China's Strategic Force Modernization: Issues and Implications

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China's Strategic Forces

China's initial quest for a nuclear capability was motivated by recognition of the political value of nuclear weapons and by a determination to remove China's vulnerability to nuclear blackmail. Following its first nuclear test in 1964, Beijing announced that it would adhere to a policy of no-first-use (NFU) of nuclear weapons and called for worldwide nuclear disarmament. Alone among the nuclear-weapon-states of the NPT, China adopted a minimal deterrent strategy relying on a small number of nuclear weapons to deliver punitive, counter-value responses to an adversary's first strike. China's nuclear forces currently consist of about 400 warheads, including about 260 "strategic" warheads and 150 "tactical" warheads. China's strategic arsenal is deployed on a triad of 130 land-based missiles, 120 strategic bombers, and one ballistic missile submarine equipped with twelve SLBMs. China's land-based Dong Feng-series (DF) strategic missiles range from the 1800-km DF-21A to the 13,000-km+ DF-5A ICBM. China currently has 18-26 DF-5A missiles capable of striking targets in the continental United States. Its tactical nuclear weapons include artillery shells, atomic demolition munitions, and short-range missiles.

Although China has been satisfied with a relatively small nuclear force, the credibility of its nuclear deterrent has always been questionable. China's H-6/B-6 strategic bombers are obsolete aircraft with limited range and little ability to penetrate modern air defenses. The single *Xia* class ballistic missile submarine has been plagued with technical problems and may no longer be operational. The linchpins of China's strategic deterrent are the DF-5A and DF-4 missiles, which are liquid-fueled and based in silos. Because these missiles are not mobile and require long preparation times before launch, they are potentially vulnerable to a preemptive first strike. The missiles are normally not mated with their warheads, further reducing readiness. China's strategic forces have a variety of other weaknesses, including deficiencies in early warning systems, limited C^3I, poor mobility and dispersal capabilities, and vulnerability to future anti-missile defenses.

The principal driving force behind China's strategic modernization has been the desire to address these weaknesses and build a credible minimal deterrent. Absent widespread deployment of missile defenses, China's current strategic modernization program will produce a credible, survivable nuclear deterrent force by 2010-2015. The technical improvements necessary to achieve this goal will provide China's future leaders with new strategic options. Technical limitations currently preclude the adoption of a more elaborate nuclear doctrine (such as a launch-on-warning posture or a limited deterrent that includes

nuclear war-fighting capabilities). The current strategic modernization program will eventually put China in position to pursue a major expansion in its nuclear force structure or a shift in nuclear doctrine toward limited deterrence. Neither choice is inevitable, but both options will become realistic goals.

Three Scenarios For Strategic Modernization

Three broad scenarios for Chinese nuclear modernization seem likely. The first involves steady improvement of existing forces at a measured pace, focusing on improving survivability of nuclear forces via greater mobility, shortened launch preparation time, improvements in command and control, and protection or concealment of hardened silos. This mode of modernization has been underway for two decades and will continue regardless of the external environment. A second scenario would respond to U.S. missile defenses by increasing force levels to maintain minimum deterrence. This would include a significant increase in Chinese missiles able to reach U.S. targets and development of multiple warheads and penetration aids to overcome U.S. missile defenses. A third scenario would be driven by doctrinal change away from minimum deterrence. This might include a shift to a limited deterrence strategy or a launch-on-warning posture. Table 1 summarizes China's likely force structure and capabilities under each scenario.

Scenario One: Credible, Minimum Deterrent

China's current modernization efforts are intended to enhance the survivability of its strategic nuclear forces (thereby increasing the credibility of China's minimum deterrent). These efforts are focused on the areas of propellant technology, mobility, guidance and accuracy, yield-to-payload ratio, and launch preparation time. China's strategic missile modernization is essentially following the same technological trajectory as the American and Soviet missile forces, albeit at a slower pace and in lesser numbers. A credible minimum deterrent would also involve a quantitative expansion to about fifty ICBMs.

The current modernization program will replace liquid-fueled missiles based in caves and silos with solid-fueled, road-mobile missiles, resulting in significant increases in survivability, accuracy, and reduced launch preparation time (from 2-3 hours to 5-10 minutes). Newer generation 8,000-km DF-31 missiles will enter service in 2000-2001, replacing older liquid-fueled DF-4 missiles. The 12-13,000km DF-41 is still under development, but is expected to begin replacing the DF-5A after 2005. Both will incorporate smaller second-generation nuclear warheads. China has conducted tests of multiple re-entry vehicles (MRVs) and various penetration aids, which might be deployed on the DF-31 and DF-41.

China is also developing the JL-2, a second-generation SLBM which will be deployed on an indigenously produced second-generation Type 094 SSBN submarine. A solid-fueled missile with a maximum range of 8,000 km, the JL-2 is expected to enter service around 2005. If the missile and submarine perform as expected (China's nuclear submarine program has experienced numerous technical problems and delays), the naval leg of China's triad would then become effective for the first time.

Although modernization may contribute to strategic stability by giving China a more survivable deterrent, it will also create new concerns about accidental or unauthorized launches. Little is known about China's nuclear command and control system. Mobile ICBMs and SLBMs will have warheads mated with their missiles, reducing the effectiveness of physical security in preventing unauthorized launches. These missiles will push operational launch authority to lower levels, require a more sophisticated command and control system, and rely more heavily on technical means to prevent unauthorized launches.

Scenario Two: Minimum Deterrent in a Missile Defense Environment

Deployment of even a thin U.S. national missile defense (NMD) system would threaten China's strategic nuclear deterrent. Beijing worries that its aging and limited number of ICBMs might not be able to penetrate a U.S. national missile defense system after absorbing a first strike. Chinese leaders are determined not to return to a situation where they are vulnerable to U.S. nuclear blackmail. Hence U.S. NMD deployment would probably result in a significant increase in the size of the Chinese ICBM force, while TMD deployment in Japan might increase the number of Chinese MRBMs. The need to maintain a credible nuclear retaliatory capability would likely push China to speed up its ballistic missile modernization programs, increase deployments of current missiles, or both. China might also retain older missiles in its inventory instead of retiring them.

U.S. planners assume that four interceptors would be needed for each ballistic missile, but Chinese experts assume a two-to-one ratio of interceptors to targets. If the United States deploys its proposed 100-interceptor NMD system, China would want at least 50 warheads to survive a U.S. first strike in order to maintain confidence in its deterrent. This would require a total force of 100-200 missiles (or a somewhat smaller number of missiles equipped with MRV/MIRV capability). More advanced U.S. NMD architectures would result in correspondingly larger increases in China's ICBM force. The financial resources and production capability that China could devote to strategic modernization are unclear, but historically China has been willing to make considerable sacrifices to build its nuclear arsenal. Although the actual effectiveness of a U.S. NMD system would be unknown to both sides, China is likely to assume the system is highly effective and to size its forces accordingly. The result would be a disjuncture between American and Chinese views of what constitutes a reasonable Chinese response to NMD deployment.

China has tested MRVs, decoys and penetration aids, but has not deployed these capabilities on operational missiles. U.S. missile defenses would make the deployment of penetration aids essential. China would probably also deploy MRVs or MIRVs to increase the number of warheads that could penetrate U.S. missile defenses. Missile defenses would make submarines more attractive as a means of increasing missile survivability and for launching from locations and depressed trajectories where missile defenses have limited coverage. Reverse-engineering of China's Russian-built Kilo-class submarines or acquisition of submarine technology could accelerate China's nuclear submarine development efforts. Development of long-range cruise missiles would be another possible response. NMD deployment would probably also result in a shift in Chinese nuclear training towards salvo launches of multiple missiles that could overwhelm U.S. missile defenses.

Scenario Three: Doctrinal Change toward a Limited Deterrent

A doctrinal shift from minimum to limited deterrence could also trigger a major increase in China's strategic nuclear forces. Some Chinese strategists have suggested adopting limited deterrence to develop a nuclear *war-fighting* capability as well as a *retaliatory* capability. A credible limited nuclear deterrent must be survivable and able to control and suppress nuclear escalation in the event of a nuclear conflict. There is a clear gap between China's current nuclear forces and the requisites of a limited-deterrence posture. Limited deterrence might cover potential regional rivals such as India and Russia as well as the United States. America's advantage in conventional forces and Russia's increasing reliance on tactical nuclear weapons may create incentives for China to develop a tactical nuclear war-fighting capability, resulting in significant increases in ICBMs, MRBMs, and tactical nuclear weapons.

China's current modernization program will produce many of the systems needed to support limited deterrence, including advanced mobile ICBMs, MRV/MIRV capability, and submarines capable of launching long-range SLBMs. A shift to limited deterrence would require greater numbers of each of these systems, which would require additional time. China would also need to move well beyond its current modernization program to develop advanced early warning satellites and radars, effective C^3I systems, anti-satellite weapons, and ballistic missile defenses of its own. China's industrial and technological infrastructure is currently incapable of meeting these requirements, but sufficient development time and additional commitment of resources would eventually permit a shift to a limited deterrence doctrine.

A more modest doctrinal shift would be toward a launch-on-warning posture. China's new generation of DF-31 and DF-41 ICBMs are assessed to have relatively short launch-preparation times. China would also need to develop advanced satellite and radar early warning capabilities and to improve its command and control system. Launch-on-warning would not require large increases in the numbers of strategic forces, and could be completed in a shorter period of time. It would increase the chance of accidental or unauthorized launches. Launch-on-warning might also be part of China's response to U.S. NMD systems, especially if only a few DF-31 and DF-41 systems were available.

Factors Influencing China's Strategic Modernization

The pace and scope of China's strategic modernization will be affected by a host of internal and external factors. Internal factors include financial resources, technological capability, the weight of the military in strategic policymaking, the balance between economic development and military modernization, strategic perceptions, and nuclear doctrine. External factors include NMD deployment, China's arms control commitments, major-power relationships, foreign assistance, international strategic trends, decisions by other major nuclear weapon states, and the state of the global arms control regime.

Scenario one is likely to occur regardless of the external environment, although the pace of modernization will be affected by available resources, technical problems encountered during development, and the perceived urgency of potential threats. Technical assistance from Russia could significantly speed up China's modernization, but Russia has been reluctant to share nuclear weapons and strategic missile technology.

Scenario two (U.S. NMD deployment) would significantly increase the ultimate size of China's strategic force, accelerate the pace of modernization, ensure deployment of MRVs/MIRVs and penetration aids, and possibly lead to adoption of launch-on-warning. The U.S. NMD architecture and the state of Sino-U.S. relations would directly shape the Chinese response. If the United States accepts a modest increase in Chinese forces as a rational response to NMD deployment, the impact on relations would be minimized. This would be more likely if China explicitly defines a cap on its nuclear forces keyed to a specific U.S. NMD architecture. If the U.S. NMD system is explicitly aimed at removing China's nuclear deterrent, as some missile defense supporters advocate, China would expand the scope and accelerate the pace of its strategic modernization and bilateral relations would deteriorate.

Scenario three (shift to limited deterrence) is possible but not predetermined. Some Chinese strategists call for developing the capabilities necessary to support a limited deterrence doctrine. Others feel that an ambitious strategic modernization program is an unnecessary waste of resources. A major change in Chinese perceptions of the strategic environment would probably be a precondition for adoption of a limited deterrent doctrine. The ability of the Chinese military and the defense industry to justify a doctrinal shift and to claim resources for significant increases in nuclear forces will be critical. Civil-military relations, domestic politics, and strategic perceptions will all shape the Chinese debate. External factors will also influence Chinese decision-making. A stable strategic environment, a functioning arms control regime, and international political pressure opposing a Chinese buildup would be moderating forces. Conversely, Sino-U.S. strategic rivalry, a breakdown in international arms control efforts, and an Indian strategic buildup that diverts international pressure would encourage a more ambitious modernization program.

Several technological and political constraints will limit the pace and scope of China's strategic modernization. China's nuclear and missile programs compete with other government programs and priorities. Resource constraints could slow modernization and make limited deterrence more difficult. Technological obstacles will delay some current modernization efforts and raise the cost of other options. China has sought foreign assistance (overtly and through espionage) to improve its strategic forces, but most of the work must be done through indigenous research and engineering efforts. Finally, China has historically been reluctant to be isolated internationally. The fact that China will be building up its arsenal while other countries are building down means that international political pressure might restrain Chinese decisions about strategic force structure.

Implications of a Chinese Strategic Buildup

The first scenario (credible minimum deterrence) would have a fairly limited international impact. It would involve a relatively modest increase in deployed Chinese weapons (assuming older systems are retired). However, development of a small but modern strategic missile force would position China to significantly expand the size of its force in the future. Given China's lack of transparency on strategic issues, this potential would fuel suspicion about China's intentions among its neighbors and in the United States, complicating regional security and arms control efforts.

If U.S. NMD deployment drives Chinese force modernization (the second scenario), China's commitment to the current arms control and nonproliferation regimes might weaken. China would attempt to use international arms control negotiations to restrain the expansion of U.S. NMD systems (for example, by linking restrictions on outer-space weapons to other arms control treaties). China would refuse to negotiate a fissile-material cutoff treaty (FMCT) that would prohibit future production and possibly require reductions in existing stockpiles. The heightened importance of developing a MRV/MIRV capability might prompt China to withdraw from the CTBT if additional tests of miniaturized nuclear warheads were necessary. Beijing might also re-evaluate its nuclear and missile nonproliferation commitments in order to increase pressure on the United States to limit missile defense deployments. U.S. TMD deployments to Japan or especially Taiwan would probably eliminate China's willingness to expand its international nonproliferation commitments or to adhere to bilateral commitments.

Because this scenario involves a significant expansion of China's strategic nuclear force, it would have a broad negative impact on international arms control and nonproliferation regimes. In the worst case, the United States might interpret China's buildup in response to a U.S. NMD deployment as evidence of hostile Chinese intentions, stimulating an arms race and an end to cooperation on regional security, nonproliferation, and arms control issues.

A doctrinal shift from minimal deterrence to limited deterrence would call China's NFU pledge into question. The associated build-up of Chinese nuclear missile forces, coupled with a U.S.-Russian START III build-down, would move China closer to numerical parity. This could have two contradictory consequences. China's two-decade free ride on superpower nuclear weapons reductions might end, as international pressure mounted for China to participate in the global nuclear disarmament process. However the United States and Russia might reconsider further reductions in their strategic nuclear arsenals, especially if China refused to make reductions in its arsenal. A shift in Chinese nuclear doctrine would probably be interpreted by the United States as evidence of Chinese hostility, worsening relations and undermining regional stability.

Any significant expansion of China's nuclear force would have important implications for regional security dynamics. Some Japanese analysts would interpret China's strategic modernization as a threat, especially if it includes a shift to limited deterrence and an expansion in the number of MRBMs. The closing of the gap between Chinese nuclear missile forces and U.S. military capabilities and the potential for nuclear exchanges in the western Pacific could cause Tokyo to question the credibility of extended deterrence and the U.S. nuclear umbrella. This might lead Japan to make a greater commitment to theater missile defense and to reconsider its nuclear and ballistic missile options. This reassessment might also be triggered by an easing of tensions on the Korean peninsula, which might undercut the rationale for a forward-based U.S. presence in Northeast Asia.

India would also be directly affected by China's nuclear modernization programs. India would point to Chinese modernization as justification for its own strategic buildup, impeding international efforts to pressure India to cap its nuclear and missile programs. However, China would continue efforts to use the international arms control regime to

pressure India, fueling bilateral tensions. As China's strategic forces become more capable and move toward a higher-alert status, India might feel the need to enhance the credibility of its own nuclear and missile forces. The resulting arms competition would further erode the nuclear nonproliferation regime and damage the fragile consensus among the nuclear weapons states.

Policy Options and Issues

Although some degree of Chinese strategic modernization is inevitable, outsiders have some ability to influence the pace and scope of China's buildup.

U.S. decisions about NMD will directly shape Chinese decisions about force structure. If the United States decides to deploy NMD, it should initiate a strategic dialogue with China to clarify the technical parameters of the NMD architecture and to discuss China's responses. Strategic dialogue is important because differing assessments of NMD's effectiveness mean that many Americans will view China's response as excessive, even if China feels it is being restrained. The goal should be to minimize damage to bilateral relations through mutual strategic reassurance. The United States might offer assurances about the ultimate scope of its NMD system; China might offer greater transparency about its modernization plans (possibly including force structure levels keyed to specific missile defense architectures). Open-ended U.S. plans for NMD expansion or an explicit effort to nullify China's nuclear deterrent would have a devastating impact on relations that would foreclose prospects for future security and arms control cooperation.

In emulating U.S. and Russian modernization patterns, China is moving away from its previous secure force structure and increasing the possibility of accidental or unauthorized launches. Bilateral or trilateral dialogue about nuclear command and control, nuclear weapons safety, and operational security might help find solutions that maintain survivability at lower alert levels that minimize chances of accidental or unauthorized launches. Greater Chinese transparency and technical exchanges about nuclear command and control and permissive action links (PALs) may be useful in addressing these concerns. China might also be invited to participate in a joint missile early warning center as a confidence-building measure.

External factors such as the overall state of the nonproliferation and arms control regimes will influence Chinese modernization plans (especially on the question of doctrinal change). Robust regimes will increase pressure on China to restrain its strategic buildup; regime breakdown will reduce the costs of unilateral modernization. China has historically responded to international pressure, especially when it is isolated. (E.g., pressure to stop nuclear testing played a major role in persuading China to sign the CTBT.)

Technology exports to China have become a contentious American political issue. As China's strategic and military modernization continues, the United States will seek to restrict the transfer of military and dual-use technology to China. The United States will urge its allies to strengthen domestic and international export control regimes to address its concerns about Chinese modernization. These efforts will increase tensions with U.S. allies who may not share Washington's perceptions about a potential China threat. They will also impede cooperative efforts to improve China's export control system and reduce incentives for China to comply fully with its nonproliferation commitments.

Three Scenarios for China's Strategic Modernization

	Current Forces	**Scenario 1: Minimal Deterrent (2010)**	**Scenario 2: Minimal Deterrent w/NMD (2020)**	**Scenario 3: Doctrinal Change (2020-25)**
ICBMs	18-26 (DF-5A)	About 50 (DF-5A, DF-31, DF-41)	100-200 (DF-5A, DF-31, DF-41)	100-200 (DF-5A, DF-31, DF-41)
Range (km)	13,000+	13,000+ (DF-5A)	13,000+ (DF-5A)	13,000+ (DF-5A)
Fuel	Liquid	Solid	Solid	Solid
CEP (km)	0.5 – 3.0	0.7-0.8	0.7-0.8	0.7-0.8
Launch preparation time	2 hours (DF-5A)	5-10 minutes (DF-41)	5-10 minutes (DF-41)	5-10 minutes (DF-41)
Mobility	None	Road Mobile	Road Mobile	Road Mobile
MRBMs	100 (DF-3/3A, DF-21, JL-1)	100	100	100-300
Advanced Early Warning	No	No	No	Yes
Launch Author-ization	Landline/senior officer in command	Radio communication/ more junior officer in command	Radio communication/ more junior officer in command	Radio communication/ more junior officer in command
Accidental launch risk	Nil (warheads not mated to missiles)	Minimal (warheads mated to mobile missiles)	Minimal (warheads mated to mobile missiles)	Minimal (warheads mated to mobile missiles)
Launch on Warning	No	No	No	Possible
Multiple Re-entry Vehicles	None	Possible	Yes	Yes
Penetration Aids	None	Possible	Yes	Yes
Doctrine	Minimal Deterrent	Minimal Deterrent	Minimal Deterrent	Limited Deterrent

Chinese Designation	**NATO Designation**	**Initial Operational Capability**	**Fuel/Basing**	**Range (Km)**	**Warhead Type**	**Number Deployed/ Projected**
DF-3/3A	CSS-2	1971	Liquid/ transportable	2,800	1-3 mt	40
DF-4	CSS-3	1980	Liquid/cave	4,750	2 mt	20
DF-5/5A	CSS-4	1981	Liquid/silo	13,000	3-5 mt MRV?	18-26
DF-21/21A	CSS-5	1986	Solid/TEL	1,700	200-300 kt	48
JL-1	CSS-N-3	1986	Liquid/SLBM	2,150	250 kt	12
DF-31	CSS-X-9	Tested in 1999	Solid/TEL	8,000	50-90 kt MIRV?	10-20 to be built
DF-41	CSS-X-10	Under development	Solid/TEL	12,000	250 kt MIRV?	12 to be built
JL-2 (based on DF-31)	CSS-NX-5	Under development	Solid/SLBM	8,000	250 kt	16 to be built?