Mulvenon and Yang, editors, *The People's Liberation Army as Organization*; Richard Fisher, "PLA Air Force Equipment Trends," in Flanagan and Marti, editors, *The People's Liberation Army and China in Transition*; and Thomas McCabe, "The Chinese Air Force and Air and Space Power."

Persian Gulf War, the capability of ballistic missiles to serve as a deterrent achieved its fullest utility, with remarkable results. Therefore, this has made missile deterrence within a conflict a major battle-fighting feature of the Second Artillery's conventional missile campaign force, and has an important status and utility within future high-technology local wars."[51] More specifically, according to *Second Artillery Campaign Studies*, after the Persian Gulf War – and under the direction of Jiang Zemin's guiding influence – China's Central Military Committee (CMC) established "two types of deterrence, two types of war" as the organizing principle for the Second Artillery's new set of responsibilities governing the organization's newly created conventional missile brigades; in support of these responsibilities, the Second Artillery produced a new series of theoretical studies and engaged in a variety of new missile exercises.[52] This shows how the Persian Gulf War influenced the development of both theory and practice for the Second Artillery's conventional ballistic missile force, specifically serving the purpose of deterrence within future localized conflicts.

The Persian Gulf War is also cited along with several other military campaigns of the 1990s as reflecting the importance of long-range, precision firepower during a conflict, and developing this capability is described as a development trend for the Second Artillery. According to *Second Artillery Campaign Studies*:

> According to the direction of CMC chairman Jiang Zemin: "As the 1990s succession of the Persian Gulf War, the 'Desert Fox' campaign, and the most recent American-led, NATO coalition armed intervention of Yugoslavia clearly shows, the use of precision-guided weapons to initiate intermediate and

[51] 在"两伊战争" 和"海湾战争"中，地地导弹的威慑功能得到全面的运用，并发挥出显著的结果。 因此，实施导弹威慑作战将是第二炮兵常规导弹战役军团的一种重要作战样式，在未来高技术局部战争中具有重要的地位和作用" (Wang Houqing and Zhang Xingye, *The Science of Military Campaigns*, p. 379).

[52] Yu Jixun, *Second Artillery Campaign Studies*, p. 13; see also pp. 31 and 35 for references to how the Persian Gulf War and Kosovo influenced the development of Second Artillery strategy.

> long-range attacks has already become an essential feature of modern warfare." The Second Artillery missile brigades compose our military's long-range attack firepower, and in the future will be the main component of our military's long-range precision attack fire-power.[53]

This indicates the importance of the Persian Gulf War for Chinese military planners, and additionally reveals how the Second Artillery has adjusted to include deploying precision-guided missile technology with conventional strike applications in response to this and other military conflicts of the 1990s. In terms of specific technology, the Persian Gulf War is cited as one of the conflicts establishing a foundation for the influence of artificial intelligence and self-controlled systems upon war-fighting technology, especially for localized fast-developing conflicts. This includes the importance of a well-developed C4ISR system for informing decision-makers during a conflict.[54]

Perhaps most importantly, the Persian Gulf War is specifically cited as influencing the development of the Second Artillery's strategy of practicing coercive diplomacy as a prelude to any armed conflict. Similar to how the U.S.-led NATO coalition used media propaganda to influence public opinion and spread warnings to the enemy, likewise the Second Artillery will engage in a period of coercive diplomacy, possibly through public media, as part of its method of achieving strategic deterrence.[55] This may reflect a specific process for achieving nuclear deterrence described by the Chinese scholar Li Bin, who defines China's method of nuclear deterrence as not minimum deterrence, but rather "counter coercion" deterrence, wherein China seeks to

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[53] 正如军委江主席所指出："90 年代相续发生的海湾战争，'沙漠之狐'行动，以及最近一美国为首的北约对南斯拉夫联盟共和国的武装干涉都表明，使用精确制导武器进行中远程打击，已经成为现代战争的重要的作战样式。"第二炮兵导弹部队，作为我军一支远程火力打击力量，将是未来我军远程精确打击力量的主体。 (Yu Jixun, *Second Artillery Campaign Studies*, p. 84.)

[54] Yu Jixun, *Second Artillery Campaign Studies*, pp. 110-111.

[55] Yu Jixun, *Second Artillery Campaign Studies*, p. 271.

develop its nuclear arsenal in a manner that counters the threatened use of nuclear weapons during the development of a crisis.[56] While Li Bin's formulation of deterrence may amount to a distinction without a true difference in nuclear deterrence theory – the very practice of nuclear deterrence has historically taken the form of political negotiation during a crisis – this nonetheless emphasizes how Chinese leadership perceives the importance of leveraging the political influence of a nuclear arsenal in service of a broader strategy. Taken together, these historical events deepened the development trajectory of China's nuclear weapons program that was established during the Deng era, as the Second Artillery continued integration with PLA by expanding its mission to include management of conventional missile forces, and continued nuclear counterstrike launch training exercises.

Change within a Context of Continuity: Path Dependence and the Reinforcement of Restraint

China's strategic culture shift of the Deng era led to stable political developments for the Chinese state as a whole, which in turn stabilized the development pattern for China's nuclear weapons program. Unlike the radical changes between the Mao and Deng eras, for the first time in the history of the PRC there was a peaceful political transition from Deng Xiaoping to his successor, Jiang Zemin. Jiang continued the overall political and economic direction of the Deng era, expanding economic reforms and deepening modernization programs for the Chinese military. Jiang also continued Second Artillery practices regarding deployment exercises, publication of deterrence theory materials, and slow but steady development of missile systems designed to

[56] Li Bin, "Tracking Chinese Strategic Mobile Missiles," pp. 4-5.

improve the response time and survivability of China's nuclear force. Overall, the 1993-2011 period reflects a self-reinforcing continuation of the restrained developmental pathway for China's nuclear weapons program in general, and the Second Artillery organization in particular.

Additionally, China continued along many of the Deng-era trends regarding its nuclear weapons program by deepening its policy of international engagement. China expanded its participation in nuclear-related treaties during this period, and these acted as additional self-reinforcing mechanisms restraining the program. These agreements created co-binding requirements for the Chinese state by codifying international expectations of restraint for China's nuclear materiel industry and instituting periodic reporting requirements regarding possible weapons-related aspects of their program. For example, in 1998 China agreed with the five other declared nuclear powers (and several other states) to a shared set of guidelines for managing civilian stores of unirradiated plutonium-which could be used in a nuclear weapon - in order to reduce the risk of nuclear proliferation.[57] These guideline have entailed annual reporting of any storage of civilian unirradiated plutonium at any facility, to include the transfer of any military stores of unirradiated plutonium to civilian facilities. While China does not declare excess military stores of unirradiated plutonium, and between 1996 and 2004 reported zero civilian stores of unirradiated plutonium, China's reporting participation within this agreement nonetheless reflects a degree of restraint regarding the production and storage of fissionable plutonium considering the extent to which China's nuclear industry has become civilianized in the post-Mao era.[58]

[57] IAEA, "Guidelines for Management of Plutonium (INFCIRC/549): Background and Declarations."
[58] IAEA, "Guidelines for Management of Plutonium (INFCIRC/549): Background and Declarations;"

Conclusion

Between 1993 and 2011, China's nuclear weapons program developed along a pathway that was established in the Mao era and continued during the Deng Xiaoping era, continuing some aspects of the program in a path dependent manner even while certain other aspects of the program were changed in response to certain key international events. China continued certain development trends established during the Deng era such as accession to multi- and bilateral nuclear-related treaty agreements. These agreements have acted as self-reinforcing mechanisms binding the program to a certain development pathway. As China's domestic political situation stabilized - exemplified by a peaceful transfer of power between Deng Xiaoping and Jiang Zemin in the early 1990s – China's political and military leaders became more responsive to external political and military events, such as the breakup of the Soviet Union and the 1991 Persian Gulf War. Reaction to these events led to further expansion of the Second Artillery's mission to include conventional long-range strikes in support of localized military conflicts along China's periphery within the overall context of Deng-era development trends for the Second Artillery.

The integration of China's nuclear and conventional missile forces is the most important of all the developments in China's nuclear weapons program between 1993 and 2011; according to Chinese sources, nuclear and conventional missile forces support each other's deterrence posture, creating a kind of expanded "ladder of escalation" for China's military. Given this, one of the key modernization trends to highlight regarding China's

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IAEA Information Circular, "Communication Received from China Concerning its Policies Regarding the Management of Plutonium."

strategic missile forces is related to mobility of land-based systems. Developments in missile deployment systems have reflected this emphasis; China has been developing new road-mobile IRBM and ICBM missile systems since at least the 1990s, and will likely field deploy some number of these systems in the coming decade. However, since these modernizations address only one form of nuclear deployment – i.e. land-based deployments - they at best serve to maintain China's minimum level of nuclear deterrence; as such these improvements should not be considered to be a direct challenge to either Russian or U.S. nuclear superiority.

Another key trend regarding China's nuclear weapon modernization concerns the continued lack of an operational sea-based nuclear weapon deployment system. The fact that China has been researching and testing SSBN/SLBM systems has been well documented, and for some authors, this has been interpreted as a current or future challenge to U.S. nuclear superiority.[59] Yet China began these efforts during the 1960s, and between 1993 and at least 2010 China had still not developed an operational SSBN capability. The fact that this capability has been in development for approximately 50 years – with no known operational deployment – reflects the slow-paced, incremental nature of China's nuclear weapon development in the post-Mao era. During the 1993 and 2011 period, China's nuclear weapons program remained constrained in terms of numbers of weapons and deployment systems, and has additionally proceeded at a slow, incremental pace of research and development regarding its ongoing modernization.

Finally, China's increasing participation in nuclear-related international agreements and treaties reflects a deepened reinforcement of restraint for China's nuclear

[59] See, for example, Michael Chase, Andrew Erickson, and Chistopher Yeaw, "Chinese Theater and Strategic Missile Force Modernization and its implications for the United States," pp. 78-80.

weapons program as a whole. Each agreement became self-reinforcing due to ongoing communication and reporting requirements; further, the number of nuclear-related agreements between China and other states increased through the 1993-2011 period, suggesting that the agreement process itself created self-reinforcing expectations among China's leadership regarding the utility of these agreements for achieving China's overall national strategic goals. These nuclear-related international agreements are mechanisms that reinforce the path dependent development pattern of restraint for China's nuclear weapons program.

Chapter Six: Conclusion

This dissertation began as an inquiry into the small size of China's nuclear weapon force throughout the history of its program. In analyzing this question, this study presents a variety of significant empirical and theoretical contributions to our understanding of China's nuclear weapons program development. In terms of empirical contributions, imagery analysis of China's primary fissile material facility during the Mao-era provided new insight into China's early nuclear weapons program development, showing that China did not expand this key facility even after perceiving a nuclear attack threat from the Soviet Union during 1969-1970. Additionally, analysis of Chinese nuclear strategy primary sources has shown the extent to which nuclear and conventional forces have become integrated within China's Second Artillery organization, and specifically reveals development trends towards land-based mobility for China's missile forces. In terms of theoretical contributions, this study identified strategic culture as an important explanatory variable for China's nuclear weapons program development. Strategic culture not only explains why China's nascent nuclear weapons program produced only a small and vulnerable force during the Mao-era, but it also causally links the broader era of reform initiated after the post-Mao leadership competition with certain specific changes to China's nuclear weapons program. Path dependence theory provided important heuristic tools for this study's historical analysis, the results of which revealed how particular historical events significantly influenced the development of

China's nuclear program. Further, path dependence explains why China's nuclear weapon force has remained small and vulnerable during a 56 year period, across changes in leadership and throughout a variety of historical events.

Strategic Culture, Path Dependence and China's Nuclear weapons program

Mao Era: 1955-1975

During the Mao era, China's People's War strategic culture fundamentally shaped leadership decision-making regarding China's national security policy. Given the incompatibility between the People's War emphasis on the role of a mass mobilized, ideologically motivated population for advancing national security policies versus the entailed techno-scientific requirements of a nuclear weapons program, there was a fundamental tension between China's prevailing People's War strategic culture and nuclear weapons program development throughout this period. Due to the importance of initial conditions during the establishment of a development trajectory, China's People's War strategic culture had a profound shaping effect on the early development of China's nuclear weapons program, limiting its size and separating it from China's broader military planning. While China's leaders sought to demonstrate a nuclear capability to other states, they nonetheless remained committed to People's War-inspired national defense projects that emphasized defense-oriented conventional warfare planning, such as the Third Line campaign. Thus, during the Mao era China's nuclear weapons program was configured according to the idea that mere demonstration of a nuclear weapon capability was sufficient for achieving deterrence, and there was no commitment to developing a large nuclear force structure.

Historical events had an additional profound effect on China's nuclear weapons program development. After receiving significant aid from the Soviet Union during the 1950s, the eventual Sino-Soviet split during 1960 was a critical juncture for China's nuclear weapons program, decisively shaping the development of the program by forcing a reliance on highly enriched uranium for fissionable material during the first stage of the program. This led China to first build the Lanzhou Gaseous Diffusion Facility during the early 1960s, which became the primary fissionable material production facility within the China during the Mao era – an important point for my imagery analysis case study. Periodically, mass-mobilization movements such as the Cultural Revolution directly interfered with the nuclear weapons program, restricting the scope of the program's development potential while further indicating the importance of these ideological campaigns vice meeting the development requirements of the nuclear program during the Mao era. This was proven again with the initiation of the Third Line campaign in 1965, which funneled most of China's budgetary resources away from its nuclear program, keeping it focused on demonstrating technical capability rather than nuclear force expansion. Imagery analysis of the Lanzhou facility throughout the Mao era corroborates this assessment, providing significant primary source evidence that China's nuclear weapons program did not appreciably expand beyond its initial investment configuration of the late 1950s and early 1960s.

The apparent efficacy of this "technical capability demonstration" approach was then confirmed during the 1969-1970 Soviet threat of a nuclear strike against China. After a series of escalating Sino-Soviet border clashes during 1969, China perceived that the Soviet Union explored conducting a nuclear first strike against China, causing

Chinese leadership to raise the alert level of their nuclear force to the highest level in the history of China's nuclear weapons program. However, despite an overwhelming nuclear advantage against China's small and vulnerable nuclear force, the Soviets eventually chose against launching a first strike. In assessing this historical event, China's demonstrated nuclear capability must be considered as a significant contributing factor for Soviet decision-making; as such, this event stands as one of the very few historical examples of a more powerful nuclear state threatening a nuclear first-strike, only to be eventually deterred from using nuclear weapons against another nuclear power. This experience effectively taught China that the demonstration of detonating fission (1964) and fusion (1967) weapons might well have contributed to deterring a Soviet nuclear attack, reinforcing the idea that a small nuclear force is effective for achieving strategic deterrence.

In summary, China's People's War strategic culture determined the initial conditions of China's nuclear weapons program, causing it to be configured to demonstrate nuclear technical achievements rather than build a large nuclear force structure. The Sino-Soviet split was a critical juncture that further restrained nuclear program development and directed it towards a particular development trajectory early in the program. The Cultural Revolution and Third Line Campaign then reinforced the restrained industrial configuration of the nuclear program. Finally, the 1969-1970 Sino-Soviet nuclear confrontation reinforced the idea that a small nuclear force was sufficient for achieving strategic nuclear deterrence, regardless of the vulnerability of this force. People's War strategic culture decisively shaped the nuclear program's early configuration, and a combination of historical events and elite decisions then established

a particular development trajectory for the program and reinforced this trajectory in a path dependent manner.

Deng Era: 1976-1992

During the post-Mao era, the importance of strategic culture for influencing China's nuclear weapons program was reduced and path dependent development patterns became more important for determining the overall trajectory of the program. China's new leadership inherited certain material and ideational conditions that reinforced the restrained development trajectory of the program in a path dependent manner. For example, in terms of material constraint, the Mao-era organization of China's nuclear industry promoted production inefficiency and hindered efforts at reform. Ideationally, the notion that a small nuclear force was sufficient for achieving nuclear deterrence – regardless of vulnerability – had been generally effective since 1964 and was specifically proven efficacious during the 1969-1970 Sino-Soviet crisis. Taken together, these inherited conditions reinforced the restrained development trajectory of the program in a path dependent manner.

While strategic culture was less influential in affecting the development of China's nuclear weapons program during this period, it was not inconsequential. After Deng Xiaoping emerged as China's de facto leader during the late 1970s, China's strategic culture transformed in a manner that caused certain changes within China's nuclear weapons program while also reinforcing the overall restrained development trajectory of the program as a whole. On the one hand, China's strategic culture change caused certain changes to China's nuclear weapons program; not only does the

timing of China's strategic culture transformation in relation to Second Artillery reforms support such a causal link, but also the content of changes to China's strategic culture correspond to specific changes to its nuclear program. For example, a renewed cultural emphasis on scientific education and training led to just these types of changes in China's nuclear weapons program, as China created a new educational system, initiated nuclear deterrence theory development, and instituted a new training regimen for Second Artillery forces. China's strategic culture transformation changed aspects of its nuclear weapons program that improved China's nuclear second-strike capability without any increase in its nuclear weapon force. However, on the other hand China's strategic culture transformation also reinforced restraint for the program as a whole. New cultural ideas about the efficacy of international diplomacy for advancing national security objectives corresponded with the various path dependent material constraints that reinforced low numbers of nuclear weapons for China's nuclear weapons program. For example, increased international engagement resulted in China's accession to several nuclear-related international treaties; these agreements became nascent mechanisms reinforcing the restrained development trajectory of China's nuclear weapons program, and created a precedent for legal transparency for the program that persists through the present period.

While strategic culture remained influential during the Deng era, path dependence was a more important influence on the development of China's nuclear weapons program during this period. In a demonstration of the importance of timing for the establishment of a development trajectory, whereas Mao-era leaders created the set of initial conditions for the nuclear weapons program, post-Mao leadership *inherited* a set of material and

ideational conditions that reflected significant physical and cognitive investment in the restrained development trajectory for the program. Then, while the transformation of China's strategic culture caused certain novel changes in its nuclear weapons program, it also reinforced aspects of restraint for the program as a whole. Taken together, this combination of inherited conditions and reinforced restraint limited the transformative effects of China's strategic culture shift in a path dependent manner.

Jiang-Hu Era: 1993-2011

Between 1993 and 2011, China's nuclear weapons program developed along a pathway that was established in the Mao era and continued during the Deng Xiaoping era, as some aspects of the program continued to develop in a path dependent manner even while certain other aspects of the program were changed. During this period, as China's domestic political environment increasingly reflected long-term stability, political and military leaders became more responsive to external political and military events, such as the breakup of the Soviet Union and the 1991 Persian Gulf War. Reaction to these events led to further expansion of the Second Artillery's mission to include conventional long-range strikes in support of localized military conflicts along China's periphery within the overall context of Deng-era development trends for the Second Artillery. While this change was not specific to the nuclear weapons program, it did affect the organization, mobilization, and deployment planning for China's nuclear forces. Further, China also improved the security of its nuclear forces during this period through incremental modernization of its nuclear deployment systems. For example, it began investment in new land-based, road-mobile ballistic missiles, including a new road-

mobile ICBM system. However, while these modernizations have marginally improved the security of a portion of China's nuclear force, the overall effect on China's nuclear force security remains negligible given the inherent vulnerability of land-based nuclear weapon systems.

Path dependence continued to be the most important influence on China's nuclear weapons program development during this period, as nuclear weapon modernization and Second Artillery organizational changes all occurred within a context of ongoing restraint for the program as a whole. During this period, even as China continued a series of modernization efforts for its nuclear program, it still did not appreciably expand its nuclear force and still had not developed an operationally deployed sea-based nuclear deterrent. Further, China continued to establish mechanisms reinforcing restraint of the program such as accession to multi- and bilateral nuclear-related treaty agreements, which have acted as self-reinforcing mechanisms binding the program to a certain development pathway. Taken together, China's nuclear weapons program had continued its restrained development trajectory, indicating an ongoing commitment to a small and somewhat vulnerable nuclear force.

Towards a "Total View" of Nuclear weapons programs

This dissertation has demonstrated that a state's nuclear weapons program is not simply a numerical account of weapons. Rather, it additionally consists of research and development institutions; fabrication and production facilities, to include fissile material production; nuclear deterrence and deployment strategy, to include educational publications; and command and control methods, to include training programs designed

to effectively implement deterrence strategies. These aspects constitute a wide variety of indicators that together comprise a "total picture" of a nuclear weapons program. In the case of China, upon analyzing this broader set of indicators it became clear that China's nuclear weapons program changed greatly throughout the 56 year period between 1955 and 2011, and much of this change occurred as a result of the changing relationship between China's strategic culture and various aspects of its nuclear weapons program. For example, China's nuclear industry has remained focused on research and development of nuclear capabilities rather than weapon force production, although the reasons for this restraint changed between 1955 and 2011. At first, China's strategic culture caused China's initial nuclear weapon industrial base to be structured in a manner that emphasized achieving the technical capability to produce and test individual nuclear weapons. This created a significant sunk cost that became expensive to change, and the prevailing People's War strategic culture of the era ruled out redirecting investment to increase the scale of weapon production beyond a minimal capacity. Later, as China's strategic culture changed, leaders decided to commercialize China's nuclear industry – primarily its fissile material production facilities - while acceding to a variety of nuclear-related international treaties and agreements. This redirected China's nuclear industry towards a different - but still restrained - development trajectory, restraint that fit within China's newly transformed strategic culture. Further, this new development trajectory included the establishment of self-reinforcing mechanisms that encouraged China's nuclear industry to continue to be restrained, given that China's nuclear-related international agreements required periodic reporting to external organizations regarding the condition of aspects of China's nuclear industry. These finding reaffirm that while

strategic culture initiated certain development patterns for China's nuclear program, path dependence encouraged the persistence of certain development patterns over time.

More generally, this dissertation has found that the development of the "total picture" of a nuclear weapons program depends upon its fit within the broader strategic culture of the state. This becomes apparent through an examination of China's nuclear weapons program within the context of the post-Mao political transition detailed in chapter four. After Deng Xiaoping assumed leadership of the Chinese state in 1979, China's military and political leaders no longer believed that world war was a likely possibility, they believed China faced no imminent military threat, and they asserted that economic development, domestic educational reform, military professionalization, and internationalization were to be the most appropriate methods for advancing China's national security goals. This shift in strategic culture caused a mix of change and continued restraint within China's nuclear weapons program; the nuclear industry was demilitarized and commercialized (restraint), educational institutions were established for the Second Artillery (change), command and control of China's nuclear arsenal was improved as training programs were initiated for Second Artillery forces (change), and China acceded to a host of nuclear-related treaties and agreements (restraint). Changes to the Second Artillery's education, command and control, and deployment training improved China's second-strike capability, resulting in an improvement of China's nuclear deterrent without any appreciable increase in the number of deployed nuclear weapons. Yet persistent patterns of restraint within China's nuclear weapons program also fit within the post-Mao strategic culture conceptualization, given the emergent belief that the threat of world war was lessened and the prospect of direct military confrontation

was reduced. These links between China's strategic culture shift of the Deng era and subsequent patterns of restraint and change in its total nuclear weapons program supports this dissertation's characterization of a causal relationship between strategic culture and China's total nuclear weapons program. Yet this mix of improved deterrence within a path dependent development pathway of restraint additionally reveals the importance of analyzing the historically contextualized effect of inherited conditions on the development trajectory of a state's nuclear weapons program.

Final Thoughts

Since the Deng era, China has improved the credibility of its strategic nuclear deterrent without appreciably increasing the number of nuclear weapons it has deployed, while simultaneously acceding to a wide variety of co-binding international agreements that limit certain aspects of its nuclear weapons program. By integrating the development of an increasingly secure, counter-value targeted second-strike capability together with international political institutions designed to reduce uncertainty with other nuclear powers, China would seem to have shifted closer to the "institutional deterrence statist" position detailed in chapter two. Far from developing a secret first-strike capability vis-à-vis the U.S., this study has found that China has instead steadily stabilized a countervalue-targeted nuclear deterrent within a broader context of international political engagement.

In the future, China will continue its nuclear weapon modernization in a manner that further improves the credibility of its strategic nuclear deterrent, for example by developing a strategic sea-based nuclear deterrent that conducts regular deterrence patrols

and a reliable, land-based, mobile ICBM force. These developments will undoubtedly improve the survivability of China's second strike capability, with or without any increase in the overall number of its deployed nuclear weapons. Further, any future advances will inevitably generate questions regarding China's strategic intent. However, in this study I have shown that interpreting future developments requires a proper grasp of the past; thus analyzing China's historical nuclear weapons program development trajectory provides the necessary context for characterizing any future nuclear-related developments. It is my hope that this dissertation has been a first step towards an improved understanding of this history.

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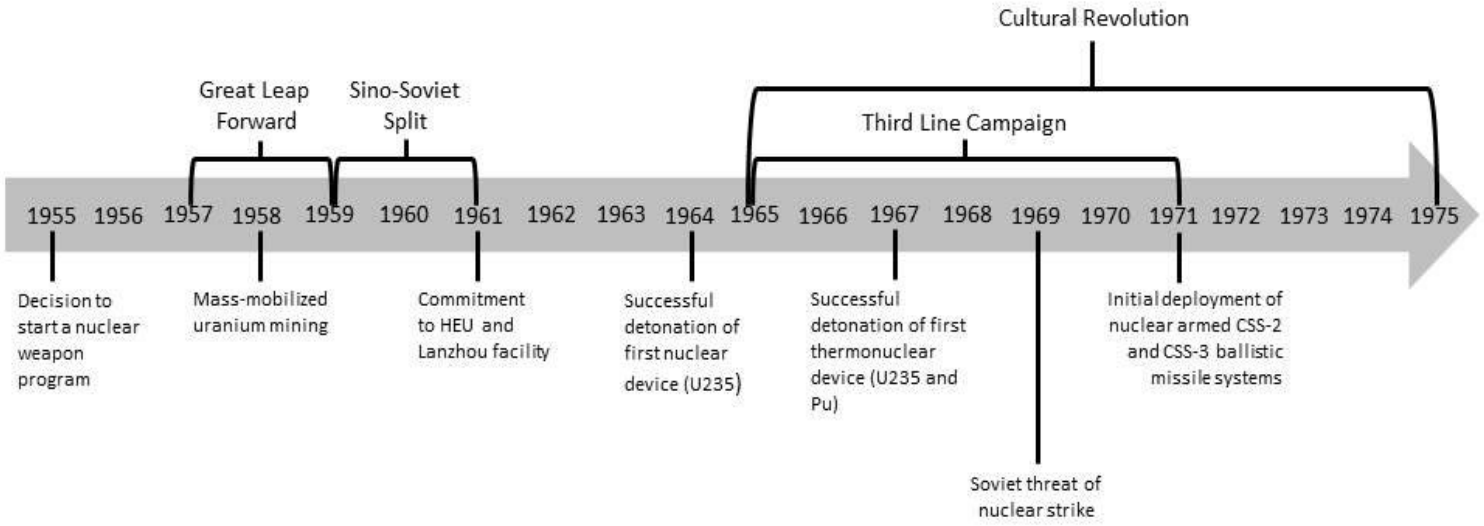
Appendix A: Mao-era Historical Timeline, Chapter Three

Timeline: Historical Events and China's Nuclear Program



Appendix B: Source Discussion, Chapter Three

Specialized sources employed in chapter three include a secret Chinese military journal published during the early 1960s, declassified U.S. Central Intelligence Agency (CIA) National Intelligence Estimates (NIEs) from the 1960s and 1970s, and U.S. declassified satellite photographs of a Chinese nuclear facility. The secret Chinese military journal is titled *Bulletin of Activities* and is primary source material for Chinese military strategy and doctrine. Published in 1961, these documents have been overlooked in recent works on China's nuclear weapons program.[1] The CIA NIEs cited here represent official U.S. government intelligence assessments of China's nuclear industry and nuclear weapons program.[2] Finally, declassified satellite photographs are referenced here in support of geospatial analysis of one particular Chinese nuclear facility.[3]

Source Discussion

1. *(工作通讯) Gongzuo Tongxun*.
    - These are primary source materials published by the Chinese military in 1961 and classified *Secret*. These materials are available from the Library of

[1] *Bulletin of Activities*, or *Gongzuo Tongxun* (originally referred to according to the Wade-Giles romanization system as *Kung-tso Tung-Hsun* in English language sources from the era and often translated as "Bulletin of Activities"), was a secret Chinese military journal acquired after Tibetan rebels overran a PLA outpost in 1961 and subsequently transferred captured documents to the U.S. government (Carol McGranahan, "Tibet's Cold War: The CIA and the Chushi Gangdrug, 1956-1974," pp. 119-120). After a period of review, these documents were released to the U.S. academic community for public review in 1963, and an English language translation was published by Hoover Institution Publications in 1966 (Chester Cheng, ed., *The Politics of the Chinese Red Army*). The documents cited here are the original Chinese versions, with supporting reference to secondary sources.

[2] These NIEs also represent secondary source interpretation of historical satellite photography of Chinese nuclear facilities.

[3] The satellite photographs referenced here are authorized under 1995 and 2002 executive orders allowing declassification of select photographs from U.S. photo-reconnaissance satellites, published by USGS Earth Resources Observation & Science Center (EROS).

Congress. I accessed these materials through the Alice Hsieh Special Collection at Virginia Polytechnic Institute and State University.

1. Declassified satellite photographs, USGS.
   - These are hard-copy photographs from U.S. photo-reconnaissance satellites. I purchased a set of these photographs from USGS and received them in digital format. The scanned images are not georeferenced.

United States Geological Services Website: Information on declassified satellite imagery

Declassified Satellite Imagery – 1
"Abstract: On February 24, 1995, President Clinton signed an Executive Order, directing the declassification of intelligence imagery acquired by the first generation of United States photo-reconnaissance satellites, including the systems code-named CORONA, ARGON, and LANYARD. More than 860,000 images of Earth's surface, collected between 1960 and 1972, were declassified with the issuance of this Executive Order. The National Archives and Records Administration (NARA) was given the responsibility for the original film and provide access to a duplicate copy for public viewing of the film. The USGS was also provided a dupe copy to support science products. Both NARA and the USGS provide access and product support for Declass-1 collection."[4]

Declassified Satellite Imagery – 2
"Abstract: President William Clinton signed an Executive Order on February 24, 1995, directing the declassification of intelligence imagery acquired by the first generation of United States photo-reconnaissance satellites. The order directed the Department of Defense's Intelligence Community to transfer declassified spy satellite imagery to the National Archives and Records Administration (NARA) in College park, MD and provide a copy to the USGS National Center for Earth Resources Observation and Science (EROS). The Key Hole (KH) series of satellites evolved over time to improve resolution and quality. The second phase of the declassification effort that occurred on September 20, 2002 involved 50,000 frames of imagery from the KH-7 Surveillance System and the KH-9 Mapping System that were taken from 1963 to 1980. NIMA recommended declassification in 1998 and paperwork was forwarded to the Director of Central Intelligence (DCI) George J.Tenet for approval. Mr. Tenet approved the recommendation in October 2000 after concurrence by both the Secretaries of Defense and State. Some of the KH-7 imagery (Missions 4001 through 4038) is comparable to current high-resolution commercial imaging systems such as IKONOS and Quickbird. Only the KH-9 frame camera (mapping) imagery (Missions 1205-5 through 1216-5) and the system designators (KH-9/System 1201 through 1220) were approved for release. The images have variable scales and quality. Cloud cover is common. The film and print products are produced

[4]USGS: Declassified Imagery 1 metadata abstract (United States Geological Services Website, last accessed 17 September 2011, http://edcsns17.cr.usgs.gov/NewEarthExplorer/form/fgdcmetadatalookup/?collection_id=1051&entity_id=DS1009-2069DF198&primary_key=DS1009-2069DF198&pageView=1).

from a duplicate negative source. More than 40 percent of the imagery contains significant cloud cover. The use of browse imagery gives the user the opportunity to review a reduced spatial resolution image to determine whether or not the area of interest is covered and is or is not obscured by clouds. The original film and technical mission-related documents are maintained by the ("http://www.nara.gov") National Archives and Records Administration."[5]

[5]USGS: Declassified Imagery 1 metadata abstract (United States Geological Services Website, last accessed 17 September 2011, http://edcsns17.cr.usgs.gov/NewEarthExplorer/form/fgdcmetadatalookup/?collection_id=4583&entity_id=DZB1210-500145L005001&primary_key=DZB1210-500145L005001&pageView=1).

Curriculum Vita: Renny Babiarz, PhD

EDUCATION

PhD, Political Science, The Johns Hopkins University, 2013
Specialization in international relations and comparative politics. Dissertation: *The People's Nuclear Weapon: Strategic Culture, Path Dependence, and China's Nuclear Weapon Program, 1955-2011*.

MA, Political Science, The Johns Hopkins University, May 2011

Certificate, Chinese Language, The Inter-University Program, UC Berkeley-Tsinghua University, Spring 2008
One year Mandarin Chinese language study program designed for intermediate to advanced language students.

MA, Asian Studies, University of Hawaii at Manoa, May 2004
Received Chung-Fong and Grace Ning Award for Excellence in Chinese Studies; nominated for Frances Davis Award for Excellence in Undergraduate Teaching, 2001-2002.

Certificate, Chinese Studies, School of Hawaiian, Asian and Pacific Studies, University of Hawaii, May 2004

Certificate, Chinese Studies, The Hopkins-Nanjing Center, April 2003
One year Chinese history and cultural study program offering undergraduate level classes in Chinese history, social sciences, business, and arts; taught in Mandarin Chinese using Chinese language source materials.

BA, Philosophy, Concentration Asian Studies, St. Mary's College of Maryland, May 1998

PROFESSIONAL EXPERIENCE

United States Federal Government, Washington, D.C.; May 2010 – August 2013
Research Analyst, Department of Defense
Conducted collaborative research and analysis; published peer-reviewed research papers; gave interactive presentations on research findings. Completed a government service requirement for a 2007 National Security Education Program Boren Fellowship (listed below).

The Johns Hopkins University, Baltimore, Maryland; Fall 2004 - Spring 2007; Fall 2009
Graduate Teaching Fellow, Political Science Department
Teaching assistant for the following classes: *Introduction to Comparative Politics*, *Domestic Politics of Contemporary China*, *Introduction to International Law*, and *Contemporary International Politics*.
Duties included leading discussion sections, developing exam content, grading research papers and exams, holding weekly office hours, and contributing to final grade evaluations.

The Alliance for Global Education, Beijing Language & Culture University, Beijing, China; Fall 2008-Spring 2009
Lecturer, *Chinese Foreign Policy: 1949 to the Present*
Created and taught advanced seminar title *Chinese Foreign Policy* for students at the Alliance for Global Education's study abroad program at the Beijing Language and Culture University in Beijing, China.

The Strategic Assessment Center, SAIC, McLean, Virginia; June 2004-January 2005
Research Intern
Conducted research and analysis of Chinese politics, foreign affairs, military affairs, and space program

progress in support of the project titled: *Indicators and Evidence of an Emerging U.S. - China Space Competition*. Conducted interviews with subject matter experts, organized and presented at the project workshop, and compiled an annotated bibliography in support of research objectives.

St. Mary's College of Maryland, St. Mary's City, Maryland; April 2002-August 2002
Co-Director, Shanghai Summer Program
Managed a staff of 5 English teachers and planned English language curriculum for 30 participant business professionals from Shanghai, China.

Asian Studies Department, University of Hawaii at Manoa, Honolulu, Hawaii; August 2001-August 2002
Graduate Teaching Assistant, Asian Studies Department
Planned and led weekly discussion groups and test review sessions for Asian Studies classes; periodically delivered lectures; integrated Web-based curriculum with course readings; nominated, Frances Davis Award for Excellence in Undergraduate Teaching. Planned and coordinated the 2002 School of Hawaiian, Asian and Pacific Studies (SHAPS) graduate student conference.

Fudan University, Shanghai, China; Fall 1998 - Spring 1999
Visiting English Teacher, College English Center
Taught University Freshmen and Sophomore spoken and written English; developed spoken English language curriculum; coordinated extensively with Chinese faculty.

HONORS, AWARDS, AND FELLOWSHIPS

United States Federal Government, Department of Defense, May 2013
Performance Award
Awarded in recognition of outstanding performance.

National Security Education Program, Fall 2007-Spring 2008
Boren Fellowship
Competitive U.S. government fellowship awarded towards language study within an area of national security interest. Completed required government service in 2013.

Johns Hopkins University, Fall 2004-Spring 2007
George Owen Fellow
Fellowship awarded for a period of three years by the Johns Hopkins University Political Science Department.

Center for Chinese Studies, University of Hawaii at Manoa, January 2004
Chung-Fong and Grace Ning Award for Excellence in Chinese Studies
Awarded annually to one graduate student in recognition of academic achievement in the field of Chinese Studies.

University of Hawaii at Manoa, 2002-2003
Foreign Language Area Studies Fellowship (FLAS)
Competitive fellowship awarded on the basis of academic achievement to graduate students towards foreign language study .

Nominated, Frances Davis Award for Excellence in Undergraduate Teaching, 2001-2002