U.S. MISSILE DEFENSE

IMPLICATIONS FOR SINO-U.S. ARMS RACE

Master of Arts in Law and Diplomacy Thesis

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Abbreviations

ASAT	Anti Satellite
ABM	Anti Ballistic Missile
ABL	Airborne Laser
BMD	Ballistic Missile Defense
CTBT	Comprehensive (Nuclear) Test Ban Treaty
C4I	Command, Control, Communication, Computers, Information
CBM	Confidence Building Measure
GBM	Ground Based Midcourse
GPALS	Global Protection Against Limited Strikes
ICBM	Intercontinental Ballistic Missile
IRBM	Intermediate Range Ballistic Missile
MTCR	Missile Technology Control Regime
MAD	Mutual Assured Destruction
MDA	Missile Defense Agency
MRBM	Medium Range Ballistic Missile
MDA	Missile Defense Agency
MEADS	Medium Extended Air Defense System
MIRV	Multiple Independently Targetable Reentry Vehicle
NMD	National Missile Defense
NPT	Non Proliferation Treaty
PAC	Patriot Advanced Capability
SDI	Strategic Defense Initiative
SDIO	Strategic Defense Initiative Organization
SBL	Space Based Laser
SBM	Sea Based Midcourse
SRBM	Short Range Ballistic Missile
SLBM	Submarine Launched Ballistic Missile
TMD	Theater Missile Defense
THAAD	Theater High Altitude Air Defense
WMD	Weapons of Mass Destruction

Abstract

In December 2002, President George W. Bush officially announced his plan to begin deployment of initial missile defense capabilities in 2004-2005. The deployment of missile defense is an essential element of the United States' broader efforts to meet its new strategic challenges in the twenty first century. Once deployed, missile defense can secure the US. force projection capability while providing an additional safety net against growing threats from WMDs in the hands of hostile regimes and international terrorists. But, Chinese government has strongly criticized the US. missile defense plan. Beijing warned that US. missile defense could not only undermine strategic stability, but also lead to the proliferation of nuclear weapons and missiles. A primary reason for Chinese criticism against missile defense is that even a limited system would undercut China's own nuclear deterrent vis-a-vis the United States. Currently, China has only about twenty liquid-fuel silo-based ICBMs that can reach the US. If US. would initiate a first strike, the Chinese assume that only a handful of Chinese ICBMs would survive. And the handful that would survive the first strike would be captured by missile defense systems. Many in China believe that such disadvantage would pose a serious menace to China's ability to employ its nuclear weapons to deter possible US. pressure and aggression in East Asia. Then, what would Sino-US. strategic relations look like under the fully-deployed missile defense, as well as how would it be affected by actual missile defense architectures employed? The thesis takes up this question and argues that prospects for Sino-US. arms race depend on the different types of missile defense architecture: limited, limited layered, and robust. And whether China enters into an arms race with the US. or not under the respective type of architecture is constrained by five variables: grand strategy in Chinese history; nuclear doctrine; military technology; economic resources; and China's commitment to arms control regimes.

Introduction

The US. Senate and House of Representatives overwhelmingly approved legislation for a National Missile Defense System on March 17 and 18, 1999, respectively. Actual withdrawal from the anti-ballistic missile (ABM) treaty occurred in June 2002. And in December 2002, the Bush administration officially announced its plan to begin deployment of initial missile defense capabilities in 2004-2005. The current US. plan calls for fielding the first twenty interceptors in Alaska and California by the end of2005. At this point, six interceptor missiles have been installed at Fort Greely in Alaska and two more are slated to be placed at Vandenberg Air Force Base in California.' In addition, since October 2004, a US. destroyer with long-range missile-tracking X-band radar has been patrolling in the East Sea (Sea of Japan), the system's first naval component to be put in place.' "We say to those tyrants who believe they can blackmail America and the free world - you fire, we're going to shoot it down," President George W. Bush said in August 2004.[3] The Pentagon said the system was scheduled to be deemed operational by the end of2004.[4]

But the Chinese government has strongly criticized this action in the harshest of terms. Beijing warned that US. missile defense could not only undermine international arms control and strategic stability, but also lead to the proliferation of nuclear weapons and missiles both on earth and in outer space. Ambassador Li Changhe, the Chinese representative to the Conference on Disarmament, stated, "[The United States] breached the existing arms control treaty by announcing its decision to accelerate the research and development of missile defense systems. ... These programs will certainly have negative impact on the bilateral and multilateral nuclear disarmament process and on global strategic

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1 Reuters, "US. Readies System for Missile Defense Despite Objections," *USA Today*, November 2, 2004,A15.
2 Ibid.
3 Ibid.
4 Ibid.

security and stability as wel1."s These charges were also echoed by President Jiang Zemin and Premier Zhu Rhongji. **In** a speech on March 26, 1999, Jiang said, "The research, development, deployment, and proliferation of sophisticated anti-missile systems ... will inevitably exert an extensive negative impact on international security and stability and trigger a new round of arms race in new areas, thereby seriously obstructing or neutralizing international efforts of nuclear disarmament and nuclear non-proliferation.:"

Surprisingly, in contrast to its forceful criticisms in previous years, the Chinese government has tempered its reactions since actual US. withdrawal from the ABM Treaty. One important factor moderating the Chinese response was President Bush's summer 2001 statement that "The [missile defense] is not about China and should not result in major alterations to China's ongoing modernization of its nuclear forces." At the same time, Bush offered to hold high level strategic dialogue with China.'

The outward silence of the Beijing government, however, does not necessarily equate with its acceptance of proposed missile defense. Indeed, Chinese concerns over missile defense have continuously been expressed after the US. withdrawal from the ABM Treaty in the voluminous writings by China's analytic and scholarly community. The Chinese government also might not openly criticize while moving ahead with countermeasure development.

An essential reason for Chinese concern and criticism against the US. missile defense is that even a limited system would undercut China's own nuclear deterrent, forcing it to spend far more than it wants to build more missiles and nuclear warheads. Unlike

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5 Li Changhe, "Statement by RE. Mr. Li Changhe, Ambassador for Disarmament Affairs of the People's Republic of China at the Plenary Meeting of the Conference on Disarmament," May 27,1999; available from http://www. arms control. org/factsheets

6 Jiang Zemin, "Promote Disarmament Process and Safeguard World Security," March 26, 1999; available from http://www.armscontrol.org/factsheets

7 Brad Roberts, *China and Ballistic Missile Defense:* 1955 *to 2002 and Beyond,* IDA Paper No. P-3826 (Alexandria, VA: Institute for Defense Analysis, 2003), 32; available from http://www. fas. org/nuke/guide/china/doctrinelbmd. pdf.

Russia, which has fielded thousands of nuclear weapons, China currently has only about twenty liquid-fuel silo-based Intercontinental Ballistic Missiles (ICBMs) that can reach the US. If the US. would initiate a first strike, the Chinese assume that only a handful of Chinese ICBMs would survive. And the handful that would survive the first strike would be destroyed by ground-based midcourse (GBM) systems in Alaska and California bases. Many in China believe that such disadvantage would pose a serious menace to China's ability to employ its nuclear weapons to deter possible US. pressure and aggression in East Asia.

Despite strident objections and warmngs, Chinese reactions to the proposed missile defense are uncertain at the present stage. Some observers contend that a missile defense would trigger a global arms race with China, thereby threatening the world's strategic stability. They suppose that China has the financial and technological wherewithal to build as many missiles and nuclear warheads as it believes are necessary to counter-balance the US. missile defense plan. Others argue that a Sino-US. arms race is not likely, given the ever-growing technological gap between the US. and China and China's still vulnerable economic infrastructure. The questions become what would Sino-US. strategic relations look like under the fully-deployed missile defense, as well as how would it be affected by actual missile defense architectures?

This thesis takes up this question and argues that prospects for Sino-US. arms race depend on the different architectures of missile defense employed. It is divided into the two parts: I) a general overview of missile defense and II) implications for Sino-US. arms race. Part I introduces the principal rationale for the missile defense together with its history, existing programs, and alternative architectures. Part II begins with a literature review in which I evaluate state of the art knowledge on the implications of missile defense for Sino-US. strategic relations. In so doing, I find the main questions left unanswered, and suggest

that more careful research on the causal relationship between Sino-U.S. arms race and alternative missile defense architectures is necessary. This section also introduces research methodology, definition of terms, and basic assumptions applied in the second part. The following five sections focus on the potential Chinese reactions to different types of missile defense architecture. **In** these sections, whether China initiates an arms race with the U.S. or not under the respective type of architecture is analyzed and estimated using five variables or constraints: grand strategy in Chinese history, nuclear doctrine, military technology, economic resources available, and China's commitment to nuclear arms control regimes. Finally, in the conclusion, I summarize the discussion with brief policy recommendations.

PART I

U.S. Missile Defense: An Overview

1. The Role of Missile Defense in a Changed Security Environment

The bad news is that in this era, deterrence may not provide even the cold comfort it did during the Cold War. We may be facing terrorists or rogue regimes with ballistic missiles and nuclear weapons at the same time in the future, and they may not buy into our deterrence theory. Indeed, they may be madder than "MAD."

William 1. Perry, speech to the Chicago Council on Foreign Relations, 1995

1.1 Changed Security Environment

During the Cold War, deterrence based on mutual assured destruction (MAD) was the only rational basis of the United States for an effective defense. The threat of mass destruction and death from nuclear weapons was so immense that once a US. adversary acquired these weapons, mutual deterrence was assured. However, conventional deterrence is no longer a panacea in the twenty first century because global security has undergone profound transformation. Among others, the following two characteristics constitute a changed security environment.

1.1.1 Proliferation of Ballistic Missiles and WMDs

The proliferation of ballistic missiles and weapons of mass destructions (WMDs) is widely recognized as the most serious threat to the US. and its allies. Although only Russia and China have ICBMs that can currently reach the US., adversaries such as North Korea and Iran are eagerly working to acquire WMDs and their long-range delivery systems. **In** July 1998, an independent panel mandated by Congress and chaired by defense secretary Donald Rumsfeld identified these two countries as being particularly dangerous.

> The extraordinary level of resources that North Korea and Iran are now devoting to developing their own ballistic missile capabilities poses a substantial and immediate danger to the U.S., its vital interests and its allies. While these nations' missile programs may presently be aimed

> primarily at regional adversaries, they inevitably and inescapably engage the vital interests of the U.S. as well.... Each of these nations places a high priority on threatening U.S. territory, and each is even now pursuing advanced ballistic capabilities to pose a direct threat to U.S. territory.[8]

In addition to North Korea and Iran, Pakistan and India have developed and continue to improve SRBMs and MRBMs.[9] There is significant potential for them to develop intermediate-range ballistic missiles (IRBM) in the near future, though they are unlikely to develop ICBMs.[10] The countries and non-state actors listed below are critical in terms of weapons proliferation.

1.1.1.1 North Korea

North Korea has played a central role in the proliferation of ballistic missiles and WMDs. The Rumsfeld Commission determined that North Korea could reach major U.S. cities in Alaska and the Hawaiian islands with its current Taepo-dong II capacity.[11] If North Korea successfully develops a three-stage Taepo-dong III ICBM with a range of 15,000 km, it could strike all of North America.[12] It also has hundreds of SCUD and No-dong medium-range ballistic missiles (MRBMs) that pose a significant threat to overseas U.S. forces, South Korea and Japan. Furthermore, North Korea has continued to export its ballistic missiles and associated technologies to Pakistan, Yemen and Syria.i" It has developed nuclear weapons as well. In January 2003, North Korea withdrew from the Non-Proliferation Treaty (NPT) and restarted its five-megawatt nuclear reactor. In August 2003,

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8 Executive Summary of the Report of the Commission to Assess the Ballistic Missile Threat to the United States, *Rumsfeld Commission Report* (Washington DC: Department of Defense, July 15, 1998): 1.
9 Joseph Cirincione, *Deadly Arsenals: Tracking Weapons of Mass Destruction* (Washington DC: Carnegie Endowment for International Peace, 2002), 80.
10 Ibid.
11 *Rumsfeld Commission Report, 6.*
12 Steven A. Hildreth, *Missile Defense: The Current Debate,* CRS Report for Congress (Washington DC: Congressional Research Service, August 21, 2003): 9.
13 Ibid.

North Korea reported that it had finished reprocessing 8,000 spent fuel rods, sufficient to make six nuclear weapons. In February 2005, Pyongyang finally declared it had nuclear weapons "for our self-defense," and suspended Six-party Talks indefinitely. The US. intelligence community now estimates that North Korea possesses two or three nuclear weapons.

1.1.1.2 Iran

Iran's efforts to acquire ballistic missiles and WMDs have long been key concerns of the US. Iran has a few hundred short-range ballistic missiles (SRBMs) composed of SCUD-Bs, SCUD-Cs and Chinese DF-7 missiles.i" It also has developed Shahab III, a MRBM with a range of 1,300 km which is based on the design of North Korean No-dong missile. A successful flight test was conducted In June 2003.[15] The US. Department of Defense determined that Iran has the capacity to deploy limited numbers of the Shahab **III** missiles in the near future." As for long term capability, a US. intelligence official testified that "Iran is likely sometime in the next 10-15 years to test an ICBM that could hit the United States.,,1? In addition to ballistic missiles, Iran has built two nuclear facilities at Arak and Natanz.[18] Natanz is an advanced uranium enrichment operator constructed to produce highly-enriched uranium by 2005. A heavy water reactor at the Arak facility could extract plutonium for nuclear weapons.[19]

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14 Ibid,8.

15 C'''InnClOne, 82.

16 The U.S Department of Defense, *Proliferation: Threat and Response,* January 2001.

17 John McLaughlin, deputy director, Central Intelligence Agency, "Remarks at the Fourth Annual Space and Missile Defense Conference," Huntsville, Alabama, August 21,2001.

18 Kenneth Katzman, *Iran: Current Developments and U.S. policy,* CRS Issue Brief for Congress (Washington DC: Congressional Research Service, July 25,2003): 3.

19 Ibid.

1.1.1.3 India

India has continued its development of both SRBMs and MRBMs as a nuclear deterrent to Pakistan and as a hedge against confrontation with China. Using the Prithvi-series - a single stage, liquid-fuel, road-mobile missile - as a standard design, India has developed three versions of SRBMs.[20] Prithvi I with a range of 150 kilometers is currently India's only deployed ballistic missile." The country also continues to develop the 250 kilometer range Prithvi II and sea-based version of the Prithvi II known as the Dhanush.[22] India has successfully developed the MRBMs called the Agni II, with a reported range of 2,000 kilometers.r' And development continues on the Agni III, an IRBM with an expected range of 3,000 kilometers.i" In addition, India has a domestic space launch vehicle program and actually tested the Polar Space Launch Vehicle (PSLV) and the Geosynchronous Space Launch Vehicle (GSLV).25 U.S. intelligence sources believe that this SLV could be converted into an ICBM capability." India is also widely believed to have about 10 nuclear weapons, though they have yet to be openly deployed."

1.1.1.4 Pakistan

Pakistan is developing ballistic missile capability as a deterrent to India's nuclear program as well as its superior conventional forces." The country possesses HarfI SRBMs with a range of 80 kilometers.f" The Harf **III** - a modified Chinese M-11 missile - is an advanced version ofHarf-series SRBMs with a range of at least 300 kilometers." Pakistan

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20 C'''InnClOne, 80.
21 Hildreth, 9.
22 C'''InnClOne, 80.
23 Ibid.
24 Ibid.
25 Ibid,81.
26 Hildreth, 9.
27 C'''InnClOne, 7-8.
28 Hildreth, 9.
29 Ibid, 9-10.
30 C'''InnClOne, 82.

has acquired a number of No-dong MRBMs, referred to as the Ghauri, from North Korea.[31] They have a range of 1,500 kilometers, and successive Ghauri II and Ghauri **III** are expected to have ranges of 2,000 and 3,000 kilometers, respectively" Pakistan is also developing the Shaheen II, a solid-fuel missile with a range of 2,500 kilometers.f Like India, Pakistan is believed to possess about 10 nuclear warheads.[34]

1.1.1.5 China

The current mainstay of the Chinese nuclear deterrent consists of liquid-propellant, single warhead, silo-based DF-5 ICBMs that can reach targets in the United States. About 20 of these missiles are to be replaced by solid-propellant DF-41 ICBMs with a range of 12,000 km by end of the decade." In addition, 4,750 km range liquid-fuelled DF-4 is to be replaced by DF-31 solid-fuelled ICBMs with a range of 8,000 km.[36] The DF-31 also serves as the basis for developing solid-propellant, road-mobile ICBMs and solid-propellant SLBMs (JL_2).37 China has significantly increased the number of SRBMs targeted against Taiwan. According to U.S. intelligence reports, 350 Chinese SRBMs could attack Taiwan within about 7 1/2 minutes.[38] China is reported to have about 410 nuclear warheads in its arsenal.[39]

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31 Hildreth, 10.
32 Ibid.
33 Ibid.
34 [illegible], 7-8.
35 Department of Defense, *Annual Report on the Military Power of the People's Republic of China,* Report to Congress: Pursuant to the FY 2000 National Defense Authorization Act (Washington DC: Department of Defense, July 2003): 31.
36 Paul H.B. Godwin, "Potential Chinese Responses to U.S. Ballistic Missile Defense," in *China and Missile Defense: Managing U.S.-PRC Strategic Relations,* ed. Alan D. Romberg and Michael McDevitt (Washington, DC: The Henry L. Stimson Center, 2003), 63-64.
37 Department of Defense, *Annual Report on the Military Power of the People's Republic of China,* Report to Congress: Pursuant to the FY 2000 National Defense Authorization Act (Washington DC: Department of Defense, July 2003): 31.
38 Hildreth, *Missile Defense: The Current Debate, 8.*
39 [illegible], 7-8.

1.1.1. 6 *Non-State Actors*

Non-state actors, particularly international terrorists, are presenting increasingly larger threats to the US. and the world community in general. What is at stake is the likelihood of non-state actors employing WMDs for terrorism purposes. Chemical and biological agents have already been used by them. Members of Aum Shinrikiyo astounded the world by spreading sarin gas on March 20, 1995 in Tokyo subway station. Also, the threat of anthrax letters in America has created a scare comparable to the collapse of the Twin Towers. Terrorists might acquire chemical or biological agents from either terror-sponsoring nations - North Korea, Iran, and Syria - or make it in their own laboratories. As for the nuclear weapons and ballistic missiles, terrorists might try to buy or steal them rather than developing their own weapons. Deputy US Secretary of State Richard Armitage recently warned that once impoverished North Korea extracted enough plutonium to create a credible nuclear threat, it could sell it to international terrorists and to hostile regimes." Non-state actors might also try to steal Russia's short-range ballistic missiles, which have less sophisticated protections or no locks at all."

1.1.2 Limits of Cold War Deterrence

Cold War deterrence based on mutual assured destruction is no longer reliable in the twenty first century. The following is an account of two factors that can lead to the failure of deterrence. First, emerging threats from non-state actors such as international terrorists and religious extremists cannot be deterred by second-strike capabilities. To successfully deter an enemy, the US. needs to have clear targets for a second strike. However, non-state actors have neither a home address nor a border. **In** other words, the

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40 *N Korea Steeling for Attack, Bush Told,* March 3,2003 (accessed April 21, 2004); available from http://www.theage.com.au/articles/2003/03/02/l046540068590.html.

41 Jessica Stem, "Getting and Using the Weapons," in *The Terrorism and Counterterrorism: Understanding the New Security Environment,* ed. Russell Howard and Reid Sawyer (New York: McGraw-Hill/Dushkin, 2003), 165.

U.S. and its allies do not know what they must deter in the face of non-state aggressors.

Regarding the emerging threats from non-state actors, Secretary of Defense Donald Rumsfeld said, "There are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know. ... Each year, we discover a few more of those unknown unknowns."[42] To make matters worse, small groups of terrorists have linkages with terror-sponsoring states from which they might be able to acquire WMDs in the near future if they have not already done so. Afterward, they could inflict catastrophic destruction on the U. S. and its allies while escaping retaliation.

Second, Cold War deterrence based on the assumption of rational opponents becomes unreliable when it faces the variety of potential challengers in the twenty first century. Regarding the assumption of deterrence, Gordon Craig and Alexander George observe that "Inherent in the calculus of deterrence lies the assumption of a rational opponent, one who can be deterred from a given course of action if the costs of pursuing it clearly outweigh the benefits to be gained thereby.v'" Despite this assumption's relevance to some degree, the following historical examples illustrate that opponents do not necessarily follow reasonable behavior.

During World War II, American leaders were aware that Japan could move against the Dutch East Indies, Malaysia and the Philippines. However, no one in a position of American leadership expected a Japanese attack on Pearl Harbor. The following remark of Dean Acheson, the former assistant secretary of state (1941-1945), shows this misperception: "No rational Japanese could believe that an attack on us could result in

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42 G. John Ikenberry, "America's Imperial Ambition," in *The Use of Force: Military Power and International Politics,* ed. Robert 1. Art and Kenneth N. Waltz (New York: Rowman & Littlefield Publishers, Inc., 2003), 325.

43 Gordon A. Craig and Alexander L. George, *Force and Statecraft: Diplomatic Problems of Our Time* (New York: Oxford University Press, 1983), 181.

anything but disaster for his country."[44] Japan, however, attacked Pearl Harbor on December 7, 1941, killing more than 2,300 American soldiers. Before 1990, US. intelligence reportedly warned the Bush I administration that Iraq could invade Kuwait.[45] Many US. policymakers at that time showed no reaction to this warning, largely because they judged Saddam Hussein to be a rational decision-maker and the invasion of Kuwait was not sensible from their perspective." But on August 2, 1990, Iraq stunned the world by attacking Kuwait. Later, April Glaspie, the former US. ambassador to Iraq, stated, "We overestimated Saddam Hussein's instinct for self-preservation.Tf

These historical cases demonstrate that deterrence sometimes did not work in the past, much less in today. The variety of hostile regimes and international terrorists would behave in ways that appear irrational from our perspective because we do not understand their values, goals and commitments." **In** his book, *Deterrence in the Second Nuclear Age,* Keith B. Payne states, "Because the United States will confront challengers with which it is relatively unfamiliar and whose intentions, will, and commitments are not well understood, it seems likely that the prospects for unpredictable behavior will grow - again, hardly the basis for definitive statements about deterrence.T" As Payne pointed out, the US. deterrence policy against North Korea, Iran, and international terrorists will be less predictable and more complex and we cannot expect them always to behave sensibly from our perspective. Such a circumstance hardly can serve as the basis for reliable deterrence in the 21st century.

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44 Scott D. Sagan, "The Origins of the Pacific War," in *The Origin and Prevention of Major Wars,* ed. Robert I. Rotberg and Theodore K. Rabb (New York: Cambridge University Press, 1989),336.
45 Payne, *Deterrence in the Second Nuclear Age, 55.*
46 Ibid.
47 Ibid,56.
48 Ibid,57.
49 Ibid,76

1.2 The Role of Missile Defense

Missile defense assumes important roles in this new setting of weapons proliferation and limited deterrence. First, missile defense can secure the US. force projection capability against coercive threats of WMD-armed rogues and terrorists. **In** the near future, rogue states and their terrorist clients will be able to blackmail or use WMDs against the US. expeditionary forces and friendly population. And most American presidents would hesitate to send American forces overseas if they estimate massive casualties of American soldiers. **In** other words, coercive threats of WMDs would deter the US. military from responding in regions of vital interest. **In** this environment, the US. should attempt to carry out a more challenging mission: securing its force projection capability against coercive threats while deterring the opponents from using WMDs, i.e., "deterring their deterrent.t"" This new mission requires the role of missile defense. An effective missile defense can provide the US. expeditionary forces with additional protection from ballistic missiles and WMDs. **In** addition, by reducing the chances of successful attack, missile defense could deter potential rogue challengers from employing their WMDs against American expeditionary forces.

Second, missile defense will provide safety net against deterrence failure that might take place in the future. As explained earlier, Cold War deterrence is no longer reliable in a changed security environment. Therefore, the US. should prepare for possible deterrence failure. British historian AlP. Taylor said, "A deterrent may work ninety-nine times out of a hundred. On the hundredth occasion it produces catastrophe.v" **In** this highly unpredictable world, the likelihood of deterrence success is far less than 99 percent. And, even if Taylor's idea is correct, we should protect our civilians, soldiers and cities from the catastrophic deterrence failure of even one percent. Missile defense would save

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50 Payne, *Deterrence in the Second Nuclear Age,34.*

51 AlP. Taylor, *War by Time-Table* (London: MacDonald & Co., 1969), 121.

the lives of people who would otherwise be killed by WMD-armed rogues and terrorists.

2. The History of Missile Defense in the United States

2.1 Missile Defense Prior to the Bush II Administration

In 1972, the US. and Soviet Union signed the ABM Treaty that prohibited the deployment of a nationwide missile defense system. Both countries concluded that it would be safer to forswear defense and leave their populations vulnerable to the other's retaliation. The treaty permitted each side to deploy a missile defense system at one location with one hundred interceptors, for which the US. chose a missile base in North Dakota and the Soviet chose Moscow. The treaty prohibited development, testing, or deployment of sea-, air-, space- and mobile land-based systems.f Under the treaty, research and development for missile defense was restrained for three decades.

But on March 23, 1983, US. President Ronald Reagan introduced the Strategic Defense Initiative (SDI) and conveyed his vision that the advanced missile technology of the US. could destroy Soviet ICBMs in flight.[53] This was precipitated by an unconstrained Soviet buildup in missiles and weapons after the conclusion of ABM Treaty." Following Reagan's speech, the Strategic Defense Initiative Organization (SDIO) was created within the Department of Defense.[55] In 1985, SDIO proposed multi-layered land- and space-based system to defend all-out missile attacks from the Soviet Union. However, during the early stage of the SDI program, SDIO concentrated virtually all of its efforts on developing

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52 Gregory H. Canavan, *Missile Defense for the 21st century,* Ballistic Missile Defense Technical Series (Washington DC: The Heritage Foundation, 2003), 23.
53 Keith B. Payne, *Missile Defense in the 21st Century: Protection against Limited Threats Including Lessonsfrom the GulfWar* (Boulder, Colorado: Westview Press, 1991),3.
54 The Soviet Union increased its warheads from 2,400 at the signing of the ABM Treaty to 6,000 in 1980. See Canavan, 29.
55 Cordesman, 184.

technologies for missile defense.[56] It was not concerned with the actual procurement and deployment of the system.[57]

Following the disintegration of the Soviet Union in 1991, the emergence of missile threats from developing nations altered the landscape of missile defense.[58] Although the nuclear threat from Russia has receded, concerns about limited missile strikes from rogue states have increased. Thus, the Bush I administration abandoned the strategy of a nationwide defense against massive missile attacks, and in its place, established the Global Protection Against Limited Strikes (GPALS) program.[59] GPALS envisions an integrated defense system that would provide protection against small numbers of ballistic missiles launched by rogue states or missiles accidentally launched from Russia and China, with hundreds of ground- and space-based interceptors, about half the number previously in the Reagan administration.[60]

The Clinton administration developed and deployed a theater missile defense (TMD) to protect the U.S. forces overseas and allied countries against short and medium-range missiles. It also pursued a national missile defense (NMD) system that could defend the U.S. against small numbers of long-range missiles. The goal of the NMD plan was to develop and research NMD technology over three years through 2000, and, if it was ready, to deploy the system by 2003.[61] However, President Clinton said the technology would not be ready before 2006 or 2007. And the final decision on the deployment was left to the next president.

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56 Ibid,185.
57 Ibid.
58 Hildreth, *Missile Defense: The Current Debate, 2.*
59 Payne, *Missile Defense in the 21st Century, 13-14.*
60 Ibid, 17.
61 Steven A. Hildreth, *National Missile Defense and Alaska,* CRS Report for Congress (Washington DC: Congressional Research Service, July 13,2001): 2.

2.2 The Bush II Administration's Approach

The missile defense system became the centerpiece of national security policy under the Bush II administration. After the withdrawal from the ABM treaty, in December 2002, President Bush announced his plan to deploy initial defensive capabilities by the end of 2005.[62] National Security Presidential Directive 23 orders that "The Defense Department... shall proceed with plans to deploy a set of initial missile defense capabilities beginning in 2004.„[63] The following day the secretary of defense defined the scope of initial capabilities: "It will be an evolutionary program... improves as you go along... It would be a very preliminary, modest capability.t"" Thus, the Bush administration has certainly brought the U. S. closer to realizing its missile defense goal.

The initial set of capabilities in 2004-2005 includes:

- 16 ground-based midcourse interceptors at Fort Greely, Alaska
- 4 ground-based midcourse interceptors at Vandenberg Air Force Base, California
- 20 sea-based midcourse (ascent phase of flight) interceptors on Aegis ships
- Patriot PAC-3 (Patriot Advanced Capability - 3)
- Land, sea and space-based sensors, new sea-based X-band radar."

These capabilities will be improved and expanded over time, depending on the changing threats and technological developments. Pentagon officials said "The system will get better with time and that even a limited missile defense is superior to no missile defense at all.„[66] Until now, six interceptor missiles have been installed at Fort Greely and two more have

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62 Hildreth, *Missile Defense: The Current Debate, 36.*
63 Canavan, 89.
64 Ibid.
65 Ibid.
66 Reuters, "US. Readies System for Missile Defense Despite Objections," *USA Today.*

been placed at Vandenberg Air Force Base.[67] A US. destroyer with X-band radar has been patrolling in the East Sea since October 2004.[68] And eight batteries of Patriot PAC-3 units are ready to operate in the Korean peninsula.

Once fully deployed, the missile defense will defend not only the US. homeland, but also its overseas bases and regional allies. The US. forward-operation bases include South Korea, Okinawa, Afghanistan, Qatar and Iraq. Meanwhile, Taiwan, Japan, South Korea, Australia, Israel and Western Europe are regional allies. Missile defense will ensure that all of these countries and bases will have reliable protection against ballistic missile attacks. In addition, the US. has eliminated the distinction between TMD and NMD; instead, it has set a goal of a layered defense. Regarding this concept, Lt. General Ronald Kadish, Director of the Missile Defense Agency (MDA), states:

> The Missile Defense Agency (MDA) will develop incrementally a Ballistic Missile Defense (BMD) System that layers defenses to intercept ballistic missiles of all ranges in all phases of flight - boost, midcourse, and terminal. ... The BMD System will consist of elements configured into layered defenses to provide autonomous and mutual support, including multiple engagement opportunities, along a threatening missile's flight path.,,[69]

The concept of layered defense is designed to intercept incoming missiles at a different stage of its flight trajectory allowing for multiple intercept opportunities. For this objective, the Bush administration will continue to pursue robust development, testing, and deployment programs.

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67 Ibid.
68 Ibid.
69 Statement of Lt. General Ronald T. Kadish, USAF, Director, Ballistic Missile Defense Organization, on The Missile Defense Program, FY03 Missile Defense Budget, Before the Senate Appropriations Committee Defense Subcommittee, April 17, 2002, page 3.

3. Major Missile Defense Programs

Described below are major missile defense programs that are currently being developed or deployed as functions of the three phases of the ballistic trajectory: boost, midcourse and terminal.

3.1 Boost Defense Segment

3.1.1 Airborne Laser (ABL)

The ABL is an air-based system designed to intercept all classes of ballistic missiles from SRBMs to ICBMs in their boost phase to provide U.S. forces with a safe area of operation through air superiority in war.[70] Modified Boeing 747 aircraft would shoot down missiles within 30 to 140 seconds after launch from a range of 300-600 km" The ABL will direct a high power chemical laser to the missile's booster skin until the internal forces in the fuel tank rupture the missile skin. The advantage of the ABL is that it could avoid the problem of destroying hundreds of decoys because it could shoot down missiles before they release countermeasures. But, the ABL's mission of shooting down theater-range ballistic missiles while in the boost phase is technically challenging because their boost phase is shorter than that of an ICBM. This, coupled with the fact that the ABL cannot engage the missile until it has cleared the cloud layer (above 10,000 feet), means that the ABL will have very little time to engage theater-range missile before its fuel supply is consumed. On the other hand, ICBMs have much longer boost phases, which gives the ABL more time to engage each missile, not to mention that ICBMs could be engaged at higher altitudes where the atmosphere is thinner. The Missile Defense Agency (MDA) is

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70 Hildreth, *Missile Defense: The Current Debate, 30.*

71 Robert Shuey, *Theater Missile Defense: Issues for Congress,* CRS Issue Brief (Washington DC: Congressional Research Service, May 22,2001): 9.

planning to attempt its first missile shoot down test in late 2005.[72] If all goes according to schedule, it is estimated that a fleet of seven aircrafts with laser could be fielded by 2008.[73]

3.1.2 Sea-Based Boost

In 2001, the Bush administration created the sea-based boost as its new missile defense program. If deployed, the sea-based boost on forward-deployed Aegis ships might be close enough to launch against some rogue states - North Korea, and Iran - so that it could increase the chances of shooting down their missiles during boost-phase. But, the concept would be impractical against ICBMs launched by China and Russia, whose launch sites are located deep inland. The technology for sea-based boost is not mature enough to try the flight experiment. At the present stage, MDA is developing a boost-phase interceptor with a speed of around 6km/s - a much higher maximum speed than that of the SM-3, an interceptor for sea-based midcourse, with 3km/s maximum speed - in order to meet the short engagement time.i" In October 2002, Pat Sanders, program executive officer for the MDA's overarching Ballistic Missile Defense System (BMDS), said that MDA expected to test the capability of the new interceptor no later than 2005.[75]

3.1.3 Space-Based Laser (SBL)

The SBL is designed to intercept ballistic missiles of all ranges in their boost phase through high-energy lasers so that it could intercept a missile over enemy territory, rather than over friendly territory. BMDO believes that an SBL system has the potential to induce aggressors to abandon ballistic missile programs by rendering them useless. One design

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72 Hildreth, *Missile Defense: The Current Debate, 29.*
73 Shuey, *Theater Missile Defense: Issuesfor Congress, 9.*
74 Hildreth, *Missile Defense: The Current Debate, 31-32.*
75 Ibid,35.

concept of the SBL system consists of 20 laser platforms at an orbit of 1,300 km." Each laser platform would be designed to intercept a missile within a range of3,200 km in two to five seconds." The unique advantage of the SBL system is its ability to intercept ballistic missiles launched from not only small- or medium-size countries, but also Russia and China before their missiles release decoys. Because the SBL technology is still in its early stage of development, the construction of a test facility and the flight experiment are not scheduled to begin before 2012.[78] The full development and deployment of 20 laser platforms is likely to cost at least $80 billion.[79]

3.2 Midcourse Defense Segment

3.2.1 Ground-basedMidcourse (GEM)

The GBM, also known previously as NMD, is designed to protect all 50 states of the United States against ICBM attacks. The kinetic kill warhead on the interceptor would destroy its target missile during its midcourse phase through direct collision." The GBM will obtain the warning and tracking information necessary to guide interceptors to the incoming ICBMs from several types of sensors: existing satellites for defense support, upgraded early warning radars in Alaska and elsewhere, and a new sea-based X-band radar." So far, MDA has conducted eight intercept tests, in which kinetic kill warheads successfully intercepted 5 of 8 intended targets. The current U. S. plan calls for fielding the first twenty interceptors at Fort Greely, Alaska and at the Vandenberg Air Force Base, California by the end of2005.

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76 William H. Possel, "Laser and Missile Defense," in *The Technological Arsenal: Emerging Defense Capabilities,* ed. William C. Martel (Washington, DC: Smithsonian Institution Press, 2001), 24.
77 Ibid.
78 Hildreth, *Missile Defense: The Current Debate, 30.*
79 Possel, 26.
80 Ibid, 36.
81 Amy L. Freedman and Robert C. Gray, "The Implications of Missile Defense for Northeast Asia," *Orbis* 48, no. 2 (Spring 2004): 340.

3.2.2 Sea-Based Midcourse (SBM)

The robust SBM placed on destroyers and cruisers with the Aegis air-defense system could provide a theater-wide defense of the US. expeditionary forces and friendly population against short- and intermediate-ranges missiles in their mid-course phase. The SM-3 missile with 3km/s speed is guided by modified SPY-I radar." Regarding this capability, General Kadish stated, "The Sea-Based Midcourse System is intended to intercept hostile missiles in the ascent phase of midcourse flight, which when accompanied by ground-based system, provides a complete midcourse layer. By engaging missiles in early ascent, sea-based systems also offer the opportunity to reduce the overall BMD System's susceptibility to countermeasures.t" The initial 20 interceptors are scheduled to be deployed by 2004-2005. In February 2005, SBM interceptor missile launched from the US. Navy Aegis cruiser successfully intercepted and destroyed a short-range target missile.t" This was the fifth successful intercept in six tests.[85] In the future, MDA hopes to upgrade the SBM system for use against ICBMs.[86]

3.3 Terminal Defense Segment

3.3.1 Patriot PAC-3

The Patriot PAC-3 is the US. Army's key air defense missile designed to protect overseas US. and allied troops in relatively small areas." It shoots down incoming aircraft, cruise missiles, and short- and medium-range ballistic missiles in their terminal phase in the lower atmosphere. It is currently the most advanced US. missile defense system and it will

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82 Ibid.

83 Statement of Lt. General Ronald T. Kadish, USAF, Director, Ballistic Missile Defense Organization, on The Ballistic Missile Defense Program, Amended FY02 Budget, Before the Senate Armed Services Committee, July 12,2001, page 24.

84 Missile Defense Agency Website (accessed March 22,2005); available from http://www.acq.osd.millmda/mdalinklhtmllnewsrel.html

85 Ibid.

86 Freedman and Gray, 340.

87 Hildreth, *Missile Defense: The Current Debate, 43.*

have a new interceptor missile (the ERINT) with improved communications, radar, and ground support systems." On March 21, April 25, and May 30,2002, PAC-3 successfully intercepted targets in its intercept flight tests.[89] Full-rate production began in late 2002.[90] The missile was first deployed during the Operation Iraqi Freedom in MarchiApril 2003, but a complete analysis of its effectiveness is not yet available."

3.3.2 Medium Extended Air Defense System (MEADS)

MEADS is a ground-based, mobile, air and missile defense system designed to defend key maneuver units against various airborne attacks." The unique characteristics of the MEADS are its 360-degree coverage of lower atmosphere and its ability to deploy quickly.I" MEADS will use the Patriot PAC-3 missile as its interceptor in order to shoot down multiple SRBMs, low cross-section cruise missiles, aircraft, and unmanned aerial vehicles" **In** 1999, NATO selected MEADS as its new air and missile defense system." The U.S., France, Italy, and Germany are participants in the program." The MEADS is scheduled to be deployed by 2009.[97]

3.3.3 Theater High-Altitude Air Defense (THAAD)

The THAAD system is the high-altitude component of the terminal defense segment designed to intercept short-, medium- and intermediate-range ballistic missiles. It can be employed in conjunction with the lower-tier Patriot PAC-3 as a part of terminal

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88 Ibid.
89 Ibid,44.
90 Ibid.
91 Freedman and Gray, 339.
92 Shuey, *Theater Missile Defense: Issues for Congress, 4.*
93 Ibid,4-5.
94 Ibid,5.
95 Hildreth, *Missile Defense: The Current Debate, 46*
96 Ibid,47
97 Ibid,46.

segment providing a protection of a larger area than other terminal defense systems." It protects U.S. expeditionary forces, friendly populations, and the area's infrastructure from the falling debris of missiles, and from nuclear, biological and chemical materials." After failing in six previous interceptor flight tests, the first success was achieved in June 1999.[100] In August 1999, a second THAAD missile successfully intercepted a target missile.i'" The actual deployment of THAAD system is scheduled for 2007.[102]

4. Alternative Architectures

Although the "layered defense" approach provides the basic parameters, the Bush administration has not yet confirmed definitive missile defense architectures. Illustrated here, then, is the range of possibilities the administration may deploy in the next decade using three levels of architectural designs.

4.1. Limited architecture

Limited architecture comprises 100 GBM interceptors, 20 Aegis SBM interceptors against short-, medium- and intermediate-range missiles, and PAC-3 lower-tier terminal defense for the U.S. force abroad and allies (South Korea, Japan, Israel, ED and Taiwan). This is the most technologically-conservative option in that all systems are currently included in the initial capabilities. It would be designed to counter only a few tens of warheads from North Korea, Iran and non-state adversaries, not large numbers of missiles from major nuclear powers.

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98 Philip Coyle, "Rhetoric or Reality? Missile Defense under Bush," *Arms Control Today* 32, no. 4 (May 2002): 4.
99 Ibid.
100 Hildreth, *Missile Defense: The Current Debate, 45.*
101 Ibid.
102 Canavan, 58.

4.2 Limited Layered Architecture

This option includes everything above as well as a SBM system upgraded to engage ICBMs, and THAAD forward deployed to intercept short-, medium-, and intermediate-range missiles. This architecture would be initially designed to provide protection against missile attacks from North Korea, Iran and non-state actors, and also would also provide defense against Chinese ICBMs.

4.3 Robust Architecture

This option would comprise every missile defense program that is currently being developed or deployed (except sea-based boost and SBL): 250 GBM interceptors for ICBMs; 40 Aegis SBM interceptors against any ranges of missiles; a fleet of seven ABL aircrafts; PAC-3 for lower-tier terminal defense; and THAAD for upper-tier defense.l'" This would provide the U.S. with a robust defense against all-out missile attacks from North Korea, Iran, and China. Depending on its design, the architecture might also have a defense capability against some level of Russian attacks.

103 Sea-based boost program is newly created in the Bush administration and it is technologically difficult to be deployed in the next decade.

PART II

Implications of Missile Defense for the Sino-U.S. Arms Race

5. Literature Review and Methodological Foundation

As was seen in Part I, the deployment of effective missile defense is an essential element of the US.'s broader efforts to meet the new strategic challenges in the twenty first century. The mission of missile defense is to secure the US. force projection capability and to provide an additional safety net against growing threats from WMDs in the hands of hostile regimes and non-state actors. But the Chinese government has strongly criticized this mission in very harsh terms. Beijing warned that missile defense could not only undermine strategic stability, but also lead to the proliferation of nuclear weapons and missiles. A primary reason for Chinese concern and criticism is that even a limited system would undercut China's own nuclear deterrent, forcing it to spend far more than it wants to build additional missiles and nuclear warheads.

The Part II addresses potential Chinese reactions to the missile defense. It suggests that the possibility of arms race between two countries varies with the missile defense architectures employed.

5.1 Literature Review

A cluster of recent books and articles address questions about Sino-US. strategic relations and missile defense. The first set of writings predicts that missile defense may prompt China to multiply its nuclear arsenal accordingly, encouraging the vertical as well as horizontal proliferation of nuclear weapons. Richard Butler's *Fatal Choice: Nuclear Weapons and the Illusion ofMissile Defense't"* is one of the most interesting and creative books, on the subject of why missile defense is so dangerous to international security.

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104 Richard Butler, former head of the United Nations Special Commission (UNSCOM) to disarm Iraq is an expert in arms control, international security issues, the United Nations and the Middle East. He is currently diplomat in residence at the Council of Foreign Relations in New York.

Butler argues that the current rationale for building a missile defense - missile threats posed by rogue states - is misdirected because there is little or no evidence that such states intend to break whatever treaty obligations they have entered into in order to develop ballistic missiles capable of harming the US.[105] Instead, the real and unstated motive for the proposed missile defense is to achieve a "full spectrum dominance of space" by US.[106] Knowing this motive and its neutralizing impact on China's nuclear arsenal, Butler insists that rational policymakers in Beijing would increase their nuclear weapons capable of penetrating the American shield.i'" And such Chinese reaction would result in a new stage of the nuclear arms race both here on earth and in space.l'" It is therefore in the national interest to avoid a global arms race with China, and instead to work with other nuclear powers to bring rogue states under the control of non-proliferation regimes, such as NPT, with credible coercive actions.[109]

Butler offers a number of intriguing insights that are deft as well as intellectually stimulating. Above all, his argument as to the misdirected rationale for a missile defense helps us understand why policy planners in Beijing cannot trust verbal assurance from the US. that its missile defense is directed solely at rogue states. But at the same time, many of Butler's central arguments are difficult to sustain because there is little evidence for what he says. First, he did not consider the current level of Chinese military/space technology and financial resources available in estimating possible Chinese reactions to the missile defense. If he had considered such factors, he would have found that Sino-US. global arms race both on earth and in space is not likely to occur at least under the robust missile defense. In addition, his argument over the actual motive for the missile defense seems overstated. He

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105 Richard Butler, *Fatal Choice: Nuclear Weapons and the Illusion of Missile Defense* (Boulder, Colorado: Westview Press, 2001), 104.
106 Ibid, 107.
107 Ibid,108.
108 Ibid.
109 Ibid, 119.

simply states, "Consistent with the principle that when the rational explanations advanced for a policy or event lack credibility or make no good sense, then one should look for the real explanation, the view is growing that the real unstated motive for NMD is, in fact, to achieve such US. dominance of space.„110 If this claim is true, the convincing evidence should be provided.

A similar argument is made in Charles Ferguson's article, *Sparking a Buildup: Us. Missile Defense and China's Nuclear Arsenal.t*[11] Ferguson predicts that China would buildup nuclear arsenal against the missile defense based on historical evidence. He argues that past history demonstrates that China has reacted by developing nuclear weapons when it has experienced nuclear blackmail. 112 In a reminiscent manner, China's current perceptions of nuclear threats and infringements on its sovereignty by the missile defense would lead to a strengthening of its missile and nuclear capability.i" Moreover, Ferguson says that China has sufficient economic power to arm itself accordingly, whatever the number of GBM interceptors US. deploys.l" For example, in the worst case scenario, assuming 100 percent effectiveness of missile defense systems, China would build 200 ICBMs to counter 200 GBM interceptors at a cost of $2 billion.l[13] This expenditure would represent less than 2 percent of China's current foreign exchange holdings when spread over several years.i'" In the end, the result of missile defense would be a significantly larger Chinese nuclear arsenal that could strike the US. horneland.U" In order to avert these dangers, Ferguson suggests that the US. and China should implement military

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110 Ibid, 107.

111 Charles Ferguson, a physicist, directs the Nuclear Policy Project at the Federation of American Scientists.

112 Charles Ferguson, "Sparking a Buildup: US. Missile Defense and China's Nuclear Arsenal," *Arms Control Today* 30, no. 2 (March 2000): 15.

113 Ibid

114 Ibid.

115 Ibid.

116 Ibid.

117 Ibid, 16.

confidence-building measures (CBMs) such as periodic high-level military-to-military contacts, annual exchanges of military data, and the construction of military communication channels during times of crisis. [118]

Ferguson is to be commended for combining historical, technological and financial factors for estimating the impacts of missile defense on Sino-US. relations. Moreover, his policy recommendations are useful and practical. However, his central argument is limited in its accuracy for two reasons. First, he did not take into account the effects of US. first strike when he calculated the number of ICBMs needed by China to maintain credible deterrence against the US. missile defense. For example, in the scenario above, if the US. initiates a first strike and successfully destroys the half of the Chinese ICBMs, the 100 that survive the first strike will be captured by 200 GBM interceptors. Thus, under the same condition, China needs to deploy far more ICBMs than Ferguson estimated.

Secondly, the modern history of China does not always show that China has increased its missile and nuclear forces against outside nuclear threats. Since 1981, China has deployed just about 20 ICBMs that can reach the US., although it has long had the capability to build more missiles and put them on higher alert. During the Star Wars Era (1983-1991), China's reaction to Reagan's SDI program was very cautious. After the end of the Cold War, Chinese leaders generally subordinated military modernization to economic development. And today, the Chinese government declares that "China did not and will never engage in a nuclear arms race with any other country.'v'" Given such characteristics, Chinese modern history alone cannot be a strong independent variable for explaining possible Chinese nuclear buildup against missile defense.

Another set of writings argue that the US. missile defense would not trigger an arms race with China. Baker Spring's *Myths about Missile Defense and the Arms Race* is

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118 Ibid, 17..

119 PRC White Paper: *China's National Defense in 2004*

one example.[120] Spring asserts that the boost-phase defenses of the US. would deter China from investing in multiple independently targetable reentry vehicle (MIRV) capabilities.l'" MIRV capabilities, he suggests, could achieve relative advantages over GBM systems.[122] However, boost-phase defenses composed of SBL and ABL can intercept MIRVs before releasing their warheads, thereby reducing the chances of successful attack.[123] Under such circumstances, missile defense would dampen the desires for China to develop and acquire MIRVs and even decoy technologies.[124] Spring further argues that China's strategic missile modernization program has nothing to do with the deployment of missile defense.t" China embarked on its strategic missile modernization program in the 1980s when the US. was strictly adhering to the ABM Treaty, which prohibited the missile defense.l'" For this reason, China intended to develop and acquire strategic missile forces "for reasons other than a possible deployment of an American missile defense system.„127

Spring's first argument is strong and convincing in favor of the US. strategic dominance over China under the missile defense. Spring contends that, if deployed, boost-phase defenses combined with space-based sensors would be the most powerful rationale for averting Sino-US. arms race. However, in raising this argument, he hastily assumes that the US. would deploy a layered defense architecture composed of boost-phase, mid-course, and terminal defense segments, although the final architecture is still not known. If the US. eventually decides to deploy limited architecture without boost-phase segment, unlike Spring's expectation, MIRVing the mobile land-based ICBMs would be an efficient way for

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120 Baker Spring is a research fellow in the Kathryn and Shelby Cullom Davis Institute for International Studies at the Heritage Foundation.
121 Baker Spring, "Myths about Missile Defense and the Arms Race," *The Heritage Foundation Backgrounder*, no. 1385 (July 13,2000): 4.
122 Ibid.
123 Ibid.
124 Ibid.
125 Ibid,5.
126 Ibid.
127 Ibid.

China to defeat US. missile defense. In addition, Spring's argument that there is no relationship between the missile defense and Chinese missile modernization program is not persuasive. Even though the modernization of Chinese strategic forces has long been under way and would likely occur even in the absence of US. missile defense, improvements can be tailored to meet the new requirements of deterrence posed by missile defense.

These sample literatures together provide interesting and important insights and tools for analyzing and understanding the implications of missile defense for Sino-US. strategic relations. Yet, questions and gaps still remain. First, no one expressed any interest in how China's reactions to the missile defense would be changed depending on the different architectures of missile defense. The crucial question now is not "Should the US. deploy the missile defense?" but "What kind of architecture should be used?" Second, although the literature here explored various factors such as history, financial resources and military technology, future research will need to integrate those factors with alternative architectures in a single research framework in order to provide a more convincing, complete and predictive model of Sino-US. strategic relations under the missile defense. And lastly, almost no literature on the prospects for Sino-US. arms race defines "arms race." Certainly not every arms increase in every pair of nations constitutes an arms race.[128] In order to enable an arms race to qualify, there should be some sort of destabilizing effects that move Sino-US. relations away from the equilibrium point. The research methodology employed here is designed to fill these remaining gaps and questions in the existing literature.

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128 James E. Dougherty and Robert L. Pfaltzgraff, *Contending Theories of International Relations: A Comprehensive Survey*, 5th ed (New York: Addison Wesley Longman, 2001), 294.

5.2 Methodological Foundation[129]

This thesis explores potential Chinese reactions to different types of missile defense architecture: limited, limited layered and robust. And whether or not China goes to arms race with the U.S. under the respective type of architecture will primarily depend on five variables or constraints: 1) historical legacy that constitutes Chinese grand strategy; 2) the nuclear doctrine; 3) military technologies; 4) economic resources available; and 5) China's commitment to nuclear arms control regimes. In other words, the possibility that China goes to arms race with the U.S. is maximized by the following conditions.

- An American decision to deploy its most robust missile defense architecture composed of boost-phase, mid-course, and terminal defense segments;
- Preference for "offensive/expansionist" strategy in Chinese history over diplomatic and "accommodationist" strategies[130];
- Chinese adoption of "limited deterrence doctrine," which assumes a limited nuclear war-fighting capability[131];
- A relatively high level of military technologies, including command, control, communication, computers, and intelligence (C4I), required to modernize and buildup Chinese strategic forces;
- A continuing high economic growth rate and that enables China to allocate its financial resources for a large scale nuclear buildup; and

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129 In this sub-section, I referred to Alastair lain Johnston's methodological framework. In his article "Prospects for Chinese Nuclear Force Modernization: Limited Deterrence versus Multilateral Arms Control," Johnston, a professor of Government at Harvard University, provides four variables: nuclear doctrine; the economical and technological resources available; China's commitment to nuclear arms control conventions; and strategic and arms control decisions by the United States, in order to predict whether China increases the size of its nuclear forces and improve its operational flexibility. For more details, see Alastair lain Johnston, "Prospects for Chinese Nuclear Force Modernization: Limited Deterrence versus Multilateral Arms Control," *The China Quarterly*, no. 146 (June 1996): 548-549.

130 Alastair lain Johnston, *Cultural Realism: Strategic Culture and Grand Strategy in Chinese History* (Princeton, New Jersey: Princeton University Press, 1995), 112-113.

131 Johnston, "Prospects for Chinese Nuclear Force Modernization," 554-555.

- The absence of any credible nuclear arms control regimes.

On the other hand, the possibility of a Sino-U.S. arms race is minimized under the following conditions:

- An American decision to deploy limited missile defense architecture designed to intercept only a few tens of warheads;
- Preference for diplomatic and "accommodationist" strategies in Chinese history over "offensive/expansionist" strategy[132];
- Chinese adoption of "minimum deterrence doctrine," which assumes that modest-sized nuclear forces would be quite sufficient to deter nuclear war[133];
- A relatively low level of C4I and counter-space technologies that prevents China from acquiring limited nuclear war-fighting capability;
- A serious deterioration of the economy that forces China to cut off its military budget; and
- Chinese participation in credible nuclear arms control regimes.

I suggest that the variables relating to nuclear doctrine, military technologies, economic resources, and the commitment to arms control regimes are all relatively less fixed and changeable, depending on the different types of missile defense architecture. For example, China may decide to invest more in developing C4I technologies and increase its military budget as the U.S. moves on to the robust architecture. However, the first variable, grand strategy in history, is fixed and is not affected by different types of architecture. Thus, I will discuss the first variable independently, and then proceed to analyze the other four

132 Johnston, *Cultural Realism, 112-113.*
133 Johnston, "Prospects for Chinese Nuclear Force Modernization," 554-555.

variables respectively under the three types of architecture.

Before entering into an analysis of the variables, basic assumptions, together with the definition of some important terms, need to be considered. There are three assumptions. First, all the discussion in Part II is only in the Sino-U.S. bilateral context. Second, advanced missile defense systems, such as ABL and upgraded SBM, are technologically feasible and can be deployed within five years or so. Third, this paper examines prospects for Sino-U.S. arms race only for the foreseeable future, i.e., the next decade.

Several important terms need definition. First, in the second part, limited architecture implies missile defense composed of 100 GBM intercepts only. The remaining Aegis SBM system and Patriot PAC-3 are excluded in the discussion because they are targeted against short-, medium- and intermediate-range missiles, not Chinese ICBMs. Second, by the same token, limited layered architecture means 150 GBM interceptors combined with 20 SBM missiles upgraded to engage ICBMs. Third, robust architecture means missile defense composed of 250 GBM interceptors, 40 SBM missiles and a fleet of seven ABL aircraft. Fourth, the nuclear arms race here means "nuclear arms accumulation between two or more rival states, associated with operational doctrine and preparation for actual nuclear war-fighting, which moves away their strategic relations from stable equilibrium point." Thus, a simple nuclear buildup between two countries that ends up stable balance is not an arms race.

Finally, Chinese government has never explicitly explained its strategic force structure and military budget details. So I acknowledge that every discussion of such issues here is based on the educated guesses of China watchers.

6. Grand Strategy in Chinese History

Understanding grand strategy of China helps predict possible Chinese reactions to the U.S. missile defense. Because China has not publicly articulated its grand strategy, I introduce here two scholastic works that attempt to interpret Chinese grand strategy from an historical perspective, deriving some shared principles from them. **In** their book, *Interpreting Chinese Grand Strategy: Past, Present, and Future,* Michael D. Swaine and Ashley 1. Tellis report that China has frequently used violent methods against external entities but, at the same time, generally followed a pragmatic and limited approach in its use of force.[134] That is, China often resorted to intense violence against outsiders in order to influence and control their strategic periphery (strong-state approach).[135] But when faced with unstable domestic environment or other external obstacles, they have generally turned to a variety of non-coercive security strategies, including appeasement and passive defenses (weak-state approachj.t" This suggests, "Security during much of Chinese history did not require unambiguous military dominance by the Chinese state over periphery areas. **In** particular, when military control over the periphery could not be established or maintained without threatening internal order and prosperity, or the interests of key elites, the Chinese state usually opted for political arrangements that provided some measures of security from attack while often, although not always, preserving some symbol of deference to Chinese authority."[137]

During the modern era (from 1850 to the present), as the definitions of the periphery, internal and external security requirements have changed, strong-state and weak-state approaches have merged into a hybrid "weak-strong state" security strategy, so called

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134 Michael D. Swaine, Ashley 1. Tellis, *Interpreting Chinese Grand Strategy: Past, Present, and Future* (Santa Monica, CA: RAND, 2000), 45-65.
135 Ibid.
136 Ibid.
137 Ibid,65.

"calculative strategy.„138 The calculative strategy is characterized by 1) a non-ideological policy approach toward the economic growth and the promotion of favorable relations with all states, particularly with the major powers; 2) limited use of force combined with efforts to modernize its military; and 3) expanded participation in regional and global inter-state politics and various international regimes with an emphasis on attaining asymmetric gains. 139 Under the calculative strategy, conflicts with the U. S. would most likely come from "normal disputes between states" such as perceived threats to domestic order or territorial integrity, not the power struggle over global hegemony. 140

Meanwhile, in his book *Cultural Realism: Strategic Culture and Grand Strategy in Chinese History,* Alastair lain Johnston proposes three types of grand strategy:

- Accommodationist: This strategy primarily includes non-coercrve policies such as diplomacy, political trading, economic incentives, bandwagoning, and balancing alliance behavior. Security is achieved through alliance building and concessions, not the physical elimination of the enemy and the annexation of its territory;
- Defensive: This strategy is more coercive in nature than accommodationist. It relies on passive defense of external boundaries through the internal mobilization of resources. But as with accommodationist, the ends of force exclude the physical elimination of the enemy or the annexation of its territory;
- Offensive/Expansionist: This highly coercive strategy primarily includes the offensive, preventive, preemptive, or predominantly punitive uses of military force. The strategic goal here is total military victory and the destruction of the adversary. 141

138 Ibid,
139 Ibid,
140 Ibid,
141 Johnston, *Cultural Realism, 112-113.*

Johnston goes on to explain how these three categories are ordered and ranked in contending paradigms of Chinese strategic culture. First, the Confucian-Mencian paradigm is primarily concerned with how to create and maintain good government and emphasizes the importance of moral suasion and imperial virtue over the use of force.[142] When the force is used under unavoidable situation, it should be defensive and minimal in nature.[143] Therefore, in this paradigm, accommodation comes first, followed by defensive and then offensive/expansionist strategies.[144]

Secondly, the *parabellum* paradigm views war as a constant element of human affairs, regards the stakes involved in inter-state conflicts as zero-sum, and assumes violence is highly efficacious for controlling the adversary.[145] These assumptions generally prefer an offensive/expansionist strategy to accommodationist.[146] However, this preference is mediated by the concept of absolute flexibility *(quan bian),* which posits that "the offensive application of violence is likely to be successful only if strategic conditions are ripe.„[147] Regarding this concept, Johnston states, "The flexibility axiom translates into a recognition that under certain expedient circumstances (usually conditions of military or political weakness and inferiority) non-violent behaviors are acceptable means for creating conditions for the more efficacious application of military force.„[148]

Finally, Johnston tests which paradigm is dominant in Chinese strategic thought through the analysis of the *Seven Military Classics,* and Ming policy toward the Mongols. He finds that the *parabellum* strategic culture has played a dominant role in Chinese history, and a general pattern seems to hold for the most recent era of the communist regime. As evidence, Johnston demonstrates that the People's Republic of China has resorted to

142 Ibid, 117-123,249.
143 Ibid.
144 Ibid.
145 Ibid, 61-108, 249
146 Ibid.
147 Ibid,249.
148 Ibid, 151.

violence against external foes more frequently than other major powers, and it has been primarily directed at the resolution of zero-sum issues such as territorial disputes.i'" For instance, PRC used violence as a key conflict-management technique in eight foreign-policy crises out of eleven (72%), in which the primary issue was territory or related to territorial security. [150]

But, what chairman Mao most clearly borrowed from traditional strategic thought was the notion of absolute flexibility. [151] In two of Mao's essays on military strategy, "Problems of Strategy in China's Revolutionary War," and "On Protracted War," he made four explicit references to Sun Zi's axiom, "Know your enemy and know yourself, and in one hundred battles you will not be in danger," one refers to avoiding the enemy when it is stronger and attacking it when it weakens while displaying a false form to the enemy.[152] Johnston argues, "All four references relate to the concept of gauging the nature of changing circumstances and exploiting changes in strategic opportunities, l.e., *quan bian."[153]*

Clearly, each author proffers different approaches. While Swaine and Tellis derive grand strategy from the material or structural conditions of Chinese states, Johnston emphasizes cultural factors in the construction of strategic thought. Despite their differences, we can derive from their works some shared principles in Chinese grand strategy:

- China has frequently relied on coercive security strategies, including sometimes the intense use of force, against outside adversaries when domestic and strategic conditions are relatively favorable;

149 Ibid, 256.
150 Ibid.
151 Ibid,255.
152 Ibid.
153 Ibid.

- But when faced with unfavorable domestic and strategic environments, China has employed a variety of non-coercive policies, including diplomacy, appeasement, passive defenses, and economic incentives;
- Such general patterns have continuing influence on the present Chinese policymaking.

Chinese strategic behavior has generally been consistent with above patterns throughout history, and such patterns might play an important role in constraining Chinese reactions to missile defense.

7. Prospects for Arms Race under the Limited Architecture

Limited architecture compnses 100 GBM interceptors. This concept originated from the Clinton administration's initial deployment plan, which became the symbolic architecture of the U.S. missile defense in many countries' defense community. Prospects for a Sino-U.S. arms race under the limited architecture depend on the following four variables.

7.1 Nuclear Doctrine

Since the late 1980s, there have been an increasing number of research programs and writings in China on nuclear-related issues such as deterrence theory, the role of nuclear weapons, and nuclear doctrine.F" Out of these writings and research programs, Chinese strategists have recognized and differentiated three kinds of nuclear doctrine:

- Minimum deterrence: This doctrine is based on the belief that the mere possession of a

154 Johnston, "Prospects for Chinese Nuclear Force Modernization," 554.

small number of nuclear warheads that can survive a first strike is sufficient to dissuade an opponent from initiating a strategic-nuclear first strike.[155] For those who subscribe to this doctrine, nuclear weapons must never be used first, and nuclear war-fighting must remain unthinkable.[156] In addition, nuclear superiority does not matter if opponent's strategic force structure remains uncertain;

- Limited deterrence: This doctrine requires credible and perceived capability for inflicting an unacceptable damage on an adversary.[157] It presupposes limited nuclear war-fighting capability (not necessarily strategic superiority), involving "a damage-limiting capability, active antimissile and passive civil defense, a highly efficient and survivable [C4I] system for early warning and battle management, and an arsenal of reliable missiles and warheads accurate enough to kill hardened targets"IS8;
- Maximum deterrence: This doctrine, which describes U'.Sv-Soviet deterrence in the 1980s, is characterized by an arms race and a counterforce war-fighting doctrine for the achievement of strategic military superiority.F"

Whereas there are diverse arguments and opinions about actual Chinese doctrine, history after the mid-1950s generally confirms the dominance of minimum deterrence in Chinese strategic thought for three reasons. First, China has maintained its longstanding no-first-use principle since its first development of nuclear weapons in 1955. Concerning the emergence of the no-first-use principle, Tsinghua University professor Li Bin states that "Based on Mao Zedong's nuclear strategic thought, China made a no-first-use commitment immediately after its first nuclear test. In this commitment, China pledged not to be the first to use nuclear weapons. Since then, the no-first-use commitment has become an important

155 Dougherty and Pfaltzgraff, 363.
156 Ibid.
157 Johnston, "Prospects for Chinese Nuclear Force Modernization," 555.
158 Dougherty and Pfaltzgraff, 364.
159 Johnston, "Prospects for Chinese Nuclear Force Modernization," 554-555.

part of the Chinese nuclear strategy.'v'" The latest Chinese Defense White Paper, *China's National Defense in 2004*, also declares no-first-use principle by stating that "[China] always pursues a policy of no-first-use of nuclear weapons."[161] Under this principle, China maintains that its nuclear weapons are to be used only for retaliation after absorbing a first strike.

Second, China has persistently relied on the uncertainty principle of its nuclear force structure. **In** order that a small number of nuclear warheads offer a credible threat, the size of nuclear forces should have quantitative ambiguity, thereby increasing uncertainty in the mind of an adversary. It is now widely believed that China has 20 silo-based ICBMs that can reach the US. However, as long as China neither denies nor confirms its quantity of nuclear warheads, the US. cannot rule out some errors in its estimate and worries about the effectiveness of a first strike.[162] As a result, the US. is dissuaded from initiating a first strike. The current Chinese deterrence strategy is thus based on the quantitative ambiguity located at the heart of minimum deterrence doctrine.

Finally, Chinese nuclear strategy has abandoned a nuclear war-fighting capability. When Mao first developed nuclear weapons, Chinese leaders believed that they were not for war-fighting but purely for defense against possible nuclear blackmail.[163] And to this day, the Chinese government has officially announced through Defense White Paper that "China's limited nuclear counterattack ability is entirely for deterrence against possible nuclear attacks by other countries.„[164] China has actually deployed only a small number of ICBMs capable of reaching the US., while upholding the no-first-use principle. It has not even put nuclear warheads on the missiles - as many China experts contend - but stored

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160 Li Bin, "The Impact of US. NMD on Chinese Nuclear Modernization," *Pugwash Newsletter* 38, no. 1 (June 2001): 59.
161 PRC White Paper: *China's National Defense in 2004.*
162 Li Bin, "The Impact of US. NMD on Chinese Nuclear Modernization," 60.
163 Ibid,59.
164 *China's National Defense in 2004.*

them separately, although it has long had the capability to build more ICBMs and put them on higher alert.[165] Some might argue that China is modernizing its strategic forces in order to acquire a nuclear war-fighting ability. However, the majority of Chinese government officials, arms control experts, and military officers denies this, instead stressing that the objective of its strategic force modernization is simply to improve quality and survivability of its obsolete weapon systems, and not to acquire an offensive capability.[166]

Therefore, it can be plausibly asserted that China has generally relied on minimum deterrence doctrine at least to date. But, questions arise as to whether China continues to maintain a minimum deterrence under the missile defense or moves toward a more robust doctrine, as well as how it would restore its quantitative ambiguity under the limited architecture if it maintains minimum deterrence. To answer these questions, I will first determine the additional numbers of missiles needed by China in order to maintain credible minimum deterrence under the limited architecture.

As discussed in the introduction, only a small handful of Chinese ICBMs out of approximately 20 would survive a U.S. first strike. Then, the small handful that survives the first strike will be captured by 100 GBM interceptors. At the present force level, therefore, the quantitative ambiguity will be dissipated by the limited architecture, and China is required to increase the quantity or to improve the survivability of its strategic forces in order to restore minimum deterrent toward the U.S.

Li Bin conducted a research on this requirement. He first assumed that 100 interceptors are able to shoot down 50 warheads and calculated the number of warheads China needs to overwhelm limited architecture in various Chinese deployment modes and at different levels of the U.S. nuclear arsenal.[167]

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165 PRC White Paper: *China's National Defense in 2002.*

166 Joanne Tompkins, "How U.S. Strategic Policy is Changing China's Nuclear Plans," *Arms Control Today* 33, no. 1 (January / February 2003): 11.

167 Li Bin, "China's Nuclear Disarmament Policy," in *The Nuclear Turning Point: A Blueprint for Deep*

Table 1: Nuclear ICBMs Needed by China to Overwhelm Limited Architecture[168]

Warheads in the U.S. at different level	Numbers of Chinese ICBMs and hypothetical deployment			
	Silo-Based	*One-Dimensionally Mobile*	*Two-Dimensionally Mobile*	*Submarine-Based*
Operational and hedge ICBM: 1400, SLBM: 2130	1250	217	72	80
Operational only ICBM: 500, SLBM: 1680	850	167	68	80
Total: 1000 ICBM: 230, SLBM: 770	480	107	64	80

Source: Li Bin, "China's Nuclear Disarmament Policy," 325-332.

Table 1 reveals that China needs to dramatically increase its silo-based ICBMs to penetrate limited architecture if it does not have mobile systems. But if China successfully develops mobile systems, it needs only a relatively small increase in ICBMs or submarine-launched ballistic missiles (SLBMs). Furthermore, when China mounts some countermeasures, such as decoys and dispersing chaff, on the mobile systems or develops MIRV technology, the number of necessary ICBMs or SLBMs becomes much smaller than Li estimates. This suggests that small but effective mobile forces combined with penetration aids and possibly MIRVs technology can restore quantitative ambiguity, which is the underlying principle of a minimum deterrence doctrine.

Some might argue that if the U.S. deploys missile defense, China would adopt a limited deterrence doctrine in order to achieve a more flexible nuclear posture. However, when minimum deterrence remains both stable and cost-effective, China is not likely to

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Cuts and De-alerting of Nuclear Weapons, ed. Harold A. Feiveson (Washington, DC: Brookings Institution Press, 1999),325-332.

168 In the table, "one-dimensionally mobile" means that the weapon are restricted to moving along a high-way or railway, with no opportunity to scatter in other direction; "two-dimensionally mobile" means that the weapon can travel off roads. One third of the submarines are assumed at sea all the time and to be 100% survivable. For more details, see Li Bin, "China's Nuclear Disarmament Policy," 325-332.

adopt a limited deterrence doctrine for a numbers of reasons.[169] First, arming itself for nuclear war-fighting may constitute a financial burden to China. Unlike minimum deterrence, limited deterrence requires China to spend much more money not only for large numbers of nuclear warheads and ICBMs, but also for associated C4I battle management system, a space-based early warning and an anti-satellite (ASAT) system. For this reason, many Chinese suspect that the missile defense program is U.S.'s trick for sabotaging China's growing economy. Secondly, adopting a limited deterrence doctrine may be bad for China's peaceful economic cooperation with the international community. China has sought to ensure a favorable strategic environment for economic cooperation in positive, cooperative, benign, and peaceful images. But, changing its nuclear policy into a more aggressive one would increase perceptions of China's threat in the minds of other countries.

Thirdly, a space-based early warning or advanced C4I technologies that limited deterrence doctrine views as being the most important are precisely the ones that China lacks. The 2000 *Militarily Critical Technologies* report rated most of China's information technologies generally low and unsuitable for nuclear war-fighting.V" Finally, and most importantly, increasing the size of a war-fighting capable nuclear arsenal may prompt a costly arms race with the United States. The Chinese see parallels between their present situation and the Soviet overreaction to the Reagan Administration's SDI program, which supposedly contributed to the collapse of Soviet Union. The Chinese are realists and they will not make the same mistake.

To sum up, as Chinese Premier Wen Jiabao stated in March 2005, China's current number one strategic priority is economic development.[171] As long as the minimum

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169 I will discuss these reasons in more detail in the next section, "2.3 Reaction under the Robust Architecture."

170 Department of Defense, *Militarily Critical Technologies,* Part III: Developing Critical Technologies, Section 10: Information Technology (Dulles, VA: Defense Threat Reduction Agency, May 2000): 9-10.

171 "Stable economic growth China's top priority: Premier," *People's Daily Online,* March 14,2005; available from http://english.people.com.cn/200503/14/print20050314_176808.html

deterrence doctrine remains both cost-effective and stable, China would not find any reason to replace it with unstable and costly one at least in the next decade.

7.2. Military Technology

An important question to pose here is whether China has the necessary military technology to develop mobile strategic forces. Although it is difficult to measure the details of Chinese strategic force modernization, estimates made by the U.S. Department of Defense, Congressional Research Service, and the International Institute for Strategic Studies generally reveal that there are no major technological barriers for China to develop such systems.

Table 2: Major Strategic Missile Forces of PRC[172]

Missiles	Initial operation	Propellant type	Quantity	Range (km)
DF-3 (CSS-2)	1971	Liquid	50 - 80	2,650 - 2,800
DF-4 (CSS-3)	1980	Liquid	20 - 30	4,750
DF-5 (CSS-4)	1981	Liquid	20	12,000 - 13,000
DF-31 / JL-2	2003	Solid		8,000
DF-41	2010?	Solid		12,000

Source: Dean A. Wilkening, *Ballistic-Missile Defense and Strategic Stability.*

The current mainstay of Chinese nuclear deterrent consists of liquid-propellant, single warhead, silo-based DF-5 ICBMs that can reach targets in the U.S. About 20 of these missiles are due to be replaced by solid-propellant DF-41 ICBMs with a range of 12,000 km by end of the decade.[173] In addition, 4,750 km range liquid-fuelled DF-4 are to be replaced by the DF-31 solid-fuelled ICBMs with a range of 8,000 km.[174] The DF-31 also

172 Dean A. Wilkening, *Ballistic-Missile Defense and Strategic Stability,* Adelphi Paper 334 (London: Oxford University Press, 2000), 76.
173 *Annual Report on the Military Power of the People's Republic of China,* 31.
174 Godwin, 63-64.

serves as the basis for developing solid-propellant, road-mobile ICBMs and solid-propellant SLBMs (JL_2).175 China conducted its first flight test of the mobile DF-31 ICBM in August 1999. U.S. intelligence estimates that it has a range that can reach America's Pacific Northwest.[176] The Congressional Research Service predicts that most of China's land-based ICBMs will be mobile by 2015.[177] However, although Beijing has frequently threatened to deploy MIRVs to counter the U.S. missile defense, China's real MIRVing capability is uncertain at the present stage. In fact China may find it difficult to develop MIRV technologies, or it may simply prefer not to risk more than one warhead on a single delivery vehicle. Nevertheless, when assuming decoys or dispersing chaff are relatively easy to be mounted on the missiles, the present level of Chinese military technology may well be able to develop highly effective mobile nuclear forces.

7.3 Economic Resources

Another critical question that arises is whether China could afford to build mobile strategic forces without a financial burden. To answer this question, I will first examine Chinese military spending. The actual level of the Chinese defense budget is hotly debated, and is probably not known with certainty even to the Chinese authorities themselves. According to the publicly reported military budget in annual Defense White Paper, China increased its defense budget by 11.9% in 2003, from $22.4 billion to $25.0 billion, the fifteenth year of double digit growth.[178] However, these publicly disclosed figures do not include major spending for the purchase of foreign weapons, procurement, research and

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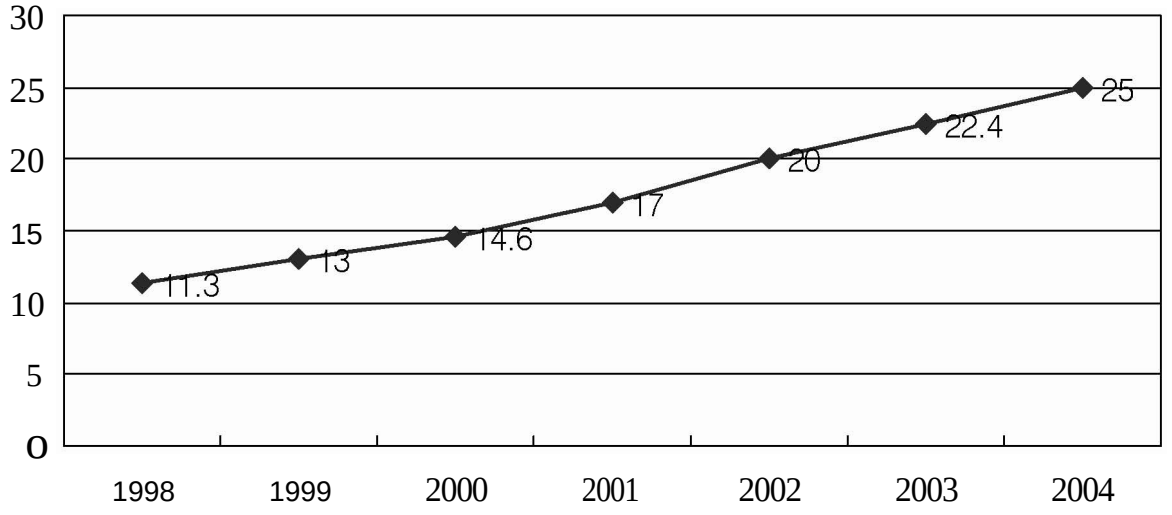
175 *Annual Report on the Military Power of the People's Republic of China,* 31.
176 Anthony H. Cordesman, *Strategic Threats and National Missile Defenses: Defending the U.S. Homeland* (Westport, CT: Praeger Publishers, 2002), 100.
177 Steven A. Hildreth, *Missile Defense: The Current Debate,* CRS Report for Congress (Washington DC: Congressional Research Service, August 21,2003): 7.
178 *China's National Defense in 2004.*

development, and most pensions for retired personnel.[179] For this reason, the U.S. Secretary of Defense's January 2001 report, *Proliferation: Threat and Response,* states that China's military spending was expected to average between $44 and $70 billion annually between 2000 and 2004.[180] According to Richard Lawless, Deputy Undersecretary of Defense, China's total defense-related expenditure for 2004 was estimated at between $50 and $70 billion.[181]

Figure 1: Chinese Military Budget (1998 - 2004, $ billion)



Source: PRC White Paper: *China's National Defense in 2004*

If this is so, what percentage of total defense spending is assigned to strategic forces? In 1986, the U.S. Department of Defense estimated Chinese defense expenditures for the 1967 to 1983 period by force categories. It found that an average of 5 percent was

179 The International Institute for Strategic Studies, *Military Balance 2004-2005* (Oxford, Britain: Oxford University Press, 2004), 319.
180 The U.S Department of Defense, *Proliferation: Threat and Response,* January 2001; available from http://www.911investigations.net/IMG/pdf/doc-71.pdf.
181 *Chinese Military Budget* (accessed December 27,2004); available from http://www.globalsecuritv.org/military/world/China/budget.htm

annually assigned to ballistic missile forces.[182] In 1994, the National Resources Defense Council estimated that 3 to 5 percent of annual defense expenditures have been allocated to nuclear forces.[183] Given all of these educated guesses on the Chinese military spending, we can roughly estimate that China spends $1.8 to $3 billion for strategic forces out of about $60 billion in annual defense spending.

Given these numbers, is it affordable for China to develop effective mobile systems? In order to acquire such a capability, China needs to spend more on the following categories: 1) a small number (30-40) mobile ICBMs or SLBMs; 2) land-mobile launching systems; 3) decoys and dispersing chaff; and 4) research and development (R&D). Among them, much of R&D cost has already been spent, land-mobile missile (DF-31 ICBM) has been produced and tested, and decoys or dispersing chaffs can be produced at a low cost. A small increase in mobile ICBMs or SLBMs may also represent a very small portion of annual spending for strategic forces if spread over several years. This suggests that China can develop mobile nuclear forces without incurring much financial burden.

7.4 Commitment to Nuclear Arms Control Regime

International arms control regimes may also play an important role in constraining China's reactions to the missile defense. In its annual Defense White Paper, China has consistently expressed its commitment to observe and promote both the Missile Technology Control Regime (MTCR) and the Comprehensive Nuclear Test Ban Treaty (CTBT). The 2004 white paper states that "China has formally joined the Nuclear Suppliers Group and has applied for its accession to the [MTCR]. ... The Chinese government firmly upholds the CTBT and supports its early entry into force. Before the treaty becomes effective, China

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182 Ibid.

183 Johnston, "Prospects for Chinese Nuclear Force Modernization," 564.

will stay committed to the moratorium on nuclear testing.„184 CTBT would ban any tests that release nuclear energy, while MTCR prohibits missile and missile technology exports.

Chinese strategic behavior under the limited architecture, however, would not be strongly constrained by the CTBT and MTCR. As discussed earlier, China does not need to significantly increase its nuclear warheads under the limited architecture. If combined with countermeasures, at most 30-40 mobile ICBMs are sufficient to secure minimum deterrence. And China might have kept reserve warheads of more than 40. For this reason, a test ban of any new warheads by CTBT would not seriously restrict Chinese strategic force modernization. Also, China would have no difficulty at all in developing sophisticated missile technologies under the commitment to the MTCR because it is export control regime and solely directed at the non-possessors.

7.5 Prospects for Arms Race

Clearly, not every nuclear buildup between two countries constitutes an arms race. To qualify as an arms race, arms accumulation must be associated with operational command doctrine, and at the same time, drive strategic relations to some sort of destabilizing point. China's nuclear doctrine, military technologies, economic resources, and commitment to the arms control regimes all indicate that a Sino-U.S. arms race is not likely to occur if the U.S. deploys only 100 GBM interceptors. At most, China would deploy 30 to 40 decoy-mounted mobile ICBMs, and continue to uphold a rmrumum deterrence doctrine without operational flexibility. China could build such a small but effective minimum deterrent under the current level of military technology and economic power, while remaining committed to the arms control regimes. The end result would be a stable deterrence between two countries, not a destabilizing arms race.

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184 *China's National Defense in 2004.*

8. Prospects for Arms Race Under a Robust Architecture

I assume that a robust architecture is composed of 250 GBM interceptors, 40 SBM missiles upgraded to engage ICBMs, and a fleet of seven ABL aircraft. The ABL system will operate outside of the range of threat weapons but sufficiently close to enemy territory and at altitudes above the clouds where it can track and intercept missiles of all ranges in their boost phase. The recent Air Force plan envisioned a fleet of seven aircraft. Five of these aircraft would be deployed to a theater to support 24-hour combat air patrol.[185] The developmental model of the ABL aircraft will be able to carry chemical fuel for 20 shots; the fully operational version will be capable of firing an estimated 40 shots before its fuel is depleted.[186] The number of shots and fuel consumed depend on the type of target and distance to it. The unique advantage of the ABL system is its ability to intercept ballistic missiles before releasing their countermeasures. Possible Chinese reactions to this robust capability depend on the following variables.

8.1 Nuclear Doctrine

Under the limited architecture, a few tens of mobile ICBMs combined with the penetration aids and quantitative ambiguity is sufficient to uphold minimum deterrence doctrine. However, robust architecture completely dissipates the quantitative ambiguity of the present level of nuclear deterrent, and China would again be required to dramatically increase its strategic forces, both quantitatively and qualitatively.

Will China continue to adhere to a minimum deterrence doctrine even under the robust architecture? Does robust architecture force China to move in the direction of

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185 Hildreth, *Missile Defense: The Current Debate, 29.*

186 John A. Tirpak, "Defense at the Speed of Light," *Air Force Magazine Online* 80, no. 11 (November 1997); available from http://www.afa.org/magazine/nov1997/1197airbom.asp.

nuclear war-fighting principles and capabilities? To answer theses questions, I calculated the number of warheads China needs to overwhelm robust architecture based on the original estimates made by Li Bin, as presented in the previous section. There are three assumptions. First, given the initial level of ABL technology, a total of 200 laser shots from 5 ABL aircraft would be able to shoot down 50 ICBMs in their boost phase (a 25% success rate). Second, as with GBM, it is assumed that 40 SBM interceptors would be able to shoot down 20 warheads (a 50% success rate). Third, although ABL (boost phase) and GBMlSBM (mid-course phase) are designed to intercept attacking missiles at different stages of their flight trajectory, I assume that every system is operated at the same time.

Table 3: Nuclear ICBMs Needed by China to Overwhelm Robust Architecture

Warheads in the U.S. at different level	Numbers of Chinese ICBMs and hypothetical deployment			
	Silo-Based	*One-Dimensionally Mobile*	*Two-Dimensionally Mobile*	*Submarine-Based*
Operational and hedge ICBM: 1400, SLBM: 2130	1395+	362+	217+	225+
Operational only ICBM: 500, SLBM: 1680	995+	312+	213+	225+
Total: 1000 ICBM: 230, SLBM: 770	625+	252+	209+	225+

Table 2 shows that China needs to increase the size of its strategic forces about ten times the current level in order to penetrate a robust architecture even if it would successfully develop mobile ICBMs. These estimated figures will increase if different phases of interception between the SBL and GBMlSBM are reflected in the calculation. Furthermore, the role of countermeasures or possible MIRV technologies will be seriously reduced because of the presence of the ABL system. All of this suggests that the minimum deterrence doctrine, which holds that the mere possession of a small number of nuclear

warheads is sufficient to deter the opponent if combined with quantitative ambiguity, can no longer be a viable policy option for China.

Therefore, it is plausibly predicted that there would be some growing pressure within the Chinese defense community to move in the direction of limited deterrence. And an increasing concern with limited deterrence doctrine would likely be linked to reinforced concern about the impact of robust architecture on the effectiveness of the Chinese deterrent. Proponents of limited deterrence have generally claimed that the basis of credible deterrence is limited war-fighting capability, not the quantitative ambiguity. In their essay "Thoughts on the relationship between nuclear war and politics," Zhao Fusheng and Zhang Chengliang noted, "Without the prerequisite that nuclear weapons could possibly be used in a real war, then nuclear weapons can't be political tools and have deterrent value. If we don't have the determination and real capability to dare to implement a nuclear attack on the enemy through powerful retaliation, then our nuclear power loses its deterrent value in constraining the outbreak of nuclear war.„187 Another book on nuclear strategy argued, "No matter whether one is a big state or a middle-ranked nuclear power, if one has nuclear weapons but does not used in actual war *(shizhan)* then these cannot constitute a real war deterrent.„188

A shift m this direction implies a targeting doctrine that goes well beyond population centers, along with more accurate, survivable and penetrable ICBMs and SLBMs. In the words of Johnston:

"limited deterrence entails the development of enough capabilities to deter conventional,

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187 Zhao Fusheng and Zhang Chengliang, "He zhanzheng yu zhengzhi guanxi de sikao," ("Thoughts on the relationship between nuclear war and politics") in *Quan jun Mao Zedongjunshi sixiang xueshu taolun wen jing xuan (Selected Essays from the All-Army Academic Meeting on Mao Zedong's Military Thought)* (Beijing: Academy of Military Science Press, 1992),592. See also Johnston, "Prospects for Chinese Nuclear Force Modernization," 555.

188 Hu Wenlong and Cha Jinlu, ed.,*Xiandai Jundui bingzhong zhanshu* (Beijing: Military Science Press, 1991),245. See also Johnston, "Prospects for Chinese Nuclear Force Modernization," 556.

> theatre and strategic war and to suppress escalation during a nuclear war. This requires a sufficient range of weapons and operational capabilities, especially, to respond to any level of attack. The response need not be a one-to-one matching of technical capabilities, merely enough to raise the costs of war dramatically for the adversary. A recognizable, realistic ability to fight and inflict sufficient counterforce and counter-value damage on an aggressor assures deterrence; and if that fails, it assures an ability to prevent an enemy victory. Thus there is a distinct, limited war-fighting hue to the concept... ,,[189]

To acquire this capability, China needs to develop advanced C4I battle management technology, including a space-based early warning, ASAT, an antimissile civil defense that can reduce the number of casualties, and most importantly, a significantly enlarged nuclear arsenal.

8.2 Military Technology

Though Chinese strategists could be in favor of limited deterrence, the PRC's actual capabilities are constrained by weaknesses in military technologies - especially in areas such as C4I - critical in performing joint battle management during a time of limited war-fighting operations. With regard to China's C4I technologies, Bates Gill and Michael O'Hanlon state, "China's C4I infrastructure cannot support large scale, joint force projection operations at any significant distance from the country's borders.,,19o The U.S. defense department also assessed China's C4I and WMD-related information technologies in its *Militarily Critical Technologies* report. This report rates country's military technologies on a scale of zero to four, with zero meaning no existence, and four indicating the superior level. China received the following ratings:

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189 Johnston, "Prospects for Chinese Nuclear Force Modernization," 555.
190 Bates Gill and Michael O'Hanlon, "China's Hollow Military: Evaluating the Military Capacity of the People's Republic of China," *The National Interest* 56 (Summer 1999): 58.

- Command, Control, Communication, Computers, Information, and Intelligence (C4I2) Systems: 1[191]
- Electronic Components: 1[192]
- Radar: 1[193]
- Information Communications: 2[194]
- Information Processing: 2[195]
- Information Systems Management and Control: 2.[196]

Such weaknesses in C4I technologies make it much more difficult for China to adopt a limited deterrence doctrine to cope with the robust architecture. Although the PRC is currently attempting to modernize its C4I systems by increasing military budgets, it will be at least a decade before China can acquire such technologies available for limited war-fighting.

8.3 Economic Resources

The question now becomes, is it affordable for China to build significantly increased strategic forces together with battle management systems? As discussed in the previous section, in order to cope with the robust architecture, China should increase its size of mobile ICBMs about 10 times the current level. At the same time, the country needs to make massive new investments in the development of C4I and ASAT technologies. This suggests that, even if a modest ratio of one-to-two is applied in cost and force expansion,

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191 Bernard D. Cole and Paul H. B. Godwin, "Advanced Military Technology and the PLA," in *The Chinese Armed Forces in the 21st Century,* ed. Larry M. Wortzel (Carlisle, PA: US. Army War College, Strategic Studies Institute, 1999), 159.
192 Ibid.
193 Ibid.
194 Department of Defense, *Militarily Critical Technologies, 9.*
195 Ibid.
196 Ibid.

Chinese spending for strategic forces would jump to $9 to $15 billion per year. Assuming $60 billion is the annual defense spending of China, such an amount of money would constitute a huge financial burden.

Furthermore, such a hike in defense spending for the strategic forces could seriously damage China for the following reasons. First, the continuing priority in China's defense spending is to modernize its conventional forces, which are equipped largely with relics from the 1960s and 1970s. Thus, China needs to finance much of spending for the strategic forces from domestic needs rather than cutting back on conventional arming. Such a reallocation may prompt a struggle between the PLA leadership and market-oriented civilian society.

Second, it could exert a negative influence on China's growing economy. According to estimates made by the RAND Institute, China's increasing military spending by 20 percent could reduce the rate of growth in the civil capital stock from 8 to 9 percent to 6 to 7 percent, while the average annual rate of growth in total factor productivity would decline by 0.5 percent.i'" The result of this reallocation can be estimated as reducing China's rate of economic growth by 1.3 percent per year.[198] As a further consequence, it can be plausibly inferred that, as the economic growth rate decreases, the foreign direct investment (FDI) - as of 2001, the FDI reached over $40 billion in China - would severely shrink in the long run.[199]

Finally, a big increase in the defense budget would be seen in Asia and the U.S. as an indication of the growing Chinese threat. Such a perception would prevent China from fully participating in the international community for its economic development.

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197 Charles Wolf, Jr., K. C. Yeh, Benjamin Zycher, Nicholas Eberstadt, Sung-Ho Lee, *Fault Lines in China's Economic Terrain,* Prepared for the Office of Net Assessment, Department of Defense, and the Smith Richardson Foundation (Santa Monica, CA: RAND, 2003), 164.
198 Ibid.
199 Ibid.

8.4 Commitment to Nuclear Arms Control Regime

China's commitment to the CTBT would play an important role in constraining its strategic behavior under the robust architecture. China is reported to have approximately 410 nuclear warheads for old type silo-based missiles.i'" This means that China needs to double or even triple the number of warheads if it decides to increase silo-based ICBMs. But if China instead decides to deploy mobile ICBMs, it would be required to produce at least 250 state-of-the-art warheads for a new system. In either case, a very restrictive CTBT doses not allow Beijing to test any new warheads that release nuclear energy. Thus, CTBT would severely limit China's ability to develop and increase new, reliable warhead designs against robust architecture. Of course, China could withdraw from CTBT, but such action would be viewed in other countries as still another indication that China has shifted to a more aggressive nuclear posture. [201] As long as Chinese policy takes economic development as a priority, withdrawal from CTBT would be the last option selected by the Chinese government.

8.5 Prospects for Arms Race

The analysis of variables reveals two dynamics conflicting with each other. From the perspective of national security, the Chinese defense community is likely to promote changing its nuclear doctrine and forge ahead to nuclear buildup. With a new doctrine that assumes actual nuclear war-fighting, China would attempt to increase its nuclear arsenal until it acquires a recognizable and realistic capability to fight and inflict sufficient counterforce and counter-value damage on the u.S.[202] This in turn would result in a possible arms race with the U.S.

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200 C'"InnClOne, 7-8.
201 Godwin, 68.
202 Johnston, "Prospects for Chinese Nuclear Force Modernization," 555.

At the same time, though, China's actual capabilities to move into an aggressive nuclear posture are strongly constrained by deficiency in military technologies, a vulnerable economy, and international arms control regime. China does not have the sophisticated C4I technologies and the space-based early warning system necessary for commanding limited war-fighting operations. The country's commitment to the CTBT would ban any tests of new warhead designs. Also expanding the size of its strategic forces about 10 times the current level will constitute a significant financial burden for China and even potential domestic repercussions in the worst case. Li Bin notes, "The approaches [to missile defense] should be affordable and not constitute a financial burden on China. China is now concentrating on economic development. It does not want a sharp expansion of military expenditure that would disturb its economic progress. The Chinese government's policy takes economic development as its priority and the policy has strong support from the Chinese people.„203 In addition, China's grand strategy has relied on non-coercive policies when faced with unfavorable domestic and strategic environments. Today, a possible arms race with the US. is expected not only to damage domestic stability, but to disturb its economic cooperation with other countries as well.

From the analysis of the above variables, it can be plausibly expected that China would not dare to venture into a costly arms race with the US. If Chinese policymakers are reasonable in terms of cost-benefit calculations, they would stay committed to the minimum deterrence and increase small numbers of warheads under the curtain of quantitative ambiguity. As long as China upholds minimum deterrence doctrine, there should be little possibility for a Sino-US. arms race under the robust architecture.

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203 Bin, "The Impact of US. NMD on Chinese Nuclear Modernization," 64.

9. Prospects for Arms Race under the Limited Layered Architecture

The question now is, what would be the potential Chinese response to the limited layered architecture composed of 150 GBM interceptors and 20 SBM missiles upgraded to engage ICBMs? Table 4 provides the number of warheads China needs to overwhelm limited layered architecture:

Table 4: Nuclear ICBMs Needed by China to Overwhelm Limited Layered Architecture

Warheads in the US. at different level	Numbers of Chinese ICBMs and hypothetical deployment			
	Silo-Based	*One-Dimensionally Mobile*	*Two-Dimensionally Mobile*	*Submarine-Based*
Operational and hedge ICBM: 1400, SLBM: 2130	1285	252	107	115
Operational only ICBM: 500, SLBM: 1680	885	202	103	115
Total: 1000 ICBM: 230, SLBM: 770	515	142	99	115

All the numbers in Table 4 are larger by 35 than those given in the same positions in Table 1. Under the limited architecture, China could maintain the doctrine of minimum deterrence by developing a limited mobile ICBM capability. That is, the mere possession of small decoy-mounted mobile ICBMs was able to restore the quantitative ambiguity of Chinese strategic forces. If there is a limited layered architecture, however, the effect of the quantitative uncertainty would be mostly eliminated, and China would then have to expand its strategic forces by deploying at least 80 countermeasure-mounted mobile ICBMs to overwhelm the system. The questions again arise as to whether China would continue to uphold a minimum deterrence doctrine under the limited layered architecture or move onto

the limited deterrence. The precise impact of this shifting strategic landscape on Chinese nuclear doctrine is difficult to assess. But it is well expected that China's leadership would begin to encourage thinking and limited debate about changing its nuclear doctrine into the limited deterrence because minimum deterrence would no longer provide a credible deterrent under the limited layered architecture.

Now the question becomes, is it affordable for China to adopt a limited deterrence doctrine at this time? To cope with the limited layered architecture, China is required to quadruple the size of the strategic forces. When I apply a one-to-two ratio in cost and force expansion, China would spend $3.6 to $6 billion for strategic forces from a $60 billion annual defense budget. Such an expansion would constitute a financial burden to some extent, but would not hugely tax the Chinese economy if annual economic growth continues at around 8 to 10 percent. In addition, when China finds it affordable to quadruple its strategic forces, more investments in the development of accompanying C41 and ASAT technologies would follow.

Therefore, a limited layered architecture can be proved to be the most destabilizing point where a Sino-US. arms race could actually occur although Chinese strategic behavior would still be somewhat constrained by its commitment to the CTBT and low-level C41 technologies. The worst scenario would be as follows: The US. deploys limited layered architecture of missile defense, China quadruples its nuclear missiles with operational flexibility for limited war-fighting, China initiates massive new investments for C41 and ASAT technologies, The US. responds to the Chinese move by deploying more missiles in the direction of China. China again increases its ICBMs at the threshold of global arms race.

10. Test of Arms Race Prospects: An Application of Game Theory

Game theory, as the science of strategic behavior, has been widely used in Political Science. Because game theoretic models are intrinsically logical, they provide political scientists with analytical clarity and rigor in their explanation of the complexity of politics. **In** this section, I will use game theoretic models to examine the strategic interaction between China and the United States, and test the previous sections' findings. I will restrict game theoretic models in 2x2 matrix only, although different types of missile defense architecture is considered and incorporated into the models.

Before I get into the details of the games, I want to clarify some basic assumptions concerning the use of game theory. The strategic setting discussed in the previous sections is simplified as follows:

- The United States would like to deploy cost-effective missile defense architecture directed solely at rogue states and terrorists;
- Regardless of America's intention, China would make the required investment to penetrate the system if it appeared affordable, given the Chinese interests and priorities;
- The current 20 Chinese ICBMs can penetrate the limited architecture;
- China has to deploy 80 ICBMs to overwhelm the limited layered architecture;
- China needs 200 ICBMs to penetrate robust architecture.

Several terms need definition. First, China's strategy profile is composed of *"Buildup"* and *"No Buildup." Buildup* means increase in the size of Chinese ICBMs to the level of deterrent restoration. For example, in the robust architecture game, *Buildup* means increase of ICBMs from 20 to 200. And, in the limited layered architecture game, *Buildup*

represents increase from 20 to 80. *No Buildup* means continuing possession of current 20 ICBMs. Second, the strategy profile of the United States comprises *"Deployment"* and *"No Deployment." Deployment* is actual deployment of missile defense system. For example, in the limited architecture game, *Deployment* means deploying limited architecture of missile defense only. Similarly, *Deployment* means deploying robust architecture of missile defense in the robust architecture game. *No Deployment* indicates the absence of missile defense system. I define that arms race occurs when China chooses *Buildup* and the US. chooses *Deployment.* Third, I label the highest payoff as 3, followed by 2, 1, 0, -1, -2, and -3 as the lowest payoff; for example, with 0 meaning indifference (or status quo), 3 representing most favorable situation in which strategic and/or economic advantages are maximized; and -3 indicating most disadvantageous situation where national or regime security is seriously jeopardized.

10.1 Model for the Limited Architecture

First, I constructed a game theoretic matrix of the interaction between China and the US. if the US. deploys limited architecture of missile defense.

Figure 2: China & U.S. under the Limited Architecture

		US.A	
		Deployment	*No Deployment*
PRC.	*Buildup*	(**-1** , **-1**)	(**-1** , -3)
	No Buildup	√ (0 , 3)	(0 , -2)

Payoffs: (PRC., US.A.)

In this matrix, China has a preference of *{No Buildup, No Deployment}* = *{No Buildup,*

Deployment} > *{Buildup, No Deployment}* = *{Buildup, Deployment}*. Limited architecture of missile defense does not affect Chinese nuclear deterrent against the United States because current 20 Chinese ICBMs can penetrate the system. For this reason, China is indifferent between *Deployment* and *No Deployment,* thus having the payoff of 0 for both *{No Buildup, Deployment}* and *{No Buildup, No Deployment}*.

What if China chooses *Buildup* although limited architecture does not damage Chinese deterrent? I defined *Buildup* as an increase in the size of Chinese ICBMs to the level of deterrent restoration. Thus, choosing a *Buildup* in the limited architecture game seems to be unreasonable. But, *Buildup* is still meaningful as China's unilateral move to enlarge its nuclear arsenal. Then, how much payoff can China expect from *{Buildup, Deployment}* and *{Buildup, No Deployment}?* Under the economy-first foreign policy objective, China has sought to ensure a peaceful and stable environment for economic cooperation with the international community in positive, cooperative, benign, and peaceful images. However, unilateral move toward a nuclear buildup could injure its relations with major trading and investment partners, thus damaging the economic prosperity that has been achieved thus far. Therefore, China considers it will have the payoff of -1 for both *{Buildup, Deployment}* and *{Buildup, No Deployment}*.

On the other hand, the US. has a separate sequence of preference: *{No Buildup, Deployment}* > *{Buildup, Deployment}* > *{No Buildup, No Deployment}* > *{Buildup, No Deployment}*. The US. will definitely have the highest payoff of 3 for *{No Buildup, Deployment}* because it is the most cost-effective way of defending its homeland from rogue states and terrorists' missile attacks while averting an arms race with China. However, if China builds up its nuclear arsenal unilaterally, the United States would face increased risks from Chinese missiles. Hence, the US. will have a payoff of -1 for *{Buildup, Deployment}*.

What if the US. chooses *No Deployment?* Even if China chooses *No Buildup,* the US. is now exposed to missile threat posed by rogue states and international terrorists. In addition, their threat is graver than that from Chinese missiles because they are less predictable and difficult to be deterred. Thus, the US. will have a payoff of -2 for *{No Buildup, No Deployment}.* Of course, the US. will have the lowest payoff of -3 for *{Buildup, No Deployment}* because it is exposed to every existing missile threat without proper means for defense.

What strategy should each country choose? Let's consider China first. It should clearly choose *No Buildup* because no matter what US. does, China does best by choosing *No Buildup.* Thus, *No Buildup* is a dominant strategy for China. The same is true for the US. No matter what China does, the US. does best by choosing *Deployment.* Therefore, assuming that both countries are rational, we know that the outcome for this game is *{No Buildup, Deployment}* in which arms race is not likely to occur.

10.2 Model for the Robust Architecture

If US. deploys robust architecture of missile defense, the payoff matrix in the Figure 2 might be changed to Figure 3.

Figure 3: China & U.S. **under the Robust Architecture**

		US.A	
		Deployment	*No Deployment*
PRC.	*Buildup*	(-3 , -2)	(-1 , -3)
	No Buildup	√ (-2 , 1)	(0 , -2)

Payoffs: (PRC., US.A.)

In this case, China has a preference of *{No Buildup, No Deployment}* > *{Buildup, No Deployment}* > *{No Buildup, Deployment}* > *{Buildup, Deployment}.* Under the limited architecture, 20 Chinese ICBMs were sufficient to keep deterrent against the United States. However, robust architecture completely dissipates the present level of Chinese deterrent, posing a serous menace to China's ability to employ its nuclear weapons to deter possible US. pressure and aggression in East Asia. Therefore, China will have the second worst payoff of -2 for *{No Buildup, Deployment}.*

What if China increases its ICBMs to 200 by choosing *Buildup?* Unfortunately, such an expansion of the strategic forces will constitute a significant financial burden for China. In order to increase its size of ICBM forces about ten times the current level, Chinese spending for strategic forces must jump to $9 - $15 billion per year. Assuming $60 billion is the annual defense spending of China, such a hike in defense spending would hugely tax Chinese economy and even damage China's regime stability in the worst case. Therefore, China will have a payoff of -3 for *{Buildup, Deployment}.* The payoffs for *{No Buildup, No Deployment}* and *{Buildup, No Deployment}* are same with those in Figure 1.

Meanwhile, the US. has a preference of *{No Buildup, Deployment}* > {No *Buildup, No Deployment}* = *{Buildup, Deployment}* > *{Buildup, No Deployment}.* Limited architecture is sufficient to protect American homeland against missiles from rogue states and international terrorists. In this sense, if China sticks to *No Buildup,* deploying robust architecture is too much investment for the US. Thus, the payoff for *{No Buildup, Deployment}* is reduced to 1. On the other hand, *{Buildup, Deployment}* is a security dilemma situation for the United States in which too much investment for safety brings greater risks of Chinese missiles. Therefore, I believe that the US. will have the second worst payoff of -2 for *{Buildup, Deployment}.* The payoffs for *{No Buildup, No Deployment}* and *{Buildup, No Deployment}* are same with those in Figure 1.

In the game model shown in Figure 2, *No Buildup* strictly dominates *Buildup* for China, while *Deployment* strictly dominates *No Deployment* for the United States. So this game also has a strictly dominant strategy equilibrium *{No Buildup, Deployment}.*

10.3 Model for the Limited Layered Architecture

Finally, I constructed a game theoretic matrix of the interaction between China and the United States under the limited layered architecture. This can help explain why limited layered architecture would be the most destabilizing design in which the possibility of a Sino-US. arms race is maximized.

Figure 4: China & U.S. **under the Limited Layered Architecture**

		US.A	
		Deployment	*No Deployment*
PRC.	*Buildup*	√ (-2 , -1.5)	(-1 , -3)
	No Buildup	√ (-2 , 2)	(3 , -1)

Payoffs: (PRC., US.A.)

In this matrix, China has a preference of *{No Buildup, No Deployment}* > *{Buildup, Deployment}* > *{No Buildup, Deployment}* = *{Buildup, Deployment}.* Faced with a limited layered architecture, the effect of the Chinese deterrent would be completely eliminated, and China is required to quadruple the size of ICBM forces to overwhelm the system. But, this expansion would not constitute a significant burden for the Chinese economy if annual economic growth continues at around 8 to 10 percent. It means the payoff for *{Buildup, Deployment}* under the limited layered architecture is not as bad as that under the robust architecture. Therefore, China will have a payoff of -2 for *{Buildup, Deployment}.* Once

China lost its nuclear deterrent, the levels of missile defense architecture would exert no significant influence upon Chinese strategic setting. Thus, the payoff for *{No Buildup, Deployment}* is same with those in Figure 2.

On the other hand, the US. has a preference of *{No Buildup, Deployment}* > *{Buildup, Deployment}* > *{No Buildup, No Deployment}* > *{Buildup, No Deployment}.* Deploying a limited layered architecture is more expensive than limited architecture, but cheaper than robust architecture. Thus, the payoff for *{No Buildup, Deployment}* is 2, lower than the payoff under the limited architecture, but higher than that of the robust architecture. By the same token, the payoff for *{Buildup, Deployment}* is also located somewhere between those under the limited architecture and robust architecture. Therefore, I believe the US. will have a payoff of -1.5 for *{Buildup, Deployment}.*

How can we determine this game's likely outcome? *No Buildup* weakly dominates *Buildup* for China because, given any set of strategies played by the US., playing *No Buildup* never results in a lower payoff for China than does *Buildup.* Meanwhile, *Deployment* is still a dominant strategy for the US. How many Nash equilibriums does this game have? This game has two Nash equilibriums *{No Buildup, Deployment}* and *{Buildup, Deployment}* in which arms race possibility reaches 50 percent.

11. Conclusion

11.1 Summary

In March 1999, the US. Congress overwhelmingly approved legislation for a National Missile Defense System. And in December 2002, Bush announced his plan to begin deployment of initial missile defense capabilities in 2004-2005. The initial capabilities composed of 20 GBM interceptors, 20 SBM interceptors, and Patriot PAC-3 units are scheduled to be operational by the end of 2005. The deployment of missile defense is an essential element of the US. broader efforts to meet its new strategic challenges in the twenty first century. **In** today's highly unpredictable world, missile defense can secure the US. force projection capability while providing an additional safety net against growing threats from WMDs in the hands of hostile regimes and international terrorists.

But China has strongly criticized the US. missile defense plan in very harsh terms. Beijing warned that missile defense could not only undermine the international arms control regimes and strategic stability, but also lead to the proliferation of nuclear weapons and missiles both in the theater and in outer space. A primary reason for China's criticism of the missile defense is that even a limited system would undercut China's own nuclear deterrent vis-a-vis the US. China currently has only about 20 liquid-fuel silo-based ICBMs that can reach the US. If the US. were initiate a first strike, China's assumes that only a small handful of Chinese ICBMs would survive. And those that do survive the first strike would be captured by missile defense systems. Many in China believe that such a disadvantage would pose a serious menace to China's ability to use its nuclear weapons to deter possible US. pressure and aggression in East Asia.

An important question to now pose is, what Sino-US. strategic relations look like

under a fully-deployed missile defense, as well as how it would be affected by actual missile defense architectures? This thesis takes up this question and argues that prospects for Sino-U.S. arms race depend on the various types of missile defense architecture: limited, limited layered, and robust. And whether or not China enters into an arms race with the U.S. under the respective type of architecture is constrained by five variables: grand strategy in Chinese history, nuclear doctrine, military technology, economic resources, and commitment to arms control regimes. Table 5 summarizes the analysis of variables.

Table 5: Summary of the Analysis of Variables

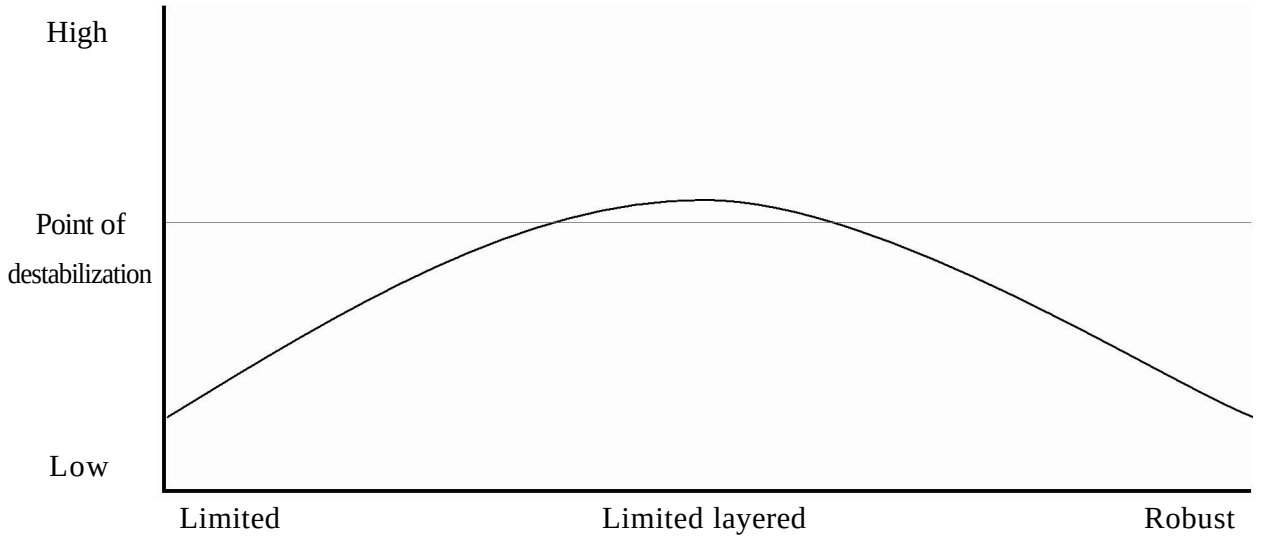
Types of architecture	Variables				
	Nuclear Doctrine	*Economic Resource*	*Military Technology*	*Commitment to arms control*	*Grand Strategy*
Limited		+/-	+/-		+/-
Limited layered	+	+			+/-
Robust	+				

Notes: "+" means positive to arms race; "-" means negative to arms race; "+/-" means no clear-cut.

Table 5 shows that China would continue to uphold a doctrine of minimum deterrence under the limited architecture, according to the belief that mere possession of a small number of nuclear warheads is sufficient to deter one's opponent. Under the robust architecture, China's defense community would promote an aggressive nuclear doctrine and push ahead to a possible arms race with the United States. But, such Chinese moves would be deterred by the other variables, which offer a disincentive to an arms race. Faced with a limited layered architecture, China may find it affordable to adopt an aggressive nuclear doctrine, although it will still be somewhat constrained by arms control and military technology variables. From this analysis, I can derive the following outcomes:

- China would deploy only small-size mobile ICBMs against a limited architecture. The result would be a stable deterrence between two the countries, not an arms race.
- China would be deterred from entering into a costly arms race with the United States under the robust architecture. Chinese policy makers would stay committed to the minimum deterrence doctrine under the curtain of quantitative ambiguity.
- Limited layered architecture would be the most destabilizing architecture since a Sino-US. arms race could actually occur.

Figure 5: Types of Architecture and Arms Race Possibilities



Note: vertical line indicates possibilities for Sino-U.S. arms race; horizontal line indicates types of missile defense architecture

11.2 Policy recommendations

The role of missile defense is to secure US. force projection capability and to provide an additional safety net against proliferation and terrorism. This is a critical mission, but it can be achieved only if missile defense does not trigger an arms race with China that would result in increased risks to both countries. The goal of this final section is to suggest some policies that the US. government could carry out to ensure stable strategic relations

with China in the era of missile defense.

First and most important, the United States should provide the best available picture of a fully-deployed missile defense architecture. Attaining a strategic understanding with China will be difficult as long as the future architecture of missile defense remains uncertain.i'" **In** addition, the prolonged absence of definitive architecture could lead China to prepare worst case scenario, revising its current doctrine of minimum deterrence into a more robust approach. Providing a picture of the final architecture might help reduce the arms race possibility either by assurance (in case of limited architecture) or by deterrence (in case of robust architecture).

Secondly, limited architecture is the best design for missile defense at the present stage. 100 GBM interceptors combined with the Aegis SBM and Patriot PAC-3 will be able to protect the US. homeland, expeditionary forces, and allies against a few tens of warheads from North Korea, Iran and non-state adversaries. At the same time, China would stay committed to the doctrine of minimum deterrence if the US. deploys only 100 GBM interceptors. Therefore, a limited architecture can attain both security and strategic stability in most cost-effective way.

Finally, the United States should reinvigorate military CBMs with China to share information about missile defense plans and Chinese missile modernization. Such measures would build upon the resumption of exchanging military data, consultative talks and high-level defense visits, as exemplified by the June 2002 talks in Beijing between the US. Assistant Secretary of Defense and China's Deputy Chief of Staff.[205]

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[204] Alan D. Romberg and Michael McDevitt, ed, *China and Missile Defense: Managing U.S.-PRC Strategic Relations* (Washington, DC: The Henry L. Stimson Center, 2003), 32.

[205] "Chinese Defense Minister Says Beijing Ready to Improve Military Ties with US.," *Financial Times Information*, June 27, 2002 (accessed on March 30,2005); available from Lexus Nexus.

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