

Stanton Nuclear Security Fellows Seminar

Panel 2: China

1. **Riqiang Wu**, CISAC: *China-US Inadvertent Nuclear Escalation*

China and the US might engage in a conventional conflict because of Taiwan, the Diaoyu Island, and the South China Sea. If so, undoubtedly both sides would want to avoid nuclear escalation. But because America's military build-up and doctrine are provocative from China's perspective, China might feel pressure to escalate. Questions naturally arise: how could China-US inadvertent nuclear escalations occur? How to avoid them? This research will be done through document analysis, interviews and technical calculation.

In a conflict, the US might attack China's nuclear forces with conventional weapons intentionally for damage-limiting purpose, or do it unintentionally because of the difficulty of discriminating between China's conventional and nuclear weapons. Given America's counterforce capability and its commitment to counterforce/damage-limiting strategy, this situation would put a huge pressure on China to escalate. The greater the counterforce capabilities in American strategic nuclear/conventional forces and the greater its commitment to counterforce/damage-limiting strategies, the greater the pressure on China for escalation. The influencing factors include: China's nuclear strategy and nuclear weapons, American nuclear strategy and counterforce capability, American missile defense system, China's military strategy and American countermeasure.

China's nuclear strategy consists of two pillars: "no-first-use" and "first strike uncertainty." China's no-first-use policy has been a real constraint on China's training, equipment and nuclear posture. But no-first-use does not mean that the US can feel free to attack China's nuclear weapons with conventional weapons. Once China's retaliatory capability is threatened, China would feel pressure to escalate. The basis of China's deterrence capability is the so-called "first strike uncertainty", which means letting the other side remain uncertain of complete success. China considers that such "first strike uncertainty" should be enough to deter the other side from attacking China with nuclear weapons.

China operates both nuclear and conventional ballistic missiles. According to China's Military Power Report released by the US Department of Defense, China's missile family includes: nuclear intercontinental ballistic missiles (DF-31A, DF-31, DF-5), nuclear submarine-launched ballistic missiles (JL-1, JL-2), conventional short-range ballistic missiles (DF-11, DF-15) and conventional and nuclear medium-range ballistic missiles (DF-21). It is reported that China deploys mixed units of conventional and nuclear missiles.

America's declared nuclear strategy is that US nuclear weapons are intended to deter not only nuclear attacks but also large-scale conventional attacks against the US and its allies. "No-first-

use” is considered as destabilizing and rejected because it weakens deterrence of major conventional war. Although the US does not have an explicit counterforce strategy, it does have large counterforce capability, which is presented as a tool to control and limit damage in a conflict.

Conventional options in the US strategic war plan are another concern of China. The conventional prompt global strike (PGS) concept provides the US president an alternative that appears to be less dangerous than nuclear options. In the latest strategic war plan, OPLAN 8010, issued in 2009, conventional options are included: Tomahawk sea-launched cruise missiles and precision-guided munitions on B-2 bombers. Unmanned aerial vehicles carrying Hellfire missiles have also been considered for use against Chinese mobile nuclear missile launchers.

The US ballistic missile defense (BMD) will pose a huge challenge on China’s deterrent capability. Although the number of China’s nuclear warheads that can survive a first strike from the United States is very small, without BMD, the uncertainty that some might survive is enough to deter the US. However, once the US possesses an operational BMD system, the situation will become problematic. Even a small scale BMD system could have enough interceptors to engage the very small number of the warheads that survive a first strike from the US. China’s “first strike uncertainty” would be reduced greatly, if not eliminated. From China’s perspective, even with an untested BMD system, US policymakers may try to transform it into a forceful diplomatic tool against China.

The Obama administration’s new BMD plan emphasizes the SM-3 system. Originally, SM-3 Block IA/B was designed as a theater missile defense system, but the upgraded version SM-3 Block IIA/B is capable of engaging China’s strategic missiles according to my calculation. Given that the MK41 vertical launch system of the Aegis BMD ship is a widely deployed standard component, America may be able to deploy a large number of SM-3 Block IIA/B interceptors.

In any future Sino-US conflict, China would probably use an “anti-access/area denial” strategy. According to The National Military Strategy 2011 of America, “Anti-access strategies seek to prevent our Nation’s ability to project and sustain combat power into a region, while area denial strategies seek to constrain our Nation’s freedom of action within the region.” The most effective weapons China might use for “anti-access/area denial” include conventional ballistic missiles and attack submarines. According to a RAND report, “Examples of antiaccess measures include attacks on airfields, which could force aircraft to operate from more-remote airfields or could prevent additional forces from being flown into the theater; ...attacks on aircraft carriers, which could prevent naval aviation from operating within the theater or force the carriers to withdraw to more-distant locations from which their aircraft would be less effective.” China’s nuclear attack submarines would be used to close the key geographic choke points to prevent American ships from entering into the theater, while China’s diesel-electric submarines patrol in the theater to delay American naval operations.

America is developing a new concept to counter it: "AirSea battle." The basic idea is that the American military attacks China's missile bases preemptively. At the same time, the US would close the first island chain and send attack submarines into it to find and sink China's submarines. Given China's mix-deployment of conventional and nuclear missiles and the difficulty of discriminating between attack submarines and ballistic missile submarines, the US might attack China's nuclear ballistic missiles and ballistic missile submarines unintentionally. There is also a possibility that the US could attack China's nuclear forces intentionally. All these attacks would be perceived by China as deliberate actions to destroy its retaliatory forces gradually. China would then feel a huge pressure toward escalation.

How to avoid it? Put simply, the answer is to give China confidence. Through strategic dialogue, China and America should work together to manage strategic weapons modernization in both sides to reach a state of asymmetrical mutual vulnerability without triggering an arms race. The desired state is that China is certain of the "first strike uncertainty," so China will not feel pressure for escalation even in a conflict or crisis with America.

The recommendations below follow from use of the sources mentioned above, interviews with military officers, policymakers and scholars in China and the US, and the application of logical conclusions to the discussion above. Possible confidence-building measures include the following.

- (1) Make specific scenario-based no-first-use pledges. In a conflict or crisis, both sides declare that they do not intend to use nuclear weapons during the specific crisis.
- (2) Separate conventional and nuclear weapons and let the other side know it. This measure would inevitably undermine the survivability of China's nuclear weapons. So this measure should be implemented with other confidence-building measures.
- (3) Limit missile defense. The US should improve transparency regarding the desired end state of its BMD system, including the performance of specific systems, the number of interceptors, and deployment structure. Some sort of constraints on the development of BMD should be applied so that China can remain confident of its retaliatory forces.
- (4) China should declare the consequences of a conventional attack against Chinese nuclear weapons. China should make clear that conventional attacks against China's nuclear weapons will be regarded as a first strike and might trigger a nuclear retaliation.
- (5) Codify rules regarding forward surveillance ships. The US surveillance ships patrol frequently in China's exclusive economic zone, with a towed-array sonar system. The purpose of these activities is to track and determine the detection range of China's nuclear submarines. China has reacted strongly to those provocations. Both sides

should work out a code of conduct regarding acceptable types and regions of forward surveillance activities.

2. **Lora Saalman**, CE: *Defining Strategic Stability - China Debates Obama's Nuclear Posture*

Introduction

China is increasingly factored into U.S. nuclear strategy. When President Obama released the administration's Nuclear Posture Review (NPR)—a document that guides America's nuclear policy, strategy, capabilities, and force posture for the next five to ten years—in April 2010, China was named 36 times. By contrast, China was barely mentioned in the last NPR completed in 2002. In this newest document, the United States expressed its desire to enhance strategic stability with China, but first there needs to be a better understanding of how China perceives America's nuclear posture.

While there has been a debate within China on how to interpret the NPR, there is an overall consensus among Chinese experts that the United States' current strategy lacks a complete definition of how "strategic stability" applies in the context of Sino-U.S. relations. This term—generally used in describing the U.S.-Russia relationship—signifies a balance between two roughly equal or balanced nuclear powers, but there is a considerable disparity in numbers and capabilities between China and the United States.

Overall, Chinese experts voice both challenges and opportunities in moving toward strategic stability with the United States. The challenge is that Washington could use nuclear talks to force Beijing to become more transparent without any U.S. commitment to limit its own military ambitions in return. The opportunity is that the two powers could build a relationship based on mutual vulnerability, diminishing the possibility of either side using nuclear coercion or aggression.

In confronting both positive and negative trends impacting Sino-U.S. strategic stability, the researcher seeks to create a regularized, systematic and in-depth platform for engagement between the two countries' scientific, military and academic experts. By defining and discussing the specific elements that comprise and constrain strategic stability—missile defense, space-based radars, boost-glide capabilities, conventional prompt global strike, etc.—this project seeks to provide concrete proposals to U.S. and Chinese officials on how to facilitate a more stable bilateral nuclear relationship.

Background

Immediately following the release of the NPR in April 2010, the researcher began a project to evaluate how Chinese experts were looking at strategic stability in the years preceding and the months following the release of the Obama administration's NPR. A comprehensive review of all references in Chinese to the words "strategic stability" (*zhanlue wending*) in the electronic databases of Tsinghua University—covering the period from the earliest date in the system, January 1981, through September 2010—revealed 297 such references.

An analysis of these texts, paired with interviews with dozens of Chinese scientists, military and academic experts, served as the basis of this research. This preliminary research resulted in a Carnegie Paper entitled “China and the U.S. Nuclear Posture Review,” issued in February 2011. Current research seeks to take this report one step further to explore both the positive and negative elements currently facing and potentially confronting Sino-U.S. strategic stability talks and measures.

Since the release of this paper, the researcher has engaged in a follow-on exploration into the evolution of how Chinese experts are interpreting U.S. progress on the various elements that comprise or are detrimental to strategic stability. New elements of this research include a comprehensive review of all Chinese-language articles since the last collection period ended in September 2010, along with a revisiting and expansion of the range of experts interviewed for the original Carnegie Paper.

Beginning in Summer 2011, the researcher also intends to integrate a seminar series on strategic stability with her already existing event series for senior and junior experts within China, respectively called the Arms Control Seminar Series and Arms Control’s Future. Heretofore, most engagement on Sino-U.S. strategic stability issues has occurred via an annual Track 2 or 1.5 event that often simply repaints the same canvass of subjects already covered for decades. Given the large scale and wide subject range of these meetings, they often cover every topic under the sun, with little in-depth or nuanced discussion.

The proposed Strategic Stability Seminar Series seeks to undertake a unique and targeted approach. The researcher will break down the issue of U.S.-China strategic stability into in-depth, digestible components for small to medium-sized discussions of between 10-20 experts. Colleagues in China will be matched up with experts from the United States to engage on specific aspects of strategic stability, whether they be doctrinal (e.g. no-first-use, extended deterrence) or material (e.g. missile defense systems, space radars). Each session will be devoted to a separate topic. This series will culminate in a large-scale event and publication that synthesizes the findings.

Framework

Findings from the February 2011 Carnegie Paper will provide the framework for follow on research and seminars. Four fundamental issues must first be resolved. First, the United States and China must clearly define the meaning of strategic stability and what bilateral cooperation on nuclear strategies and policies might entail. While Beijing seeks to define specific terms of engagement, Washington relies on broad concepts. A vague approach by the United States, however, carries the risk that its intentions will be misinterpreted and this could damage overall bilateral ties. This study seeks to reduce the gaps in definition that currently plague these discussions.

Second, the United States must define and develop concrete confidence building measures to encourage China to take part in detailed discussions on nuclear issues. Better understanding of each other's motives is critical for both sides. Areas for greater discussion and clarification include: no-first-use policies; advanced conventional weapons systems; use of nuclear weapons in "extreme circumstances," including Taiwan; extended nuclear deterrence; and weaponization of outer space. Beyond attempting to understand where China and the United States converge and differ on the subject of strategic stability, this study seeks to devise concrete proposals on joint projects and other bilateral confidence-building measures.

Third, the NPR opens the door to greater U.S. engagement with China and it also gives China the chance to shape new strategic trends in the relationship. Chinese experts differ on when and at what level Beijing should take part in arms control discussions with Washington, but China should actively participate in strategic stability talks now before any new trends develop that hurt its interests. This study and a series of seminars provides just such a platform for regularized interaction. It engages various levels of Chinese experts—senior and junior from scientific, military and academic fields—to provide a more comprehensive platform for forthright exchange. These frank discussions will create the groundwork for government-to-government discussions.

Fourth, Washington and Beijing should resume and expand on cooperative measures to deepen their interaction, such as reciprocal visits and projects between U.S. and Chinese nuclear laboratories. This cooperation could be introduced into other arenas to include eradicating space debris, sharing data on ballistic missile defense, and developing a joint radar system. Building on such measures will show China that the United States wants to engage on substantive issues and will require China to work with the United States on multiple levels. This study seeks to concretize proposals from the February 2011 Carnegie Paper, while offering new recommendations and a forum for joint research.

Conclusion

Carnegie-Tsinghua Center for Global Policy is uniquely positioned with its permanent office in Beijing, association with Tsinghua University and regularized contact with the Chinese expert community to undertake the necessary steps to provide a more systematic, regularized and in-depth platform to pursue strategic stability between China and the United States. Given that achievement of U.S.-China strategic stability will require political will at the upper echelons of government, this project seeks to build the foundation at the levels of society most open to discussion and debate and most likely to shape the political realm through their scientific, strategic and academic pursuits.

It is clear that Washington needs to match its rhetoric on nuclear stability and disarmament with concrete proposals and measures that will build confidence between the United States and China. And Beijing needs to become an active participant in shaping bilateral strategic relations.

Without these steps, it will be nearly impossible for a nuclear relationship that is clearly defined by strategic ambiguity today to shift to one of strategic trust—and ultimately strategic stability. This study intends to undertake the next step in the process of transforming strategic stability rhetoric into reality.

3. **Yun Zhou**, BCSIA: *China's Spent Nuclear Fuel Management: Current Practices and Future Strategies*

Although China's nuclear power industry is relatively young and the management of its spent nuclear fuel is not yet a concern, China's commitment to nuclear energy and its rapid pace of development require detailed analyses of its future spent fuel management policies. The purpose of this study is to provide an overview of China's fuel cycle program and its reprocessing policy, and to suggest strategies for managing its future fuel cycle program. The study concludes that China can and should maintain a reprocessing operation to meet its R&D activities before its fast reactor program is further developed.

As part of its nuclear energy policy, China is moving forward on its commitment to operate a closed nuclear fuel cycle, a policy that was first articulated in the 1980s. China's main rationale for a closed fuel cycle that includes the capability to reprocess spent nuclear fuel has been its inadequate supply of uranium resources. However, for reasons that will be discussed later, China is likely to have enough uranium from both domestic production and imports to satisfy nuclear fuel demands in the next several decades. As it considers what type of reprocessing program it should pursue in the long-term, China would do well to consider a range of options.

In general, China's decision to reprocess its spent fuel was made with an absence of transparency and a lack of public and outside expert input. In the absence of these inputs, current strategies could bear the influence of the nuclear industry's commercial interests. In the hopes of influencing Chinese fuel cycle development process, this study explores China's long-term options for managing the back-end of its nuclear fuel cycle by examining China's spent fuel storage capability, uranium resources, fast reactor R&D capability, and the cost and proliferation risks of each option. This paper is divided into four sections: the first discusses, in general, alternate spent fuel management strategies and current Chinese' spent nuclear fuel storage practices; the second examines China's current nuclear fuel cycle program and its reprocessing policy; the third estimates the likely natural uranium inputs and spent fuel outputs of China's expanding nuclear energy sector, as well as the amount of spent fuel storage that could be required; the fourth develops various different long-term spent fuel management and reprocessing scenarios and analyzes the financial costs and proliferation risks of each scenario. Overall, the study aims to provide an overview of Chinese fuel cycle program to the general audience and policy implications on China's long-term spent fuel management to Chinese policy makers.

From this study, it concludes that: 1) China will experience very little pressure to lessen the burden of spent fuel storage in the next three decades. It could use on-site/off-site dry storage facilities or current and planned off-site wet storage facilities to meet storage demand, diminishing the impact of this issue on China's reprocessing and recycling programs if any; 2) currently discovered uranium resources in China and near-term uranium ensured via foreign vendors will supply China's nuclear program for the next several decades. Uranium supply

should not be a barrier to limit the nuclear energy program in China; 3) due to the poor economics of reprocessing MOX fuel fabrication, interim storage of spent fuel is likely to remain the most economic way for the next several decades; and 4) China certainly will start reprocessing for its fast reactor R&D program in the near future. The need-based reprocessing principle proposed could provide better economics and cause less nuclear security risks.

Considering China's tremendous projected energy demands, its huge commitment to nuclear energy, its infrastructure of nuclear science and technology, and its estimated uranium resources, it is not surprising that China insists on a *long-term* policy of reprocessing spent fuel and operating fast neutron reactors. The implementation of such a closed fuel cycle will depend on various factors, such as China's technology development, continued economic growth, a consistent national energy policy, and international cooperation on advanced nuclear technologies. After all, reprocessing is still an uneconomical process compared to interim storage, and fast-reactor technologies are not yet ready for industrial and commercial deployment. Some countries, such as India, Japan, and Russia, are still actively working to commercialize their fast neutron reactors, others, such as German and Britain, have stopped their programs.

As China moves forward, it should focus on when and how it should reprocess, taking into account cost, uranium fuel security, spent fuel management, and proliferation risk issues. To aid this discussion, China could benefit from a decision-making framework that allows for more flexibility and greater variability in order to account for the long timescales inherent in nuclear development. In the short term, China should maintain an active research and development program and sufficient reprocessing operations to meet its demands. In the meanwhile, environmental impacts of radioactive discharges from reprocessing and on/off site nuclear waste management due to reprocessing need to be studied and addressed before China moves to a commercial reprocessing level. Furthermore, an effective safeguard system to secure unused separated plutonium needs to be demonstrated.