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Understanding the Dragon Shield: Likelihood and Implications of Chinese Strategic Ballistic Missile Defense

A special report published by the Federation of American Scientists

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September 2015

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Acknowledgments
This publication was developed under work supported by the Naval Postgraduate School (NPS) Project on Advanced Systems and Concepts for Countering WMD No. N00244-14-1-0035 awarded by the NAVSUP Fleet Logistics Center San Diego (NAVSUP FLC San Diego), with funding from the Defense Threat Reduction Agency (DTRA). It has not been formally reviewed by NPS. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of NPS, NAVSUP FLC San Diego, or DTRA.

The impetus for this study began a few years ago when one of us (Bruce W. MacDonald) recognized that there was little or no analysis in the open literature about the strategic implications for the United States and other countries if China decides to deploy even a limited strategic ballistic missile defense. This was despite the fact that China had recently performed some ballistic missile defense tests. We are thankful for the more than 50 colleagues, experts, and officials who took time out of their busy schedules to discuss these important issues with us in Beijing and Shanghai, China; Cambridge, Massachusetts; Hanover, New Hampshire; and Washington, DC. We want to especially thank Assistant Secretary of State Frank A. Rose for giving an on-the-record speech at our workshop on February 20, 2015, at the Federation of American Scientists' conference room during which about 20 experts participated. Also, we are grateful for the invitation to participate as observers at the 9th China-U.S. Strategic Nuclear Dynamics Dialogue on February 9-10, 2015, in Beijing, convened by the Pacific Forum CSIS, with the China Foundation for International and Strategic Studies. Moreover, we are very appreciative of the logistical support by Katie Colten and Pia Ulrich of FAS and the report's editing and formatting by Allison Feldman, Communications and Community Outreach Officer at FAS.

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Design, layout, and edits by Allison Feldman.
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Table of Contents

Executive Summary

Motivated by the relative lack of open source analysis of China's testing of missile interceptors since 2010, we decided to investigate the potential strategic implications for the United States and its allies if China continued to develop strategic ballistic missile defense (BMD) and then deployed even a limited strategic BMD system. During late 2014 and the first half of 2015, we had discussions with more than 50 experts (including about two dozen Chinese officials, military officers, and academics) in China and the United States. Based on these discussions, our study of the literature, our examination of potential incentives and disincentives for China's BMD development and deployment, and prior experience in studying BMD issues, we have observed:

- None of the Chinese we spoke with attempted to "explain away" Chinese activities in strategic BMD developments. While several Chinese explained this work as only intended to gain technological insight, Chinese views on strategic BMD have appeared to shift in recent years toward receptivity of development and even possible deployment.

- Chinese experts expressed acceptance and understanding about the connection between strategic BMD and anti-satellite weapons (ASAT). Indeed, several Chinese experts stated that Chinese ASAT activity is necessary for technical readiness and in order to understand what the United States and other nations could do in this field.

- The Chinese government is discussing whether to deploy some level of strategic BMD but no decisions (at least publicly) have been announced as of yet. Such a decision would have to be made at very senior levels.

- Importantly, any likely level of Chinese strategic BMD deployment would have very little effect on U.S. strategic forces, given the size and technological advancement of U.S. nuclear weapon systems. Nonetheless, the United States would most likely have to respond to U.S. domestic political concerns and U.S. allies' seeking reassurances, which may necessitate deploying possible countermeasures as a demonstration of U.S. commitment to maintaining a viable nuclear deterrent.

While we provide an in-depth analysis in the body of the report, we summarize our main findings here:

- Chinese development of strategic BMD is ongoing and is helping China to understand the complexities and nuances of designing such a system and what its weak points are, regardless of whether they decide to deploy such a BMD system. Also, this development provides an important hedging option for China against an uncertain and evolving future strategic environment.

- At a minimum, it appears that a Chinese deployment of strategic BMD is probably *less unlikely* than most U.S. defense analysts have in the past assessed.

- Should China decide to deploy such defenses, the most likely reasons would be to:

    - Provide a plausible cover to continue testing its kinetic energy ASAT system. This suggests that a thin, regional/nationwide defense would be more likely than a point defense, though the latter cannot be ruled out. Point defense would not provide much cover for an ASAT testing program.
    - Send a strategic message to India, Japan, and the United States, in that order, that China is capable of defending itself and overcoming major technical obstacles to do so.
    - Obtain important operational understanding of BMD systems for their own use and to better understand the systems that others may have or may develop.
    - Enhance its regional prestige and sway, gaining a "technological merit badge" of recognition for achieving such a difficult technological task

- Should China decide to deploy strategic BMD, limited deployment levels appear to be more likely than larger levels, given the relatively high cost for a large system; furthermore, even were it to ultimately deploy larger levels, China would want to gain more experience in what (for them) would be a new class of weapons.

- The incremental cost to China of a limited deployment of strategic BMD as part of its overall R&D program would probably be modest compared to the security benefits China would receive, even taking some political drawbacks into account. Accordingly, the odds are fairly good that China will make at least a limited deployment of strategic BMD in the near- to mid-term, though this is not certain.

- To the extent that any U.S. programmatic changes would be needed for political reassurance reasons, there are a number of options available to the United States, particularly in strategic BMD penetration aids and enhancements to the bomber leg of the triad, which should suffice. The United States would likely have no technical reason to make any significant adjustments to its strategic posture in response to plausible levels of Chinese strategic BMD deployments, should they take place. The U.S. strategic nuclear posture and forces are robust and are able to deal with such deployments.

- A Chinese move to deploy early warning satellites would be a significant indicator of greater interest in strategic BMD deployment, as it would be a crucial component of an effective strategic BMD system. Such satellites would not be necessary for a purely ASAT-testing-oriented deployment.

Introduction

China has received growing attention over the last ten years for its activity in modernizing and expanding its strategic offensive nuclear forces, both land- and sea-based developments and deployments.[1] At the same time, little attention has been paid to Chinese activities in developing ballistic missile defenses (BMD). Since the conclusion of the Cold War, if not earlier, U.S. security policy has seemed to tacitly assume that only the United States would possess credible strategic ballistic missile defense capabilities with non-nuclear interceptors. Russia's nuclear-tipped interceptors' BMD defenses against U.S. strategic ballistic missiles atrophied as the Soviet Union fell apart and were not accorded much strategic significance. This tacit assumption of a U.S. strategic BMD monopoly underlying U.S. policy has been effective for the last quarter century in the aftermath of the Cold War. However, it may not remain valid for much longer. Chinese development, testing, and possible deployment of strategic BMD may upset U.S. thinking about missile defense and stimulate new policies and approaches in this area.

For a number of years, China has been exploring and developing BMD capabilities to defend against a spectrum of ballistic missile challenges, from short-range missiles to ballistic missiles with intercontinental ranges. [China's earliest exploration of missile defense occurred more than 50 years ago, as discussed later in this report.] According to the U.S. Department of Defense (DOD), "China has made efforts … to gain a BMD capability in order to provide further protection of China's mainland and strategic assets." Of particular interest for this study, DOD continues to employ language similar to that which it has used for several years to describe China's strategic BMD efforts: "China is proceeding with the research and development of a missile defense umbrella consisting of a kinetic energy intercept at exo-atmospheric altitudes (greater than 80 km), as well as intercepts of ballistic missiles and other aerospace vehicles within the upper atmosphere. In January 2010 and again in January 2013, China successfully intercepted a ballistic missile at mid-course, using a ground-based missile."[2] Although the Chinese military does not normally say much about its BMD programs, China did publicly announce that it conducted ground-based mid-course BMD tests in 2010, 2013, and 2014 (although the United States believes the 2014 test was actually a test of an anti-satellite system rather than a BMD test).[3] This BMD-ASAT connection will be discussed in more depth later in this report. Chinese state media describes

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[1] Steps China has taken include deployments of the road-mobile DF-31A intercontinental ballistic missile (ICBM), development and likely future deployment of the longer-range DF-41 ICBM, Jin-class missile-firing submarines (SSBNs) and associated JL-2 submarine-launched ballistic missiles (SLBMs), deployment of multiple independently-targetable re-entry vehicles (MIRVs) on its older DF-5 ICBM and possible deployment on the DF-41, and other associated developments. Notably, the deployment of the DF-31A first took place in 2006, and the most recent Defense Department's report notes that China has begun MIRVing the older DF-5 ICBM and possibly the much newer D-41. See: Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China*, U.S. Department of Defense, April 7, 2015.

[2] Ibid., p. 34.

[3] Frank A. Rose, Deputy Assistant Secretary of State, Bureau of Arms Control, Verification, and Compliance, "Ensuring the Long-Term Sustainability and Security of the Space Environment," Speech at the U.S. Strategic Command Deterrence Symposium, Omaha, Nebraska, August 13, 2014, available at http://www.state.gov/t/avc/rls/2014/230611.htm

all these tests as BMD tests that are defensive in nature and are not targeted at any country.[4]

One noteworthy feature of these Chinese statements about their BMD intercept tests is the fact that they were made public at all. China is typically quite secretive about its weapons tests, especially its strategic weapons tests. For example, the world was recently informed that China has begun putting multiple warheads on its DF-5 silo-based ICBMs (though this information came from the U.S. Defense Department annual report on Chinese Military Power, not from China itself). Regardless, this still makes the Chinese announcements about these BMD intercept tests quite noteworthy. The authors were told by knowledgeable Chinese that the habit of not releasing such information has been so ingrained over decades in internal Chinese policy that it just is not done under normal circumstances (though this may eventually change). A major reason why BMD is such a striking exception is likely due to the extraordinarily bad press and worldwide condemnation China experienced in conjunction with its 2007 ASAT test, which was not explained by China until well after the United States revealed information about the test shortly after it happened. The Chinese statements also allow China to characterize their tests as they would like, for example, describing an ASAT test as a BMD test, which is far less controversial. This issue is discussed later in the report.

At the very least, this suggests that China has an ongoing interest in strategic ballistic missile defense, if only to understand the technology to a much greater extent. Given China's substantially increasing aerospace and defense capabilities, its growing assertiveness on the world stage, and its understandable desire to be respected for its broadening economic and military capabilities, the authors believe that it is important to identify and assess:

1. Possible incentives and disincentives China faces in considering development and deployment (D&D) of strategic BMD capabilities;

2. Plausible D&D scenarios and missions;

3. The security implications of these scenarios for the United States and its allies; and

4. Options for the United States going forward.

This study is mostly agnostic regarding the question of D&D of Chinese strategic BMD. However, it would be unwise to dismiss the possibility and remain unprepared for what could be a significant new development in a dimension of the strategic environment that, for the past 25 years, the United States has heretofore had largely to itself. The series of strategic BMD tests that China has conducted in the past five years alone should compel the United States and its allies to be alert to this important possibility and encourage closer examination of China's possible motivations and objectives.

Study Methodology. There have been three broad interacting components to this study: First was to posit possible incentives and disincentives for China to develop and deploy strategic ballistic missile defense; Second was to meet with Chinese and U.S. experts to

[4] Assistant Secretary of State Frank A. Rose, speaking at an FAS-hosted workshop, Washington, D.C., February 20, 2015; see Appendix A-1 for full text of his speech.

discuss these issues and seek their thoughts on China and strategic BMD; And finally, the authors and colleagues assessed the implications for U.S. security interests for each of the scenarios examined. In pursuit of these objectives, meetings and discussions were conducted with numerous experts from defense agencies, militaries, think tanks, embassies, and universities in Beijing and Shanghai in China; Washington, DC; Cambridge, Massachusetts; and Hanover, New Hampshire. The New England meetings were concentrated at Dartmouth College, the Massachusetts Institute of Technology, and Harvard University; a separate day-long workshop was held at FAS headquarters in Washington, DC. In total, we spoke with more than 50 experts over the course of this study, all of whom provided valuable insights (for which we are most grateful).

Previous Chinese Research and Development on Strategic BMD

While the academic literature is overflowing with 20+ years' worth of Chinese experts' concerns over U.S. BMD development and deployment, there is scant information available about China's research and development on its own BMD systems (prior to the Chinese BMD test in January 2010). China's serious exploration of BMD dates back at least to 1964. Iain Johnston, a leading non-Chinese scholar of China, notes that soon after China's first nuclear test explosion in 1964, Chairman Mao Zedong ordered "the start of a long-term BMD research program. According to one of the engineers involved in this program, China spent around $100 million on the program through to around 1977."[5] This program was code-named the "640 Program" due to its having commenced in 1964 as the first major defense R&D program of that year. Mark Stokes, an American analyst who closely monitors Chinese military developments, noted that "under the 640 Program, the space and missile industry's Second Academy, traditionally responsible for SAM [surface-to-air missile] development, set out to field a viable antimissile system, consisting of a kinetic kill vehicle, high-powered laser, space early warning, and target discrimination system components."[6] Despite this ambitious agenda for the 640 Program, it fell well short of having a feasible BMD system. In particular, according to Evan Medeiros, a leading U.S. expert on China, nonproliferation, and arms control, there was "a team of 8-10 scientists … [who] conducted multiple feasibility studies on development of missile defense systems. This work roughly paralleled extensive U.S. and Soviet R&D efforts on missile defense prior to the 1972 Anti-Ballistic Missile (ABM) Treaty. Yet China's program achieved few successes due to the high technological barriers and China's relative backwardness. Deng Xiaoping cancelled the program in 1983."[7] Deng also shifted China's grand strategy from recurring revolutionary upheaval (as practiced by Chairman Mao) to emphasizing economic development (while still modernizing China's military).[8] Of the "Four Modernizations" enacted under Deng, military modernization was clearly #4 in priority, behind agriculture, industry, and science and technology. With China already spending 7-10 percent of its GDP on the military, the defense modernization called for in implementing the Ten Year Plan would have cost an additional $300 billion, an excessive amount that was thus dropped.[9] An expensive missile defense program at that time would have detracted from Deng's admonition that "to get rich is glorious" for China.

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[5] A. I. Johnston, "Some Thoughts on Chinese Nuclear Deterrence," discussion paper prepared for a workshop on Chinese military doctrine at the CNA Corporation, February 2, 2000, as quoted in Brad Roberts, "China and Ballistic Missile Defense: 1955 to 2002 and Beyond," IDA Paper P-3826, Institute for Defense Analyses, September 2003, p. 7.

[6] Mark Stokes, *China's Strategic Modernization: Implications for the United States* (Carlisle Barracks, Pa.: Strategic Studies Institute of the U.S. Army War College, 1999), p. 118.

[7] Evan Medeiros, "Integrating a Rising Power Into Global Nonproliferation Regimes: US-China Negotiations and Interactions on Nonproliferation, 1980-2001," unpublished dissertation manuscript, p. 245. Medeiros notes, "there is no published data on China's ABM efforts in the 1970s. This information is based on several conversations with Wu Zhan, a missile engineer who participated in the program," footnote 4 of the reference, as quoted in Roberts (2003).

[8] Orville Schell and John Delury, *Wealth and Power: China's Long March to the Twenty-first Century* (New York: Random House, 2014), chapter 11.

[9] John W. Lewis, Hua Di, and Xue Litai, "Beijing's Defense Establishment: Solving the Arms-Export Enigma," *International Security*, Vol. 15, No. 4 (Spring 1991), pp. 87-109.

But soon after Deng stopped the 640 Program, China's leadership still had to understand the implications of the Reagan administration's launch in 1983 of the *Strategic Defense Initiative (SDI)*. Due to Deng's and other Chinese leaders' efforts to open up China to the outside world, the number of research institutes and experts in China specializing in security studies was growing dramatically. The SDI program stimulated considerable debate within this Chinese research community. In particular, Premier Zhao Ziyang directed this community to study the implications of SDI.[10] The views ranged from some experts (especially those in the Chinese military) who believed that SDI could be stabilizing as a "deterrent of deterrents" to others who were concerned that it was a harbinger of the United States seeking to become militarily dominant.[11] Many Chinese security analysts expressly worried about the potential effect on China's relatively small number of nuclear-armed ICBMs and specifically on the possibility that SDI could give the United States the capability to launch a disarming first strike.

As this internal Chinese domestic debate developed, the Chinese government "began to draw a distinction between the deployment of such systems, to which it remained opposed, and research, to which it was no longer averse."[12] Moreover, Chinese officials wanted to avoid falling behind the Americans and Soviets and thought that there could be valuable spinoff technologies to the Chinese economy from an R&D program on BMD.[13] By 1986, Chinese officials were acknowledging that China "along with many others, is carrying out a great deal of research into defense against nuclear weapons."[14] A Chinese scholar assessed, "with growing interest, especially in the mid-1980s, the Chinese have already begun conceiving the development and even the eventual deployment of their own space-based deterrent, or star wars system. The Chinese defense specialists, unlike their Western counterparts, have consistently expressed a positive attitude toward the feasibility and desirability of acquiring such a system."[15]

The R&D program, initiated by COSTIND, the PLA commission managing China's defense industries, was known by the code name "863 Program" (due to its having started in March 1986) and involved 18 critical technologies with the overall objective of modernizing the PLA.[16] In 1999, Mark Stokes identified that four prominent defense engineers presented a petition in March 1986 to the Central Committee and that:

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[10] Bonnie S. Glaser and Banning N. Garrett, "Chinese Perspectives on the Strategic Defense Initiative," *Problems of Communism*, Vol. 35 (March-April 1986), p. 30.
[11] See references and analysis in Roberts (2003) pp. 11-12.
[12] *China's Evolving Arms Control Policy*, an anonymously authored summary prepared for the Foreign Broadcast Information Service (FBIS), FB87-10018, September 30, 1987, p. 10, as cited in Roberts (2003).
[13] Bonnie S. Glaser and Banning N. Garrett, "SDI and China's National Interest," paper presented to a conference on SDI: Implications for the Asian Community, Seoul, Korea, July 29-31, 1986, as referenced in Roberts (2003).
[14] Alastair I. Johnston, "China and Arms Control: Emerging Issues and Interests in the 1980s," Aurora Paper (Ottawa: Canadian Centre for Arms Control and Disarmament, 1986), p. 75.
[15] Chong-Pin Lin, *China's Nuclear Weapons Strategy: Tradition Within Evolution* (Lanham, MD: Lexington Books, 1988), pp. 40-41.
[16] Mark Stokes, "China's Ballistic Missiles and East Asian Reaction to U.S. Missile Defense Initiatives," pp. 128-129, in Andrew Scobell and Larry M. Wortzel, editors, *China's Growing Military*

> All of the engineers pushing the new initiative were involved in strategic programs—Wang Daheng, a preeminent optics expert who played a role in China's space tracking network; Wang Ganchang, one of the founding fathers of China's nuclear program; Yang Jiachi, a satellite attitude control expert; and Chen Fangyun, an electronics engineer and leader of the program to develop China's space tracking network. The plan, referred to as the 863 Program, was implemented in parallel to COSTIND's Long Range Plan to Year 2000 and was jointly managed by COSTIND and the SSTC [State Science and Technology Commission]. The 863 Program, still a guide and funding source for numerous preliminary R&D projects, focuses on some of the same technologies included in the SDI and Europe's answer to SDI, the Eureka Program, including space systems, high powered lasers, microelectronics, and automated control systems.[17]

In 1991, China's potential interest in BMD deployment waned; in January of that year, President George H. W. Bush decided to substantially downsize SDI to a much more modest program, *Global Protection Against Limited Strikes (GPALS)*, and then, that December, the Soviet Union ceased to exist. Consequently, the threat of massive thermonuclear war reduced substantially and the potential risk to China's nuclear deterrent from U.S. missile defense looked less threatening. But also in 1991, Chinese defense planners became concerned about the implications of the U.S. military's precision strike weapons and the theater missile defense system demonstrated during the Gulf War. As a result of this demonstration, Taiwanese leaders and military officials became interested in acquiring theater missile defense systems as protection against missiles aimed at Taiwan from mainland China.[18] PRC officials vehemently protested against such an acquisition and ordered a buildup of ballistic missiles that could strike Taiwan. Some Chinese defense analysts also believed that the United States had a strategy of leveraging missile defense in East Asia in order to contain China.

While the United States remained committed to limited-scale strategic BMD development throughout most of the 1990s, the Clinton Administration came under increasing political pressure to move toward deployment and even to expand the scale of the notional BMD system, even though the ABM Treaty was (then) still in effect and thus placed significant constraints on the scale of deployment. The tipping point came in August 1998 when North Korea launched a long-range Taepodong missile with the ostensible purpose of placing a satellite in orbit. Although the launch failed in its ultimate mission of satellite placement, the missile itself appeared to jolt the U.S. intelligence community due to its three stages. Further, this launch had auspicious timing because of the *Rumsfeld Commission to Assess the Ballistic Missile Threat to the United States*, which had issued its report on July 15, 1998, underscoring how missile threats had been underestimated and that the U.S. intelligence community had

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Power: Perspectives on Security, Ballistic Missiles, and Conventional Capabilities (Carlisle, PA: Strategic Studies Institute, September 2002).

[17] Mark A. Stokes (September 1999), pp. 11-12.

[18] Wei-Chin Lee, "Thunder in the Air: Taiwan and Theater Missile Defense," *The Nonproliferation Review*, Fall 2001.

not been adequately tracking these developments.[19] The North Korean missile launch appeared to confirm this assessment.

Soon after this launch, the United States decided to invest more in regional and national missile defense systems. Yet even before this high-profile occurrence, China had already been ramping up its development of missile defense, beginning in the mid-1990s. Its R&D program to defeat U.S. missile defense programs focused on counter-surveillance and counter-intercept technologies. The former included electronic countermeasures, stealthy decoys, and fast burn motors, while the latter involved multiple warheads and maneuvering reentry vehicles. Also in the mid-1990s, the Central Military Commission "approved funding for a 10-year development program for a missile defense system, to include satellites for missile launch warning. The PLA Air Force and the Chinese Aerospace Corporation advocated a 15-year, three-phase approach to missile defense. The first step is to field a 'Patriot-like' system, such as the HQ-9, followed by research and development of an extended range interceptor modeled on the PAC-3 missile, and basic conceptual research on a THAAD [Terminal High Altitude Area Defense]-like mid-course intercept system."[20] It is important to point out that China was focusing in the mid-1990s on *theater missile defense (TMD)*-type systems and that the shift in U.S. priorities after 1998 toward larger scale *national missile defense (NMD)* took Beijing by surprise. In January 1999, then-Secretary of Defense William Cohen announced that the United States would invest more in both TMD and NMD systems and would seek an amendment of the ABM Treaty to enable such an NMD deployment.

[19] Donald H. Rumsfeld, Chairman, *Report of the Commission to Assess the Ballistic Missile Threat to the United States*, Pursuant to Public Law 201, 104th Congress, July 15, 1998.
[20] Stokes, "China's Ballistic Missiles and East Asian Reaction to U.S. Missile Defense Initiatives," p. 129.

Chinese Reactions toward U.S. Strategic BMD

A number of Chinese academics emphasized to us that China has followed a decades-long pattern: (1) Chinese arms control officials and political leaders strongly denounce U.S. deployment of strategic BMD; (2) in parallel, China devotes financial and technical resources toward R&D to understand the nature of the U.S. system; (3) if Beijing's rhetoric does not have the intended effect of convincing the United States to cease deployment, China can accelerate a limited ongoing BMD development program; and (4) if the U.S. deployment appears increasingly threatening to China's nuclear deterrent, Chinese senior leadership can then decide, weighing many factors, whether or not to move forward with deployment of its own BMD system, (which would likely be limited in scale).

Sixteen years ago, the Chinese government launched a vigorous effort to denounce U.S. BMD. In particular, the shift in U.S. missile defense policy in 1999 revved up China's arms control diplomatic corps into high gear. Ambassador Sha Zukang, then Director General of China's newly created Department of Arms Control and Disarmament in the Ministry of Foreign Affairs, seemed to be omnipresent and indefatigable in making China's arguments against strategic BMD. Ambassador Sha deployed four main arguments:[21]

1. Strategic BMD would present a direct threat to China's nuclear deterrent especially when a certain country (that is, the United States) would then have both potent "swords" (nuclear warheads) and "shields" (BMD). Li Bin, a prominent Chinese academic of Tsinghua University, made the argument at that time that "deterrence would be compromised once American policymakers *believed* that NMD could defend the United States against a Chinese nuclear attack, even if it could not actually do so."[22] A 2014 review by two U.S.-based experts of the Chinese defense literature, as well as interviews conducted by these experts in China, underscored that this perceived threat remains the top concern.[23]

2. BMD would undermine international nuclear arms control and strategic stability. In particular, Chinese leaders discredited the U.S. position on NMD deployment and the ABM Treaty, arguing that the treaty was a pillar of international stability. In July 2000, Chinese President Jiang Zemin and Russian President Vladimir Putin issued a joint statement in support of not modifying the ABM Treaty.

3. In a related argument, BMD would halt nuclear disarmament, stimulate further missile proliferation, and spur an arms race in outer space. Chinese officials and analysts explained that a significant BMD deployment by the United States would logically lead to a Russian interest in at least maintaining its large number of ballistic missiles and even result in a further buildup. Other states would also have incentive

[21] See Roberts (2003) for a more detailed exposition, pp. 23-26.
[22] Quoted in Zhu Mingquan, "U.S. Plans on National Missile Defense (NMD) and Theater Missile Defense (TMD): A Chinese Perspective," *The Monitor*, Center for International Trade and Security, Winter-Spring 1999.
[23] Fiona Cunningham and M. Taylor Fravel, "Capabilities and Crises: The Future of U.S.-China Strategic Stability," Paper prepared for Nuclear Studies Research Initiative Conference, Airlie Center, Virginia, April 30—May 3, 2015.

to follow suit according to the Chinese assessment. As an exemplar of the view that too much strategic BMD can be destabilizing, a leading Chinese arms control scholar, Sun Xiangli, wrote in 2010: "Historically, limitations on the development of strategic missile defense systems were a cornerstone of nuclear arms control. The development of strategic missile defense not only easily facilitates nuclear arms racing; it poisons relations between the nuclear nations, destroys strategic stability, and makes deep nuclear reductions difficult to realize."[24]

4. Finally, BMD would contribute to the United States becoming the dominant political and military power. Chinese experts worried that the United States was seeking "absolute security" and would weaken or eviscerate other states' security. Ambassador Sha went so far as to argue that BMD would feed the U.S. tendency toward unilateralism and its pursuit of a preemptive strategy. A related concern was that U.S. missile defense cooperation with Japan and Taiwan would embolden them. Beijing explicitly worried about U.S. missile defense technology transfer to Japan that could then be applied to Japanese manufacture of offensive missiles.

Presently, China's main concerns about U.S. BMD are not so much over what U.S. capabilities are today as they are about what they could be in the future, as well as the possible strategic spill-over effects of U.S. TMD capabilities deployed in East Asia. The U.S. system known as THAAD is of particular concern, primarily concerning its X-band radar, which China sees as having the potential for cuing U.S.-based strategic BMD, allowing the 44 *Ground-Based Midcourse Defense (GMD)* interceptors to be more effective in defeating a Chinese retaliatory strike. The authors have heard these concerns repeatedly expressed by their Chinese interlocutors in both the United States and China. China appears to understand the U.S. rationale for a defense against North Korea, but is worried that the United States may increase the number of interceptors deployed and/or the capabilities of its interceptors. In dialogue with Chinese experts, they point out that China is only modestly increasing its numbers of warheads, and that they must not only have retaliatory forces to address the United States, but made reference to strategic needs vis-à-vis Russia as well. Strategic stability is a major Chinese concern, and China is worried that U.S. strategic BMD will upset strategic stability if it increases beyond current levels.

In addition to vigorous diplomatic demarches in multiple arenas, China has responded to U.S. missile defense developments by investing more in countermeasures, such as field testing the road-mobile DF-31A ICBM, modernizing its nuclear command and control system, and increasing the proportion of its nuclear force dedicated to targeting the United States.[25] Notably, in August 1999, the Central Committee approved the "998 Project" that renewed China's R&D for technologies that could support an eventual deployment of Chinese BMD. It is important to emphasize that this project involved many weapons technologies, not just BMD, that could give China asymmetric countermeasures, especially in

[24] Sun Xiangli, "Zhongguo junking de xin tiaozhan yu xin yi-cheng (New Challenges and New Agendas for Chinese Arms Control)," Beijing: *Foreign Affairs Review*, Vol. 3, as translated by Gregory Kulacki.
[25] Roberts (2003) and references therein, p. 30.

response to the U.S. revolution in military affairs. The project has also been known as the "Assassin's Mace Program."[26]

Several Chinese scholars who are affiliated with prominent academic institutions have assessed how China could respond to the challenges of U.S. strategic BMD.[27] These analysts have largely agreed with each other as to what China could do. The options include using countermeasures, such as decoys and chaff; deploying more ICBMs; placing MIRVs on these ICBMs; deploying more mobile ICBMs; and building more SSBNs and making sure that enough are deployed at sea. On the other hand, they are mindful (as a group) of China's "No First Use Policy" and the international perception of China. That is, they would not want China and the United States to engage in a heated arms race. However, they agree that China must have an assured nuclear deterrent retaliatory force. Notably, these scholars tend to prefer that China choose relatively low cost countermeasures as much as possible. Hui Zhang, physicist and arms control analyst, has described in detail the potential passive countermeasures against U.S. missile defense:

> Boost phase countermeasures:
>
> - Reducing the boost time using fast-burn booster
> - Lofting or depressing the ICBM trajectories
> - Spoofing the defender's tracking sensors
> - Simultaneously launching several ICBMs (or with some theater or tactical ballistic missiles) from a compact area
> - Protecting the missile body with reflective or ablative coatings
> - Rotating the missile
>
> Midcourse phase countermeasures:
>
> - Using reentry vehicle (RV)-simulating decoys and chaff to hide the RV from BMD radars
> - Using anti-simulation techniques to make the RV radar image look like one among many balloons
> - Reducing the radar signature of the warhead
> - Reducing the infrared signature of the warhead
>
> Terminal phase countermeasures:
>
> - Making the high-velocity warhead maneuverable[28]

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[26] See: Ashley J. Tellis, "China's Military Space Strategy," *Survival*, Vol. 49, No. 3, Autumn 2007, pp. 50-51, and references therein.

[27] For example, see the published writings of Shen Dingli, Li Bin, Wu Riqiang, and Hui Zhang.

[28] Hui Zhang, "Chinese Perceptions on Space Weapons," Chapter 2 in Pavel Podvig and Hui Zhang, *Russian and Chinese Responses to U.S. Military Plans in Space* (Cambridge, MA: American Academy of Arts & Sciences, 2008), p. 56.

Note that in his analysis, Zhang deemphasized China building up its missile forces. Prior to the January 2010 Chinese BMD test, Chinese academics tended to not publish articles about China's potential development and deployment of BMD. As noted earlier in this report, non-Chinese scholars (particularly a select few American experts) were examining this issue, but they were largely skeptical of China's capability to field a strategic BMD system. For example, Paul H.B. Godwin assessed in 2003:

> As with many advanced technology military programs, initial research programs are relatively inexpensive, especially when compared to developing and testing prototypes. Consequently, although China's interest in an extensive range of technologies is evident, even if only for point defense of missile bases and command [and] control (C2) facilities, whether and when these research programs can be translated into operational systems are questionable. If U.S. missile defense programs are any measure, it will be many years before China can deploy effective missile defenses—and then, only after considerable investment.[29]

Based on a literature review of Chinese writings and interviews conducted in 2013 and early 2014 with Chinese experts, Gregory Kulacki, the China Project Manager with the Union of Concerned Scientists, assessed that "Chinese experimentation with missile defense technology is leading to a greater awareness of its limitations. This awareness, especially because it is a product of China's own research, development, and testing, is reducing Chinese anxieties about the threat missile defense might present to Chinese missile forces, both nuclear and conventional."[30] Kulacki concluded that China would continue research and development but not necessarily move to deployment.

There is widespread acceptance of the idea that China is seeking to better understand strategic BMD technology, even to the point of conducting strategic BMD developmental flight tests thus to better understand BMD technical issues confronting the United States. Among other benefits, this would help China design penetration aids and other countermeasures to overcome U.S. ballistic missile defenses. However, there is an unresolved issue of whether China's need for better understanding of strategic BMD issues would extend to operational issues as well, from the technical to the mundane, which could be much better understood from actual deployment using actual military personnel, not developmental scientists. The authors' research did not uncover any insights on this point.

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[29] Paul H.B. Godwin, "Potential Chinese Responses to U.S. Ballistic Missile Defense," in Alan D. Romberg and Michael McDevitt, editors, *China and Missile Defense: Managing U.S.-PRC Strategic Relations* (Washington, DC: Henry L. Stimson Center, 2003), p. 69.

[30] Gregory Kulacki, "Chinese Concerns About U.S. Missile Defense," Report for the Union of Concerned Scientists, July 2014.

Stability Dimensions of Strategic Ballistic Missile Defense

In discussions with Chinese experts and government officials about strategic BMD, it does not take long for them to raise the subject of strategic stability. While they are well aware of the daunting technical challenges in developing and deploying an effective strategic BMD system, Chinese defense analysts also have great respect for U.S. technological prowess and past technical achievements. Despite repeated reassurances from the United States about its lack of interest in defending against a Chinese retaliatory strategic strike (China's chief worry), China continues to be worried that the United States may achieve a strategic BMD technological breakthrough. At a minimum, China is concerned that the United States could improve its BMD capabilities, both quantitatively and qualitatively, to what would be sufficient to force China to undertake costly improvements to its strategic offensive capabilities (beyond those improvements it is already developing and deploying). The potential for an even more costly and unstable action-reaction cycle between U.S. defense and Chinese offense appears to underscore these Chinese concerns.

China is apprehensive that the United States could attack and destroy much of its ICBM force and then rely on its missile defenses to defend against the ragged, much-diminished Chinese retaliatory response. In the last ten years, it appears that China has moved to address this core strategic problem, primarily by relying on an increase of ICBM warheads and deploying these added warheads on road-mobile DF-31A ICBMs to reduce their vulnerability, and, more recently, by MIRVing its silo-based Titan II-class (that is, earlier generation liquid-fuelled) DF-5 ICBMs. China has also begun strengthening its sea-based nuclear force capability, according to the Department of Defense.

While China's concerns about U.S. strategic BMD and potential strategic instability are often dismissed by the United States at both official and unofficial levels, these concerns are understandable (although exaggerated, at least to some extent). Given that China's offensive nuclear forces are much smaller than those of Russia, any significant increase in U.S. strategic BMD could potentially have far greater impact on the credibility of the Chinese nuclear deterrent than it would have on Russia's much larger deterrent force, and therefore likely result in worst-case contingency planning (as the United States does). It is also important to recall that China does not have decades of experience in developing and testing strategic BMD countermeasures for its missile forces, unlike the United States and Russia (though it likely is working on such capabilities).

China has taken a more forthright stance in the past 15 years against U.S. strategic BMD in the wake of the U.S. decision to deploy limited strategic missile defenses, despite Chinese conducting its own albeit lower-level research. This has also been the period when China has begun to expand its strategic offensive forces with the recent deployment of the DF-31A road-mobile ICBM, its Jin-class submarine launched ballistic missile and submarine, and DF-41 ICBM development work. The timing of this deployment may simply be coincidental, or it may be related to U.S. missile defense activity. As the Perry-Schlesinger Congressional Strategic Posture Review Commission's 2009 report, in addressing China and strategic BMD, noted:

> U.S. assessments indicate that a significant operational impact on the Chinese deterrent would require a larger and more capable defense than the United States has plans to construct, but China may already be increasing the size of its ICBM force in response to its assessment of the U.S. missile defense program.[31]

To gain a better appreciation for the dynamics of the U.S.-Chinese offense-defense interaction and how this may influence Chinese decision-making on strategic BMD and strategic modernization, it is important to recognize that U.S. confidence in, or Chinese anxiety about, strategic ballistic missile defense is not a zero-sum game, where decreased U.S. confidence in its strategic BMD leads directly to increased Chinese confidence in its ability to overcome those defenses. To the extent that U.S. confidence in its strategic BMD falls short of perfection, China's (or another adversary's) confidence in its ability to penetrate U.S. missile defenses *does not increase by a corresponding amount, or anywhere near it.* This is because *perceptions* of possible BMD performance are, at least, as (if not more) important to deterrence than real capability, at least from a crisis planning perspective. And perceptions are strongly influenced by risk aversion.

At the strategic nuclear level, risk aversion plays an essential role both in force-planning and crisis decision-making and, thus, also in deterrence. When considering nuclear weapons use, countries are typically strongly risk-averse. They often do not base their decisions on likely circumstances, but on unlikely (but usually still plausible) conditions. Given the longstanding U.S. reputation for technological accomplishment, it would be unwise for other countries to assume that U.S. missile defenses would not be effective. The United States demonstrated this same risk-averse approach when the Soviet Union deployed its missile defenses around Moscow in the late 1960s and seemed to be considering building more extensive missile defenses elsewhere in western Russia (these later turned out to be air defenses). Facing such a potential threat to its ability to retaliate against the Soviet Union, the United States invested in a variety of steps (MIRVing and penetration aid development, continued strategic modernization, etc.) to ensure the viability of its nuclear deterrent even against this "worst-case" threat.

A limited Chinese strategic BMD deployment could incrementally reassure China from a stability perspective because it could complicate any U.S. attempt to execute a counterforce attack against Chinese strategic nuclear forces. This effect would likely be minor, however, because of the much larger number of warheads the United States could allocate to attacking Chinese nuclear forces.

For a country like China, risk aversion could well manifest itself as needing to ensure that it could effectively retaliate against a U.S. first strike, including taking U.S. strategic BMD into account. While current U.S. strategic BMD could not blunt a Chinese first strike, China could see this American BMD, in a risk-averse sort of way, as being potentially able to blunt a diminished Chinese retaliatory response to a U.S. first strike, especially if U.S. defenses were more capable than those deployed today. At the force-planning level, risk aversion

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[31] *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States*, William J. Perry, Chairman, and James R. Schlesinger, Vice Chairman (Washington, DC: United States Institute of Peace, 2009), p. 32.

exhibits potential destabilizing characteristics, and this appears to be what concerns China most about U.S. strategic BMD. The more confidence that a country like China has that this modest U.S. strategic BMD deployment will not increase, the less instability is introduced into the relationship.

At the same time, there can be stabilizing dimensions to this instability in the case of North Korea. In spring 2013, North Korea engaged in unusually bellicose rhetoric against the United States, threatening nuclear attacks and other provocative actions, such as closing down the Kaesong industrial zone where South and North Korea cooperate in economic activity. As before, China claimed it could do little to persuade North Korea to discontinue its provocative behavior. In response to North Korea's harsh rhetorical attacks and to reassure regional U.S. allies (as well as the American public), the United States flew B-2 and B-52 aircraft (which are capable of delivering nuclear weapons) over South Korea, sending a strong message not just to North Korea, but China as well. A number of days later, the United States also announced that it would deploy an additional 14 ground-based BMD interceptors in Alaska, a proportionate response to North Korea's incendiary rhetoric that strengthened U.S. capabilities to defend against a North Korean attack against the United States.

Almost immediately after this announcement of additional U.S. strategic BMD interceptor deployments, China reduced North Korea's access to hard currency banking in China, imposing an important new crimp on the North Korean economy. In just a few days, Pyongyang's oratory returned to its normal level of vitriol, North Korea announced that it would reopen the Kaesong economic area to normal activity and invited back the South Korean workers it had just ordered expelled; North Korean border forces were stood down from their higher alert status; and North Korea suddenly expressed renewed interest in returning to the Six Party talks with fewer preconditions. China's economic pressure on North Korea appeared to have led to a major turnaround in North Korean behavior. But why did China suddenly apply major pressure to North Korea when it had previously not done so?

We believe that with the announced U.S. plans to deploy 14 more interceptors, China suddenly saw North Korean behavior as a direct threat to a core Chinese interest: the viability of its modestly-sized strategic nuclear deterrent. It is possible that this was all just coincidence, but we do not believe so. More likely, this move, made possible by the thin U.S. BMD deployment, allowed the United States to signal China in a direct, rational, proportionate way, that China would pay a strategic price if it did not rein in its threatening neighbor. There are diminishing marginal returns for additional such deployments, however, and China could choose to respond with an offsetting increase in its strategic forces. The United States could also choose to not deploy those additional 14 interceptors, a return to the *status quo ante*, though always with the option of threatening to deploy them in the future if circumstances warranted. So, from an arms race stability standpoint, limited strategic BMD deployments have a mixture of stabilizing and destabilizing elements in a multi-polar nuclear world. If Chinese statements accurately reflect Chinese policy, the more strategic BMD capability that the United States deploys beyond current levels, the more likely that China will take counterbalancing actions to preserve the credibility of its nuclear deterrent.

In contrast, however, risk aversion appears to play mostly a stabilizing role in crisis management with a smaller nuclear power where strategic BMD is concerned. Facing a threat from a small nuclear power, and aware of its strategic BMD limitations, the United States cannot count on its missile defenses working reasonably well. On the other hand, facing U.S. missile defenses, a small nuclear power cannot count on U.S. BMD *not* working reasonably well. Each side is deterred by the combined effects of confidence/outcome uncertainty and risk aversion, an important island of stability in a chaotic crisis. This situation is portrayed conceptually in Charts 1 and 2 below, where risk aversion acts as a stabilizing presence in the simplified two-country game. Chart 1 illustrates no risk aversion, while Chart 2 does. The shaded "island" depicted in the figure is the product of the risk aversion of each country in this game-theoretic construct and is labeled as a "risk-aversive effect." Both sides in the crisis have the same perceptions in this theoretical case. However, given the stakes involved, adversaries in the crisis will likely have uncertainty and be aversive to risk. The greater the stakes, the greater the risk aversion. Is this stabilizing risk-aversive effect robust? No. Is it resilient over time? Probably not. Will it work vis-à-vis China? Not likely, though China should not ignore this important additional dimension of the BMD issue. But this risk-aversive stability effect does not appear to be trivial; it is better than nothing; and it should not be ignored, particularly where North Korea is concerned.

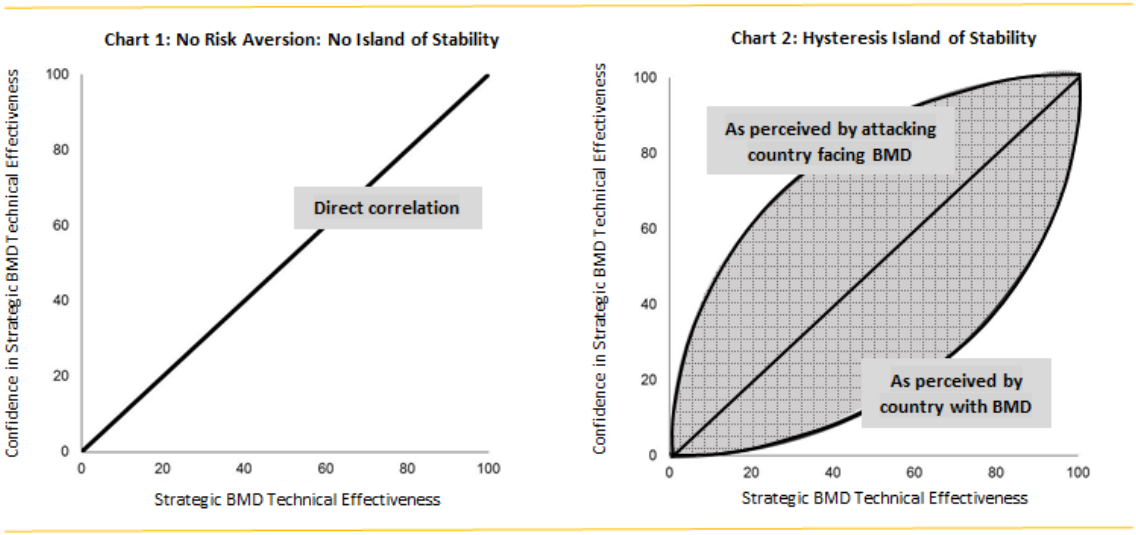

Figure 1. *Mutual Risk Aversion Strategic BMD Hysteresis.* Where there is no risk aversion or uncertainty, there is no island or zone of stability (Chart 1).

It is possible to discern a few deterrent characteristics of thin strategic BMD; there are elements of both fragility and robustness, namely that it is:

- Not affected by small changes in either offense or defense;
- Affected by large offense increases, where modest defenses are simply overwhelmed;
- Potentially affected by important BMD technology changes;
- More robust against North Korean offensive technological changes than those by Iran, as Iran can bring far more resources to bear to defeat strategic BMD than can North Korea; and

- Subject to being eroded by perceptions of regime survival ("what have I got to lose?").

This purely qualitative analysis suggests that from an "arms race stability" perspective, there are noteworthy, however not decisive, destabilizing aspects to strategic BMD, even modest deployments or even just an active engineering development program. However, from a crisis management perspective, there are important stabilizing dimensions to a thin strategic BMD posture, where risk aversion on both sides in a confrontation appears to augment the important deterrent effects of nuclear weapons themselves. This risk aversive effect leads each side to hedge against the possibility that the other country's systems are more effective than expected, while its own systems are less effective than expected, suggesting that actions to upset the status quo could leave the country significantly worse off versus taking no action at all.

Observations on the strategic implications of thin U.S. strategic BMD are:

- BMD performance and capabilities are very important, but they are not the only metric by which BMD should be assessed;
- From a crisis stability perspective, limited BMD deployments appear to be stabilizing as long as they remain limited;
- From an arms race stability perspective, there are elements of both stability and instability present;
- Geopolitically, it provides a useful tool for messaging and affecting adversary perceptions, at least at limited deployment levels;
- Having no strategic BMD would deny the United States certain strategic and geopolitical benefits that have already advanced U.S. security interests;
- In the absence of agreed limitations on strategic BMD deployments, countries are likely to want to hedge against the possibility of larger such adversary BMD deployments to preserve the credibility of their offense nuclear deterrent.
- Going beyond a thin U.S. strategic missile defense posture should only be considered when:

    - A suitable answer can be provided as to how China and Russia can be persuaded to turn their backs on decades of policy and behavior and accept a serious degradation of their strategic deterrent capabilities; or
    - New defensive technologies are developed that fundamentally change the offense-dominant nature of the nuclear domain.[32]

[32] For example, we note the arguments for the possible stabilizing effects of a defense-dominant world in David Goldfischer, *The Best Defense: Policy Alternatives for U.S. Nuclear Security from the 1950s to the 1990s* (Ithaca: Cornell University Press, 1993).

Observations on the strategic implications of a thin Chinese strategic BMD are:

- As long as deployments are small, there should be no significant strategic impact on U.S. nuclear capabilities;
- The prime impact will be on Indian confidence in its ability to deter China with nuclear weapons;
- The demonstration of such a strategic BMD capability would enhance Chinese defense technology prestige in the region; and
- Such testing and operational deployment would strengthen Chinese ASAT capabilities.

Chinese Incentives and Disincentives to Develop and Deploy Strategic Ballistic Missile Defense (BMD)

Unlike some years ago, there is little doubt today that China is developing a strategic BMD capability; their flight tests alone make that clear. It is possible that China does not view this development as a definite precursor to deployment, though that certainly cannot be ruled out. The United States developed several BMD systems that it ultimately did not meaningfully deploy, such as the "Airborne Laser." The United States also developed the *Safeguard ABM* system, which was operationally deployed for less than a year in 1975-76 and then stood down, though the large Perimeter Acquisition Radar near Grand Forks, ND, remains an important part of the U.S. early warning network to this day.

Given the extended duration of China's strategic BMD development program, going back two to three decades, it is safe to say that China is not on any crash course to develop, much less to deploy, a strategic BMD system. Nonetheless, China's program has reached a stage of maturity that gives it a viable option to deploy if it so chooses. The question now is whether, when, and to what purpose would China deploy such a system. This report addresses these questions, as well as the implications of possible deployments for U.S. and allied security interests.

Below, we identify and briefly discuss possible incentives that China would have to develop and deploy a strategic BMD system. This list is not all-inclusive, as there are undoubtedly other factors at work (of which we are unaware). Neither are these incentives mutually exclusive; a Chinese decision to deploy could well be due to a combination of several incentives. Based on discussions with experts and our own judgment, we assign each of these incentives to three categories:

1. Quite important;
2. Important; and
3. Less important.

Quite Important Incentives

a. To better understand strategic BMD technology in general and, in particular, to understand the intricacies and challenges of current and future U.S. BMD systems and their components. This understanding would be useful for China's own planning and intelligence purposes and would provide insight into system vulnerabilities and ways to overcome or defeat U.S. BMD systems. Were China to decide to deploy strategic BMD, this insight would enable them to deploy a more effective system. Almost all experts interviewed, Chinese and American alike, generally agreed with this as an important incentive for China to develop strategic BMD, though some believe that China would not go beyond development and will not deploy a system. It is worth noting that China would gain important operational information and insight if it went on to deploy a BMD system, though most of these operational insights could be gained by just a limited deployment, with less incremental benefit from more sizable deployment levels. This incentive has its roots in China's deep-seated uneasiness over "falling behind" technologically, making it vulnerable to a

more sophisticated adversary, as China has experienced several times over the last two centuries (e.g., European colonial domination and the "century of humiliation," as China often describes it, war with Japan, etc.). Accordingly, as Denise Der and other analysts have pointed out, "there is strong Chinese sentiment that China cannot fall behind technologically…[lest China become] vulnerable to outside security threats. This is evident in the Chinese phrase *luohou jiuyao aida*, or 'the backward will be beaten up,' which permeates Chinese culture as well as defense policy."[33]

b. Strategic BMD testing provides an excellent cover for kinetic energy ASAT testing. When China tested an ASAT (anti-satellite) weapon in January 2007, it was heavily criticized for the debris the test generated, not to mention the test also undercut its campaign against the "weaponization of space." This ASAT test used hit-to-kill technology very similar to the hit-to-kill technology of China's strategic BMD that it is currently testing, for which China has not been criticized. These BMD tests also generally do not generate long-lived orbital debris, unlike a full ASAT test (another advantage). As a result, developing strategic BMD provides an excellent facade that allows China to continue to improve its kinetic ASAT technology while avoiding the diplomatic downsides of ASAT testing. As one senior PLA officer told us, "the [HTK] technology is useful for both missile defense and space applications, *but space is more important.*" Given the strong Chinese belief in the importance of informed warfare and of interrupting and degrading the adversary's ability to transmit key data and instructions to its weapons and leadership, this PLA officer's observation appears both accurate and relevant to the Chinese strategic BMD question.

c. Technological prestige and messaging. Strategic BMD is a very challenging mission, one that very few nations have even partially mastered. Technologically, it is a much more difficult task to achieve than defense against shorter-range missiles, which travel at much slower velocities. Until recently, only the United States and Soviet Union achieved any level of success, and until 1984, even these superpowers relied upon nuclear warheads as the kill mechanism for their interceptors to destroy incoming ICBM re-entry vehicles, a brute force approach if ever there was one. Raising the technological ante still further was the advent of non-nuclear BMD interceptors, a challenge colorfully described as trying to "hit a bullet with a bullet." The United States first achieved this in 1984 with its *Homing Overlay Experiment*. This made a major impression on Chinese defense scientists, who recognized the BMD and ASAT potential of such a technology that did not require detonating nuclear warheads to function.[34] China is rightly proud of its growing technological prowess and seeks appropriate ways to demonstrate it. Validating this capability would represent a "technological merit badge" for China, one that few others can match. Such a capability would be a point of Chinese pride on both domestic and international stages. This capability would also be a subtle form of deterrence, to

[33]Denise E. Der, *Playing Defense: Examining China's Intentions Regarding Ballistic Missile Defense*, (Washington, DC: Georgetown University, Master's Thesis, Spring 2015), p. 14.
[34] Private communication with Chinese scientist, February 2015.

send a message especially to the United States, Japan, and India that "we are strong, we have muscle, we are able,"[35] (phrases we heard multiple times in China).

d. Technological accomplishments elevating China on the international stage. The Chinese Communist Party has not been shy about promoting China as a powerful new country deserving of a major role on the world stage, with medallions of technological leadership serving to buttress this message. China's manned space program is an excellent example of this, and arguably the challenging task of strategic BMD falls into this same category.

e. As a counter to growing Indian ICBM capabilities. India has successfully tested its canister-launched 3-stage Agni-5 ICBM and is expected to begin deploying it in 2016, placing all major Chinese metropolitan areas within range of Indian nuclear weapons for the first time. Its most recent test in January 2015 was from a truck-mounted canister, indicating road mobility (and thus a higher degree of survivability). In addition, India is expected to begin testing an even longer range, larger payload Agni-6 ICBM by 2017, expected to be capable of carrying multiple warheads. As both China and India likely see their offensive nuclear capabilities as intended for deterrence, not nuclear war-fighting, these developments need not be directly provocative. But from a domestic and political perspective, Chinese leaders may feel the need to respond to such developments, as "Chinese nuclear vulnerability to India," symbolized by the new ICBMs, could be a potent political issue (see below).

f. Keeping up with India's BMD developments. A related incentive for China to develop and deploy at least some strategic BMD is that India is seeking to develop and deploy a strategic BMD system itself. According to India's Director General of the Defense Research and Development Organization (DRDO), "Phase II [of the missile defense system] would be completed by 2016 to protect against missiles having range up to 5,000 kilometers."[36] From a purely political perspective, it is difficult to believe that China would acquiesce in India having such a BMD system while China would not. As one Chinese academic told us, "can you imagine India having strategic ballistic missile defense and China not having it?" (This statement was made in a tone of voice of complete incredulity.) India and China are taking some important steps to reduce tensions between them, but there nonetheless remains a strong subtext of competition and wariness between the two countries.

Important Incentives

a. Reinforce Chinese ICBM survivability. China is deeply committed to the deterrent credibility of its nuclear forces, especially to ensure that it can withstand an intended disarming first-strike and still have sufficient retaliatory weapons. Given its lower warhead numbers, China has a smaller margin of error and is quite sensitive to

[35] Private communications with two separate Chinese academic experts, February 2015.
[36] Wang Ting, "Agni V and China/India Ballistic Missile Defense," presentation at Carnegie undated briefing at the Carnegie Endowment for International Peace, available at http://carnegieendowment.org/files/Wang_Ting%20Presentation.pdf, accessed on September 17, 2015.

potential perceived threats to its deterrent capabilities. As one Chinese specialist told us, "do not mistake China's lean nuclear deterrent as meaning it will not do whatever is necessary to maintain the viability of that smaller deterrent."[37] China has great respect for U.S. technological capabilities, and it is possible that it would have concerns that road mobility is not a permanent guarantee of ICBM survivability going forward. As U.S. surveillance, intelligence, sensor, reconnaissance, and (especially) software capabilities advance, along with a burgeoning ability to extract useful information from the "big data" that these capabilities provide, China will likely have continuing and growing concerns about road mobile ICBM survivability going forward. The United States (or Russia, for that matter) would not need to precisely identify a mobile ICBM's location, though that may become possible at some point with appropriate sensors and big-data analytics. It is important to remember that road mobile ICBMs are much "softer" targets than silo-based ones, which means that a Chinese adversary would only need to be able to locate a Chinese road mobile ICBM to within a few miles to have confidence in its ability to attack and destroy it with a nuclear weapon. A Chinese BMD capability tailored to this threat could not guarantee survivability, but at the very least, it could seriously complicate an adversary's planning. China could not count on its BMD working well, but neither could the adversary count on its own BMD not working well. This risk-aversive "hysteresis effect," as we have called it, creates a modest but important island of stability in an otherwise potentially unstable crisis situation. (See Figure 1.) In a high-stakes crisis where the use of nuclear weapons is being contemplated, a modest level of Chinese BMD defense of its ICBMs, both silo-based and road-mobile, could strengthen China's ability to deter. Again, China asserts that it will take the steps needed to maintain the credibility of its nuclear deterrent, and BMD to defend its ICBMs could be a component of that.[38]

b. Inoculate the leadership against domestic charges it was leaving China defenseless against external ballistic missile threats. Xi Jinping is a powerful leader, but he serves as President at the pleasure of the now seven members of the Standing Committee of the Politburo of the Chinese Communist Party. While his position presently appears to be quite secure, it is not too difficult to envision a scenario where his hold on power could become more tenuous: a serious decline in China's economy, growing unemployment, a stock market or banking system collapse, a worsening of the long litany of ills that afflict China, new scandals, and more. Under a political attack from another political faction within China due to poor leadership, President Xi would risk political disaster if his critics successfully argued that even a single nuclear-armed missile heading toward China could not be stopped. A comparable argument in the United States had political impact in the late 1990s, and put considerable pressure on President Clinton and missile defense opponents in Congress. Even a limited Chinese missile defense, which would provide other security benefits as well, would seem like a reasonable and low-cost domestic political insurance policy to take out against such a possible, though not too likely, political challenge. Politically, there is a significant difference between a small

[37] Private communication, February 2015.

[38] One Chinese academic we met with in spring 2015 told us that he is writing an article that will argue for China's deployment of limited BMD to protect ICBMs.

strategic BMD system and none at all, as U.S. domestic politics have demonstrated.

c. Non-nuclear counter to U.S. conventional prompt global strike capabilities. Chinese specialists have voiced increasing concerns over growing U.S. capabilities to use what they see as "conventional weapons with strategic effects," e.g. extremely accurate conventional munitions capable of destroying ICBM silos, a capability heretofore only deliverable by ICBM nuclear warheads. This has put China in a difficult position with respect to its nuclear "No First Use" policy. Such advanced conventional attacks could force China into a strategically difficult corner: either initiate the use of nuclear weapons and risk a greater nuclear war, or only respond conventionally, in which case such advanced U.S. conventional weapons could destroy China's ICBMs, making it more vulnerable to nuclear blackmail. China presumably would want some effective non-nuclear options to avoid this agonizing choice in a crisis. Strategic BMD would provide one such option to Chinese senior leadership, at least for long-range ballistic missile-delivered conventional munitions. Indeed, China is re-examining a number of issues in its strategic policies, especially "No First Use." One well-placed Chinese person in China stated to us that there are now voices within China openly calling for China to drop this policy.[39] Some level of strategic BMD could enable China to maintain its NFU policy while also providing options in dealing with difficult crisis scenarios such as these.

d. Defend essential "point targets." This is a variation on defending Chinese ICBM locations. China may wish to defend smaller, high-value assets against possible attack from, say, India. Particular candidates would be central leadership facilities, e.g., Beijing, essential military facilities, such as nuclear weapons storage sites and the Chinese SSBN base, or key economic areas whose loss could threaten domestic stability, e.g., the Three Gorges Dam, and others.[40] The cost of such defense would be substantial, so the number of such facilities would essentially need to be limited to a few high priority locations, but certainly senior leadership protection could qualify. Both the radars and interceptors for such point defenses would be different than those used for broad area defense, with interception taking place endo-atmospherically rather than exo-atmospherically (consequently, this could be a drawback for this type of defense).

Less Important Incentives

a. Introduce a level of uncertainty in U.S. allies about the U.S. extended nuclear deterrence guarantee, especially as the U.S. strategic arsenal is reduced. Any Chinese deployment of strategic BMD would likely introduce at least a slight note of uncertainty about its impact on the U.S. extended deterrence guarantee to its allies. As discussed below, even if the reality of the United States being fully able to counter

[39] Private communication, February 2015.

[40] In 1993, a Chinese scholar published an article that examined the threat to China's Three Gorges Dam from missile strikes and raised the possibility of missile defense to protect it. See: Wan Yung-Kui, "Can the Chinese Armed Forces Successfully Protect the Three-Gorges Dam?" *Hong Kong Tangai*, No. 31, October 15, 1993, pp. 72-80, FBIS 3769 3057 2710, as referenced in Roberts (2003), p. 21.

the modest effects of such defenses, there could still be a lingering uncertainty about the impact on U.S. deterrent capabilities, especially given uncertainty over what China might choose to do in the future with its strategic BMD, i.e., deploy more capable and more extensive defenses. Thus, it could serve at the margins to weaken U.S. ties with its Asian allies.

b. Chinese strategic BMD would provide China important negotiating leverage in any eventual multilateral strategic arms control negotiations. China is clearly unhappy with U.S. strategic BMD deployments. Any further strategic arms agreements need await an improved environment between Russia and the United States, and even then, the earliest that China might enter into such negotiations would be in a round subsequent to that. Nonetheless, a deployed strategic BMD would give China extra bargaining leverage in any future arms control negotiations, and could even exert some influence nearer term. During the latter stages of the Cold War, the United States, on more than one occasion, developed, and even deployed, weapons that were primarily intended to pressure the Soviet Union to negotiate limitations on those classes of weapons.[41] If U.S. efforts to get New Strategic Arms Reduction Treaty follow-on negotiations resume at some point in the future (and China becomes a party to such talks), at some point, a China that was in the midst of deploying strategic BMD capabilities might now be in a stronger position to leverage such present and prospective deployments, therefore putting pressure on the United States to agree to some further upper-bound-level limitations on strategic BMD. In addition, China has been increasingly interested in promoting the idea of strategic stability talks with the United States, with strategic BMD a key concern of theirs in terms of strategic stability and their own vulnerability (as discussed earlier). Having their own system in place would enhance their leverage in getting such talks initiated, as well as giving them added negotiating heft in such talks. Chinese interest in and testing of hypersonic vehicles also partially falls in this category of incentive.

c. Technology spin-off, especially for theater BMD. Pursuing strategic BMD would provide important ancillary technological benefits in addition to the biggest spin-off (relevant to ASAT). Chinese theater ballistic missile defense, an area of which China is actively pursuing, would be one obvious beneficiary, as well as radar and data processing capabilities, solid rocket motor technology, and others. This spin-off factor would not likely be determinative, but it could well contribute to a decision

[41] In 1978, the year after ASAT arms control negotiations between the United States and the Soviet Union began, President Jimmy Carter directed the Air Force to develop a new ASAT system (involving an interceptor missile with a hit-to-kill warhead launched from an F-15 at high altitude) to give the U.S. leverage in these negotiations; the Soviet Union had already demonstrated a co-orbital ASAT. The talks ended with no agreement after the Soviet invasion of Afghanistan in December 1979. The Reagan Administration continued the U.S. ASAT program and conducted a successful test in September 1985, though it was not deployed based on Congressional action. Carter also gave the go-ahead to the Pershing II and Ground-Launched Cruise Missile programs to pressure the Soviet Union to agree to limitations on intermediate range nuclear forces, particularly the 3-warhead Soviet SS-20 IRBM. Despite great turmoil in Europe when these U.S. weapons were initially deployed, the strategy was eventually successful and led to the signing of the U.S.-Soviet INF Treaty in 1987 that banned all such weapons for both countries.

that was also influenced by other incentives. Certainly the early-warning radars needed for strategic BMD deployment would greatly improve China's early warning and situational awareness capabilities, giving China a number of strategic options, such as launching its ICBMs on warning instead of waiting until nuclear warheads detonated on Chinese soil.

None of these possible explanations should be considered as black-or-white. A more nuanced view of Chinese motivations would probably involve a combination of several individual motives. In addition, depending on the success (or lack thereof) of the R&D program, geopolitical developments, etc., Chinese motivations could change over time. It is entirely possible (and likely), that China's motivations today are different from what initially led Beijing to begin its modern-day program more than 30 years ago. Certainly its test successes, developing interest in ASAT capability, substantial economic progress, and growing need to stay abreast of technology have all shaped its strategic BMD program over the years.

Likely Important Disincentives

a. Cost of deployment and life cycle costs. Developing and deploying effective strategic BMD would be an expensive proposition, though China appears to have already taken on the cost burden of developing such a capability. A number of academics in China made references to the cost of deployment, a few calling strategic BMD "a money burning program," and "a hole with no bottom."[42] The cost of the U.S. program was foremost in these experts' minds, though no one openly stated this as a reason why deployment would never be done by China. The implication was that any deployment would likely be of a limited nature (if done at all). The declining rate of growth of China's GDP in the last couple of years (after years of 10 percent annual growth, China itself projects 2015 GDP growth of 7 percent, and that may be optimistic in light of recent more bearish indicators) makes it more likely that China's defense budget rate of growth will begin to decline as well. As a result, expensive new programs in this circumstance would likely be subject to more scrutiny.

b. Contradict past Chinese position on strategic BMD. For many years, China has been highly critical of U.S. strategic BMD efforts (as pointed out earlier). To actually deploy such a system would represent a major shift in a key Chinese policy position, similar to Chinese behavior on ASAT. Deployment would also be a jarring departure from the peaceful image China seeks to present to the world. Of course, if Chinese leaders decide that such a move would be in their national interest, they would provide justifications for the change, likely stating that U.S. behavior is forcing them against their preferences to take this otherwise unnecessary step.

c. Chinese deployment could trigger U.S./Indian/Japanese/other responses. While Chinese work on developing strategic BMD does not appear to have led to any significant responses from other countries, actual deployment could do so. For alliance management purposes at a minimum, as well as to address possible domestic political reactions, the United States would likely take at least some steps in response,

[42] Private communications, February 2015.

perhaps in the form of additional work on BMD countermeasures. It is useful to note that in its recent weapons developments, Russia has emphasized new ICBMs that have substantially improved abilities to penetrate even advanced BMD systems, a logical way to reassure the domestic audience about Russia's continuing ability to deter its adversaries. In the event of a Chinese deployment of a limited strategic BMD system, Japan may seek U.S. reassurances, which the countermeasures work would help to support. It could well further incentivize greater Japanese defense efforts and even further revisions to the Japanese Constitution to give Japan's Self-Defense Force explicit approval to project military power beyond the very limited supporting role it currently plays, a matter of continuing concern to China. It seems likely that deployment would further drive other Asian countries to seek closer relations with the United States, given their growing fears of Chinese hegemony in Asia. Perhaps the greatest and most direct impact of BMD deployment would be on India As mentioned earlier, India is already pressing ahead with BMD and long-range ballistic missiles. Chinese BMD deployment could further stimulate India to build more missiles with extended strike capability to target all of China, and to deploy multiple-warhead missiles, such as what is projected for the Agni-6 ICBM, to improve India's ability to penetrate Chinese strategic BMD.

Perspectives from Chinese Experts

Chinese experts were relatively open in their views and were largely not dismissive (though some were skeptical) of the idea of China possibly deploying strategic BMD. Generally, they understood that it is important for China to understand BMD technology and to know how to build and deploy such a system, whether or not it would actually do so. No one questioned the value of the strategic BMD development program that is currently underway; there were only cautionary comments about the eventual cost. They all agreed that it was important that China not be technologically surprised, and that China must know how to build such a system, both for its own purposes and to better understand how to penetrate U.S. strategic BMD.

For those more familiar with the program, Chinese academics and specialists emphasized that such a development program signals to India and Japan that "we know how to do this, we know how to protect ourselves, and we have the muscle to do so." In this light, we were told that the message of Chinese BMD efforts is primarily for India and Japan, not the United States, suggesting that there is an important regional and geopolitical message that China is sending with its BMD program.[43]

Chinese experts stated that while current U.S. strategic BMD is not a serious a threat to Chinese security interests, "we want to watch what you do." They would be more concerned if the next generation of U.S. BMD interceptors were substantially more capable than the current generation. There was broad agreement that it would make little sense for China to seek to defend against U.S. nuclear warheads given the potentially several hundred warheads the United States could launch within minutes. The United States has far too many warheads, so it would be futile, as well as costly (again, "money burning program," "hole with no bottom") on China's part.

Overall, the experts appeared positive (more so than what the authors expected) about the possibility of China not only developing, but deploying, some level of strategic BMD. There was little disavowal of Chinese interest in strategic BMD, unlike the forthright statements of disinterest in strategic BMD that characterized most dialogue with China a decade ago. Most did not rule out China's full-scale development of strategic BMD and believed in the rationale for doing so. A good number believed that at least limited deployment was possible. It is important to note that the more authoritative the person, the more the person seemed to be open to the idea. Several academics argue that China persisted to try to dissuade the United States, through diplomacy, not to deploy strategic BMD (or at least to agree to limits on such deployments), but these efforts clearly failed. Accordingly, China's current back-up option is to deploy some of its own strategic BMD and use it, at least in part, to encourage the U.S. to agree to strategic BMD limits. Although uncomfortable with current U.S. strategic BMD deployments, Chinese experts understand the North Korean/ Iranian missile threats' rationale for them. Their major worry is that there is nothing to stop the United States from deploying more, and more capable, missile defense intercept

[43] See: James Clay Moltz, *Asia's Space Race: National Motivations, Regional Rivalries, and International Risks* (New York: Columbia University Press, 2011).

capabilities. This is particularly worrisome given the United States' vast BMD experience and general technological pre-eminence.

Indeed, the most revealing comments came from higher level PLA officials, who acknowledged in early 2015 that "internal discussions about China deploying strategic BMD are taking place, though nothing has been resolved." They noted that any decision taken would be at a very high level and will not be taken lightly. "There is greater interest now in the possibility of deploying strategic BMD … several issues are being balanced," suggesting that the issue is rising in importance at senior levels, likely with President Xi Jinping. One of the issues cited more than once is on the number of sites and interceptors, and likely several of the issues mentioned earlier in the discussion on incentives and disincentives are also in play. As of mid-2015, no decisions had yet been made (at least publicly) by China on whether or not to deploy strategic BMD.

These officials acknowledged that China is conducting research and development on strategic BMD. In the discussion, the role of hit-to-kill technology was called out, citing that it is crucial for both space and BMD purposes. In a noteworthy explanation, as noted earlier, we were told that though key for both applications, "*space has the higher priority*" [emphasis added]. This appears to align with more recent Chinese writings about the importance of space and being able to interrupt an adversary's [read "the United States"] being able to exploit space to conduct operations at great distances. Of course, a central Chinese concern is being able to deter the United States from sending its carrier battle groups to defend Taiwan, and offensive counterspace operations have a very important role to play in this mission.

Strategic Issues Raised by Chinese Strategic BMD

Should China decide to deploy strategic BMD at any level, such a decision would represent a significant new development in the strategic nuclear environment. In combination with China's vigorous strategic nuclear force modernization and expanding numbers of available strategic warheads, it puts China on a path to becoming a more significant player in strategic nuclear competition and would fundamentally alter the offense-defense dynamics of this competition, creating a far more complicated, multi-country issue. In addition, these broader Chinese strategic nuclear actions seem almost certain to impel India into this competition (increasing the complexity to at least four major nuclear-armed states), which may occur anyway for reasons unrelated to strategic BMD.

Impact on India. For all but the smallest BMD deployments, China's strategic BMD would pose the greatest challenge to India and its small yet growing number of ballistic missile warheads, far more of an impact than for the United States and Russia and their several thousand nuclear warheads. At a minimum, Chinese deployment would likely spur India to increase its efforts (that are already underway) to develop its own strategic BMD, a program that, to date, has been longer on rhetoric than it has been on accomplishments, in order to ensure that India is not perceived as being left behind in this competition. Certainly, India would also likely advance any ongoing work on BMD penetration aids. A central strategic question would be how India chooses to respond to such a Chinese development, both offensively and defensively.

Impact on Pakistan. Given the generally positive nature of the Chinese-Pakistani relationship, it seems likely that any impact on Pakistan would occur indirectly via Pakistan's reaction to Indian responses. India has already been working on theater missile defenses against Pakistan's ballistic missiles, but a possible India-China competition would almost certainly have spillover effects of some kind on Pakistan.

Impact on Russia. For the duration of the Cold War, in terms of economic and military strength, China was by far the inferior partner of the two Communist nations, and to this day, Russian strategic forces far outnumber those of China. Today their roles are much different, and China is the more economically advanced of the two countries, with Russia working hard to derive economic benefits from a relationship it seeks to improve with China. While nominally enjoying good relations with China, Russia remains uneasy over its increasingly powerful nuclear-armed neighbor, particularly that China is free to deploy intermediate range missiles capable of striking Russia, while Russia is barred by the INF Treaty from deploying comparable forces against China. Russia is forced to allocate warheads from its strategic forces for an anti-China mission, and Chinese BMD would only exacerbate that problem. Such a Chinese BMD deployment would also aggravate a politically sensitive Russian insecurity of being left behind by technically more advanced countries, as China has now demonstrated a non-nuclear, hit-to-kill capability that Russia does not yet possess (or at least has not yet demonstrated). Russia should feel no more threatened by Chinese strategic BMD than the United States, but given the troubled history between the two countries, this cannot be taken for granted.

Impact on the United States and U.S. Allies. A modest Chinese deployment of strategic BMD should have little effect on the U.S. ability to deter China. Not only does the United States have a large nuclear arsenal, a stockpile of penetration aid technology, and other countermeasures to address ballistic missile defenses, it also has by far the most robust, air-breathing strategic nuclear capability of any nuclear power, with B-2 and B-52H bombers (some equipped with air-launched cruise missiles) and dual-capable aircraft (based in Europe), not to mention plans for a new-generation Long Range Strike Bomber (LRS-B). These aircraft would be largely unaffected by Chinese BMD. The impact of Chinese strategic BMD would instead come from U.S. domestic political reactions and the geopolitical impact on U.S. allies and friends from such a development. As alluded to earlier, even if not strictly necessary, the United States could take relatively inexpensive measures to reduce the trivial technical impact of such a Chinese deployment on U.S. offensive nuclear capabilities and to respond to any domestic pressure to counter the new challenge. These steps would also be useful in addressing any new allied concerns, but it seems possible, even probable, that some, particularly U.S. East Asian allies, would need reassurance, given China's recent moves on disputed territorial islands and its overall more assertive regional posture. While current U.S. policy rules out any negotiated limitations on missile defense numbers, it is possible that specific transparency and other confidence-building measures could help to reduce allied anxieties, in addition to U.S. policy and programmatic steps. At a minimum, some kind of a dialogue on missile defense could be useful. To the extent that China might be unwilling to engage in such dialogue, that, at least, could indicate that China has plans for more extensive BMD deployments. In short, there would be minimal programmatic impact of such a move by China; the diplomatic and domestic impacts, though greater, should be manageable (unless external factors inflate public and/or allied perceptions of the challenges such defenses present).

How much missile defense might China deploy? At present, this is unanswerable, though logic and judgment offer some clues. The same logic that has led China into an apparently robust development program can help U.S. and allied defense planners understand the options China must confront as it approaches decisions on whether and how much missile defense to deploy. It is highly unlikely that China would seek to defend against either the United States or Russia launching a massive nuclear attack. To even begin to do so would require as many as several thousand interceptors, plus extensive radar, command and control, and other support as needed. If China were to deploy any number of interceptors at all, it would probably make sense to deploy 10-20, perhaps one or two squadrons, if only to assure that China understands the operational challenges such deployments can present. If China sought to defend its fixed ICBMs, this would suggest 20-40 interceptors to defend its fleet of 20 DF-5 ICBMs. To match the United States, China would deploy 44 interceptors, or to match Russia, it would need to deploy 68. If it sought to defend against Indian nuclear warheads however, the numbers become much less clear. A first order assumption might be to plan on 20 Indian Agni-5/6 missiles (the same number as Chinese DF-5), plus 2-4 Arihant SSBNs with four missiles on each platform. If the Agni-6 is not MIRVed (and assuming China would want to fire two interceptors at each warhead), this would mean a minimum of 72 interceptors, though it could pace its deployments with the Indian deployments, as it will likely require at least several years to a decade or more before India could deploy such missile levels. If the Agni-6 is MIRVed, this could increase these numbers to over 100 interceptors.

These are just "back of the envelope" types of calculations and should be considered notional. These estimates do not reflect whether the interceptors would be exo- or endo-atmospheric, the former probably more expensive than the latter. Precision on these calculations is not possible, but by inspection, there is the suggestion that any Chinese deployment of strategic BMD would likely be fewer than 100 interceptors, and perhaps fewer than 50. Conversations with Chinese specialists suggest that China may take a more target-specific approach to missile defense rather than seek to provide a thin defense for the entire country. The United States' GMD system is estimated to cost about $41 billion through 2017 in R&D alone, with the program having started on a highly concurrent basis in December 2004.[44] It seems unlikely that it would cost China a comparable amount to deploy a rudimentary capability comparable to what the United States has paid. To first order, one could make the very crude assumption that to deploy 44 interceptors and associated radars, it would cost China about $41 billion, minus what they have already expended. If China has spent half that amount already, and spent the rest over a 15 year period, that would be an expenditure of $1.34 billion per year, slightly less than one percent of China's 2015 official defense budget of $141.45 billion. Some believe that the latter figure does not fully cover all Chinese defense expenditures.[45] This $1.34 billion annual figure is substantial but hardly overwhelming. Even if China's defense budget growth drops from its current official rate of 10 percent to the estimated GDP growth rate of 7 percent, it means that China's defense budget will grow by about ten times as much as the estimated cost to deploy a limited strategic BMD capability. Given that China is already expending an unknown (but hardly insubstantial) amount on its strategic BMD program, the incremental cost of deployment may be much less. To the extent that cost is a major consideration, a strategic BMD system based on nuclear-armed interceptors would probably be much less costly because high interceptor accuracy would not be required – but to date, China has shown no interest in this option. Its geopolitical unattractiveness and the fact that employing it would require nuclear use likely pose as overwhelming obstacles for China.

Based on the tests that it has conducted to date, China seems to be more interested in developing a thin, nation-wide strategic BMD capability rather than point defense (though the latter should not be ruled out). A point defense system would make sense in terms of defending their ICBM fields, or key government facilities, but this would not be strategically consistent with their nuclear policy, which is to avoid getting drawn into an "arms race" with the United States. Also, such interceptors would not provide the "cover" for ASAT testing that a longer-range, exo-atmospheric interceptor would (the kind that a thin nation-wide defense would employ).

In short, it seems unlikely that, were China to proceed with some BMD deployment, that it would rush to deploy large numbers of interceptors, radars, and necessary support. A rough case can be made that China would, at least initially, deploy fewer than 100 exo-atmospheric interceptors, and quite possibly fewer than 50, if for no other reason than to "walk before it runs" with this new technology that it has limited experience, and to avoid the geopolitical

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[44] Government Accountability Office, "Assessments of Major Weapon Programs," GAO-13-294SP, Washington, DC, March 2013, p.51.

[45] See arguments as discussed in Zachary Keck, "China's Defense Budget: A Mixed Bag," *The Diplomat*, March 8, 2014.

glare of deploying more strategic BMD interceptors than any other country's number of interceptors.

Impetus for China to Deploy Strategic BMD

As noted earlier, even limited strategic BMD deployments would allow China to conduct tests that would be very useful for their ASAT program. This is an important strategic priority for China and would by itself make a strong case for modest Chinese deployment of strategic BMD. We believe it is not just a coincidence that there have been no more official Chinese ASAT tests, yet there have been several officially announced BMD tests. The United States could hardly criticize China for conducting strategic BMD tests when the United States conducts such tests itself.

We believe it is also significant that China characterized the interception test it conducted in 2014 as a BMD test, though the United States has been clear that it believes the test was an ASAT test. In the words of Assistant Secretary of State Frank Rose earlier this year at the FAS workshop on this subject, "Despite China's claims that this was not an ASAT test, let me assure you the United States has high confidence in its assessment, that the event was indeed an ASAT test."[46] If the U.S. assessment about the 2014 test is correct, this contrast directly links Chinese strategic BMD testing with its ASAT program and strengthens the argument for the usefulness of strategic BMD as a plausible cover for ASAT testing. If China seeks to deploy an ASAT system, deployment of BMD would advance China's security interests for both strategic BMD and ASAT: two benefits for the price of one.

We were also impressed by repeated references to the message that such a deployment would signify that "China has muscle," and "it is able" to tackle challenging but important defense missions. It also appears important to China that India, Japan, and the United States (in that order), receive this message that China is capable of defending itself. Besides serving direct strategic and mission requirements, such deployment would also serve important political objectives of regional prestige and sway, the aforementioned "technological merit badge" of Chinese accomplishment and expertise. In addition, China would obtain important operational understanding of BMD systems, such as those of potential adversaries like the United States and India, which would benefit their own BMD system and aid in coping with those of others.

There seems to be little question that China is developing a strategic BMD system capability. In such a development program, the articles of equipment are typically much less expensive than the extensive cost of development, and initial deployments are easily represented as part of the development program, as has been true for the U.S. GMD system. Thus, China will be able to realize important strategic objectives with only modest deployments and likely fairly modest incremental costs that can be portrayed as part of a longstanding R&D program. Accordingly, it would not be surprising if China deploys a limited BMD system involving radars and other early warning systems, interceptors, command and control centers, and links to decision-makers, in the near- to mid-term. An interesting question for China concerns how much autonomy would be granted to lower levels of authority to launch defensive interceptors. Chinese experts often emphasize that China would not need to launch a nuclear retaliation quickly, were it attacked with nuclear weapons; it could take its time in doing so. At the offensive level, this removes the need for quick decision-making at

[46] Frank Rose, op.cit.; see Appendix A-1.

senior levels. However, strategic BMD allows no such luxury of time. At ICBM ranges, China would need to launch interceptors within 15-20 minutes of hostile ICBM launch to have any hope of making an exo-atmospheric interception. Shorter-range intercept within the atmosphere to defend point targets could allow China to wait only a few minutes longer, and thus this would be of marginal value.

Another consideration in this question of possible Chinese strategic BMD deployment is China's need for an early warning infrared satellite system to detect potential hostile ballistic missile launches. China does not say whether it has such a capability, and on an unclassified basis, there have only been rumors that it may have such a set of satellites.[47] Such a satellite constellation would not be necessary for a purely ASAT-oriented system, but it would be essential for strategic BMD in order to provide enough warning time for a Chinese missile defense system. Deployment of such a satellite configuration could still be useful for addressing theater missile launches, and it would help maintain the cover of a system that was actually ASAT-oriented. At a minimum, such a Chinese early-warning satellite deployment would be a strong indicator that a Chinese strategic BMD system was increasingly likely.

[47] See, for example, Stephen Clark, "Long March Rocket Boosts Chinese Satellite to Orbit," *Spaceflight Now*, March 31, 2014.

Observations

1. None of the interlocutors we met offered attempts to "explain away" Chinese strategic BMD development activities. The development program was accepted as a given, though some say for technology insight only. Whatever else one can say, China's thinking on strategic BMD appears to have shifted in recent years.

2. The connection between strategic BMD and ASAT was widely accepted and understood.

3. No one tried to "explain away" Chinese ASAT activity. At a minimum, it was defended as necessary for technical readiness and to understand what the United States and others might be capable of regarding ASAT.

4. The question of deploying at least some level of strategic BMD is being discussed within the Chinese government. As of mid-2015, no decisions have been made (at least publicly) on the extent of deployment, if there is any at all, but judgements will be made at very senior levels if (and when) strategically necessary.

5. The size and technological depth of the U.S. strategic nuclear arsenal are such that any likely level of Chinese strategic BMD deployment would have very little effect on U.S. strategic deterrence capabilities. Any impact would be almost entirely in the U.S. domestic political arena and possibly uneasiness among some U.S. allies.

Conclusions and Findings

- Chinese development of strategic BMD is ongoing and is helping China to understand the complexities and nuances of designing such a system, what its weak points are, and whether or not to deploy such a BMD system. In addition, this development provides an important hedging option for China against an uncertain and evolving future strategic environment.

- The question of whether or not to deploy some level of strategic BMD is under active consideration at present, though no decisions have been made (as far as publicly announced). Such a decision will have to be made at a very high level.

- China faces a variety of incentives and disincentives for deploying strategic BMD. Whether and for what reasons China would deploy such a missile defense are unclear at present, but the very fact that such a decision is under consideration is telling and represents a major deviation from where China was on this issue only ten years ago.

- At a minimum, it appears that a Chinese deployment of strategic BMD is probably less unlikely than most U.S. defense analysts have assessed in the past.

- Should China decide to deploy such defenses, the most likely reasons would be to:

    - Provide a plausible cover to continue testing its kinetic energy ASAT system. This suggests that a thin, regional/nationwide defense would be more likely than a point defense, though the latter cannot be ruled out. Point defense would not provide much cover for an ASAT testing program.
    - Send a strategic message to India, Japan, and the United States (in that order), that China is capable of defending itself and overcoming major technical obstacles to do so.
    - Obtain important operational understanding of BMD systems for its own use and to better understand the systems that others may have or may develop.
    - Enhance its regional prestige and sway, a "technological merit badge" of recognition for achieving such a difficult technological task.

- Should China decide to deploy strategic BMD, limited deployment levels appear to be more likely than larger levels. The most compelling reason for China to deploy such defenses is that it would not require large numbers of interceptors. Furthermore, even were it to ultimately deploy greater levels, China would want to gain more experience in what for it would be a new class of weapons.

- The incremental cost to China of a limited deployment of strategic BMD as part of its overall R&D program would probably be modest in comparison to the security benefits China would receive, even taking into account some political drawbacks. Accordingly, the odds are fairly good that China will make at least a modest deployment of strategic BMD in the near- to mid-term (though this is uncertain).

- It is unlikely that China would seek to deploy more than a limited level of strategic missile defense, barring some extraordinary technology breakthrough. Seeking to defend against the larger U.S. or Russian nuclear arsenals would require a very large investment with no assurance that it could reach its goal, as either Chinese adversary would almost certainly take off-setting steps to counter such a Chinese strategic BMD initiative.

- The United States would likely have no technical reason to make any significant adjustments to its strategic posture in response to the most likely levels of Chinese strategic BMD deployments, should they take place. That said, it would be relatively *more* likely that some U.S. responses would be needed to address domestic U.S. political concerns, in order to demonstrate that the U.S. strategic nuclear posture and forces are robust and able to deal with such deployments. U.S. allies, particularly those in Asia, would likely also require some reassurance. To the extent that any programmatic changes would be needed for reassurance reasons, there are a number of options available to the United States, particularly in BMD penetration aids and enhancements to the bomber leg of the triad, that would suffice.

- A Chinese move to deploy early warning satellites would be a significant indicator of greater interest in strategic BMD deployment, as it would be a crucial component of an effective strategic BMD system. Such satellites would not be necessary for a purely ASAT-testing-oriented deployment.

In closing, Chinese deployment of even a limited strategic BMD would be an important development in an increasingly multi-polar strategic nuclear world. There should be no cause for alarm if China does so, but the implications would be significant and would merit greater understanding through increased dialogue and more thorough policy and technical review. This study and report have only scratched the surface of this issue. Of particular interest would be to understand the new dynamics of a multi-polar strategic BMD world, especially in light of Indian determination to deploy such defenses and Russia a growing possibility in this field as well. FAS plans to examine this issue in the months ahead and welcomes inputs from interested parties.

Appendix A-1

Ballistic Missile Defense and Strategic Stability in East Asia

Remarks by Frank A. Rose, Assistant Secretary of State,
Bureau of Arms Control, Verification and Compliance at the Federation of American Scientists Workshop on Possible Chinese Interest in Strategic Ballistic Missile Defense
Washington, DC, February 20, 2015

Introduction

Thank you all very much, and a special thanks to Bruce and Chuck for having me here today to address this important workshop.

I'm told that this group is exploring China's potential interest in and deployment of strategic ballistic missile defense and what that means for U.S. and allied security.

At the State Department, we're taking a hard look at it as well, and in particular, the role of ballistic missile defense in achieving the overarching goal of strategic stability between the United States and China.

Overview of Strategic Stability with China

Before discussing China's interest in developing a BMD system and the possible implications of such an effort, I'd first like to provide an overview of what the United States is doing to ensure a stable U.S.-China strategic relationship in the region.

As stated in the Nuclear Posture Review, the United States is committed to maintaining strategic stability in U.S.-China relations and supports initiation of a dialogue on strategic stability and nuclear postures aimed at fostering a more stable, resilient, and transparent security relationship with China.

During the Cold War, many associated strategic stability with what we called "mutual assured destruction," the notion that the incentive to initiate nuclear use would be discouraged by the fear of suffering unacceptable retaliatory damage. This notion, of course, is ill-suited and too narrow to fully capture the U.S.-China relationship, given our multifaceted and shared interests. In today's world, strategic stability encompasses much more than just nuclear relations and reflects the fact that the U.S.-China relationship, which has both elements of competition and cooperation, is not adversarial.

The strategic relationship between the United States and China is complex, and we each view stability differently. Thus, it is important that we have frank and open dialogue about how our nations define and view strategic stability and how we perceive our nuclear postures and policies impacting this balance. As part of these discussions, the United States is willing to discuss all issues, including missile defense, space-related issues, conventional precision strike capabilities, and nuclear weapons issues, with the goal of improving the conditions for a more predictable and safer security environment.

A sustained and substantive discussion of our national approaches to maintaining effective

deterrent postures and modernization of associated strategic capabilities can increase understanding, enhance confidence, and reduce mistrust.

Overview of China's BMD Activities

As you're all aware, China is continuing to develop its BMD capabilities.

Although China does not say much about its BMD programs, China publicly announced that it conducted ground-based mid-course BMD tests in 2010, 2013, and 2014. I'll say more about the 2014 "BMD" test later. Chinese state media has stated that such tests are defensive in nature and are not targeted at any country.

I was in Beijing earlier this month, and the message I delivered was clear: It is important that our governments have a sustained dialogue on the role that our BMD systems have in our respective defense policies and strategies. We would welcome an opportunity to learn more about how BMD fits into China's defense policy and strategy.

More broadly, a sustained dialogue would improve our understanding of China's strategic perspective and enhance China's understanding of U.S. policy and strategy. Institutionalizing discussions of strategic issues is a prudent long-term approach to strengthening strategic stability and exploring means for strengthening mutual trust and risk reduction.

To encourage that dialogue, we have taken and will continue to take steps to keep China informed about developments in U.S. BMD policy.

Potential Chinese BMD through the Lens of the U.S. Experience

The U.S. experience with BMD and specifically with our Ground-based Midcourse Defense System, or GMD, provides a useful lens for examining the challenges the Chinese would face in developing a BMD capability to threaten our nuclear deterrent.

We have been clear that our homeland BMD capabilities provide for defense of the U.S. homeland from limited ICBM attack, and are purposely not intended to affect Russia's or China's strategic deterrent. The GMD system is designed to support that policy, and it is not scaled, intended, or capable of defending the United States against the larger and more sophisticated arsenals of Russia and China. GMD is designed to protect the U.S. homeland only from limited ICBM attacks from states such as North Korea and Iran.

The U.S. experience with BMD suggests that attempting to develop a comprehensive homeland BMD system to defend against ballistic missile attack from China or Russia would be extremely challenging – and costly – given the size and sophistication of Chinese and Russian ICBMs. This owes to several factors, including the relatively low number of GMD interceptors and the sophistication and large numbers of Russian and Chinese missiles.

Former Secretary of Defense Robert Gates stated this publically on May 18, 2010, in testimony to the Senate Foreign Relations Committee, when he said that trying to eliminate the viability of the Russian nuclear capability would be "unbelievably expensive."

Given these factors, we could potentially expect a notional Chinese equivalent to the GMD

system to provide at most a limited defense of the Chinese homeland, which would not counter the U.S. strategic deterrent and therefore would not undermine strategic stability.

This is for the same reason that GMD does not impact strategic stability: the number of interceptors is low and they are not designed to deal with complex threats, and developing a comprehensive system to cope with a full-scale attack from another nuclear-armed great power would be expensive and ultimately unsuccessful.

Relationship to ASAT Testing

There is another important aspect of China's BMD program that bears discussing, which is its connection with China's anti-satellite, or ASAT, weapons program.

On July 23, 2014, the Chinese Government conducted a non-destructive test of a missile designed to destroy satellites in low Earth orbit. However, China publicly called this ASAT test a "land-based missile interception test."

Despite China's claims that this was not an ASAT test, let me assure you the United States has high confidence in its assessment that the event was indeed an ASAT test.

The continued development and testing of destructive ASAT systems is both destabilizing and threatens the long-term security and sustainability of the outer space environment. A previous destructive test of the Chinese system in 2007 created thousands of pieces of debris, which continue to present an ongoing danger to the space systems—as well as astronauts—of all nations, including China.

The destructive nature of debris-generating weapons has decades-long consequences: they can increase the potential for further collisions in the future, which only creates more debris. A debris-forming test or attack may only be minutes in duration, but the consequences can last for decades. It is for these reasons that the United States believes testing debris-generating ASAT systems threaten the security, economic well-being, and civil endeavors of all nations.

Space systems and their supporting infrastructures enable a wide range of services, including communication; position, navigation, and timing; intelligence, surveillance, and reconnaissance; and meteorology, which provide vital national, military, civil, scientific, and economic benefits. Other nations recognize these benefits to the United States and seek to counter the U.S. strategic advantage by pursuing capabilities to deny or destroy our access to space services.

The use of such ASAT weapons could be escalatory in a crisis.

China's ASAT program, and the lack of transparency accompanying it, also impedes bilateral space cooperation. While we prefer cooperation, it will by necessity have to be a product of a step-by-step approach starting with dialogue, leading to modest CBMs, which might then perhaps lead to deeper engagement. However, none of this is possible until China changes its behavior with regard to ASATs.

Conclusion

As many of you know, one of my biggest priorities as Assistant Secretary is to look over the horizon a bit and begin to structure our Bureau to address the emerging security challenges of the 21st Century.

For me, that means an increased focus on developing a stable strategic relationship with China, while at the same time reassuring our Allies.

Managing the U.S.-China relationship will take a lot of time and effort, and we won't always be successful. It's a challenge. But as Secretary Kerry likes to remind us, it's important for us to get caught trying, and that's what we intend to do.

Thanks very much.

Appendix A-2

About the Authors

Bruce W. MacDonald is Special Advisor to the Arms Control and Nonproliferation Project at the United States Institute of Peace (USIP) and a USIP Academy professor on nuclear nonproliferation, arms control and space/cyber issues. Also, he is an adjunct professor at the Johns Hopkins University School of Advanced International Studies. In addition, he is Adjunct Senior Fellow for National Security Technology at FAS. He was Senior Director for the Congressional Commission on the Strategic Posture of the United States. At the U.S. State Department, he analyzed strategic forces, BMD, and arms control, and served on the U.S. START delegation in Geneva. He was the State Department's principal strategic BMD expert in the crucial 1977-1983 years when numerous strategic BMD initiatives were developed. He performed advanced BMD studies for the Army's Ballistic Missile Defense Agency and assessed Navy theater missile defense programs for the Institute for Defense Analyses in its support of an OSD/JCS BMD review. Also, he performed numerous studies for DOD's SALT Task Force, supported senior interagency groups at the State Department through his leadership of the START Policy Interagency Working Group, and worked on strategic BMD and larger strategic nuclear issues in the Clinton White House as Senior Director for Science and Technology on the National Security Council staff and in the Office of Science and Technology Policy. He was a professional staff member for the House Armed Services Committee responsible for oversight of Air Force, BMD, military space, and strategic forces acquisition budgets. He is a member of the Council on Foreign Relations and the American Institute of Aeronautics and Astronautics. He graduated with honors from Princeton University, with a BSE and MSE in aerospace engineering, and an MPA in Economics and Public Policy from Princeton's Woodrow Wilson School of Public and International Affairs.

Charles D. Ferguson is the President of the Federation of American Scientists. Prior to FAS, Dr. Ferguson served as the Philip D. Reed Senior Fellow for Science and Technology at the Council on Foreign Relations (CFR). At CFR, he served from 2007 to 2009 as the Director of the Independent Task Force on U.S. Nuclear Weapons Policy, co-chaired by William J. Perry and Brent Scowcroft. Before his work at CFR, he was the Scientist-in-Residence in the Monterey Institute's Center for Nonproliferation Studies, where he co-wrote (with William C. Potter, Amy Sands, Leonard Spector, and Fred Wehling) the book *The Four Faces of Nuclear Terrorism* (Routledge, 2005). He was the lead author of the 2003 report *Commercial Radioactive Sources: Surveying the Security Risks*, which was the first in-depth, post-9/11 study of the "dirty bomb" threat. This report won the 2003 Robert S. Landauer Lecture Award from the Health Physics Society. He has served as an adviser to the U.S. government and national laboratories. In May 2011, his book *Nuclear Energy: What Everyone Needs to Know* was published by Oxford University Press. In 2013, he was elected a Fellow of the American Physical Society for his work in educating the public and policy makers about nuclear issues. He graduated with distinction from the U.S. Naval Academy, served in the nuclear Navy on a ballistic missile submarine, and earned a Ph.D. in physics from Boston University.

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