HEARING ON CHINA'S NUCLEAR FORCES

HEARING

BEFORE THE

U.S.-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

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FIRST SESSION

THURSDAY, JUNE 10, 2021

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UNITED STATES-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

WASHINGTON: 2021

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CHINA'S NUCLEAR FORCES

THURSDAY, JUNE 10, 2021

U.S.-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

Washington, D.C.

The Commission met in Room 430 of Dirksen Senate Office Building, Washington, DC and via videoconference at 9:30 a.m., Commissioner Jeffrey Fiedler and Commissioner Alex Wong (Hearing Co-Chairs) presiding.

OPENING STATEMENT OF COMMISSIONER JEFFREY FIEDLER HEARING CO-CHAIR

COMMISSIONER FIEDLER: Good morning and welcome to the sixth hearing of the U.S. China Economic Security Review Commission's 2021 Annual Report Cycle. Thank you all for joining us. Thank you especially to our witnesses for the time and effort they've put into their testimonies.

Many, if not most, aspects of high-level decision making in China are opaque; but few aspects are more difficult to discern than the CCP's leadership's actual thinking about nuclear weapons. To be sure, they seem to make some things clear, such as insisting that they will never use nuclear weapons first. They also, at one point, assured the world that they would not militarize the islands they occupy in the South China Sea.

Their public and private statements on numerous other issues have been similarly false or misleading. Therefore, it seems to me only prudent to question their public stance on the role of nuclear weapons in their overall quest for superpower status. Given the catastrophic dangers of nuclear war, it may not just be prudent to question their motives and actions but imperative.

Our hearing today will look first at the expansion of China's nuclear weapon stockpile and delivery systems, command and control and communications for China's nuclear forces, and Beijing's use of civil-military fusion to support the expansion and modernization of its nuclear forces.

The hearing's second panel will examine recent changes in and the future trajectory of China's nuclear weapons posture, strategy, and doctrine. The final panel will assess U.S. and regional perspectives on China's nuclear buildup, as well as implications for the global proliferation regime.

I will now turn the floor over to my colleague and co-chair for this hearing, Commissioner Alex Wong.

PREPARED STATEMENT OF COMMISSIONER JEFFREY FIEDLER
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Good morning, and welcome to the sixth hearing of the U.S.-China Economic and Security Review Commission's 2021 Annual Report cycle. Thank you all for joining us, and thank you especially to our witnesses for the time and effort they have put into their testimonies.

Many, if not most, aspects of high-level decision-making in China are opaque. But few aspects are more difficult to discern than the CCP leadership's actual thinking about nuclear weapons. To be sure, they seem to make some things clear such as insisting they will never use nuclear weapons first. They also at one point assured the world that they would not militarize the islands they occupy in the South China Sea. Their public and private statements on numerous other issues have been similarly false or misleading.

Therefore, it seems to me only prudent to question their public stance on the role of nuclear weapons in their overall quest for super power status. Given the catastrophic dangers of nuclear war, it may not just be prudent to question their motives and actions, but imperative.

Our hearing today is an attempt to better understand the nuclear threat that China poses to the United States based entirely on open-source information. We believe we have assembled a group of expert witnesses who spend the better part of their lives trying to understand this difficult field of inquiry.

Our hearing today will look first at the expansion of China's nuclear weapons stockpile and delivery systems; command, control, and communications for China's nuclear forces; and Beijing's use of military-civil fusion to support the expansion and modernization of its nuclear forces. The hearing's second panel will examine recent changes in and the future trajectory of China's nuclear weapons posture, strategy, and doctrine. The final panel will assess U.S. and regional perspectives on China's nuclear buildup as well as implications for the global nonproliferation regime.

I will now turn the floor over to my colleague and co-chair for this hearing, Commissioner Alex Wong.

OPENING STATEMENT OF COMMISSIONER ALEX WONG
HEARING CO-CHAIR

COMMISSIONER WONG: Thank you, Commissioner Fiedler, and thank you, as well for being a consummate colleague and partner in putting this hearing together, together with our expert staff who have been wonderful throughout this process. It's my first hearing as a co-chair, and your wisdom and advice have been invaluable to me.

It's been some six years since this commission has squarely addressed in a hearing the status of China's nuclear forces. And in that relatively short time period, we've seen a number of trends in China's overall political and security development that cast China's growing nuclear arsenal in a new and concerning light.

In recent years, we have seen China's ambition to revise the global order to go from, in large part, conjecture to concrete reality. We've seen a sharp buildup and exponential improvement in China's conventional military capabilities toward an expeditionary force capable of power projection. And we've seen high-end rhetoric from Communist Party leaders regarding the domestic political value of and, hence, their risk tolerance toward the regional flashpoints that pose the greatest risk of sparking great power and conflict. This is a markedly different context than we saw just a few short years ago, and it's a new context that magnifies the specter of the Chinese nuclear arsenal.

We have before the Commission today a number of scholars and practitioners who are at the top of their field. Thank you all for being here. Your knowledge and insights on the Chinese nuclear complex are greatly welcome. But I should note that you are working from a relative information deficit. There are five permanent members of the UN Security Council, all of which are exclusively recognized by the Non-Proliferation Treaty as nuclear weapon states. Four of those five states participate in exchange and confidence-building mechanisms to enhance transparency on nuclear capabilities, doctrine, and crisis communications. They do so for the security of their own people but also for the security of the world.

The one that doesn't participate in those transparency measures is China. That creates uncertainty, and uncertainty when it comes to nuclear weapons is dangerous. But that uncertainty makes our effort here today to explore this issue even more important.

I look forward to hearing from all of you, and I look forward in particular to your recommendations for U.S. legislation and policy. Formulating those recommendations, after all, is this commission's central mission. And in making your recommendations, I ask that you prize specificity and even boldness. The Commission for two decades has been a forum where ideas once considered premature, unrealistic, or even peculiar began their movement to the center of the U.S.-China policy discussion and into practice. I hope the ideas you put forth today will have similar significance down the road.

So let's begin.

PREPARED STATEMENT OF COMMISSIONER ALEX WONG
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So let's begin.

PANEL I INTRODUCTION BY COMMISSIONER ALEX WONG

Our first panel will examine the ongoing modernization of China's nuclear forces. First, we'll hear from Mr. Hans Kristensen, the Director of the Nuclear Information Project at the Federation of American Scientists, who will address China's nuclear weapons stockpile and delivery systems. At FAS, he is responsible for researching the operations of nine nuclear-armed states and nuclear forces. He is co-author of the bimonthly Nuclear Notebook column in the Bulletin of Atomic Scientists and the World Nuclear Forces overview in the Stockholm International Peace Research Institute Yearbook, two of the most widely-used reference materials on the status of global nuclear arsenals.

Next, we will hear from Dr. Phillip C. Saunders, Director of the Center for the Study of Chinese Military Affairs at the National Defense University. He'll speak to command, control, and communications for China's nuclear forces. He previously worked at the Monterey Institute of International Studies where he directed the East Asia Non-Proliferation Program from 1999 to 2003 and served as an officer in the United States Air Force from 1989 to 1993. He last testified before this commission in 2019. Welcome back, Dr. Saunders.

Finally, we'll hear from Mr. Mark Hibbs, non-resident Senior Fellow at the Carnegie Endowment for International Peace's Nuclear Policy Program, who will focus on China's ability to leverage extensively civilian nuclear entities to support the modernization of the nuclear forces. Before joining Carnegie in 2010, he was an editor and correspondent covering nuclear energy, nuclear trade, and non-proliferation. He is the author of "The Future of Nuclear Power in China."

Thank you all very much for your testimony. I'd like to remind you to keep your remarks to seven minutes at the front end. We will have lots of time for discussion, therefore. And, Mr. Kristensen, we will begin with you.

OPENING STATEMENT OF HANS KRISTENSEN, DIRECTOR OF THE NUCLEAR INFORMATION PROJECT, FEDERATION OF AMERICAN SCIENTISTS

MR. KRISTENSEN: Thanks very much and good morning, and thank you for the invitation to testify here today. This is obviously a hot issue, not least given the current debate but also how it has evolved over the last decade and a half. nd so in my testimony I will focus on three issues, three major issues. One, of course, is a broad outline of the existing modernization program and the sort of front end of it in terms of what we're seeing right now. I'll talk about the stockpile development, and, as part of that, I have drawn up some hypothetical nuclear force postures that China, again, hypothetically, would have to, well, could do in order to fill those warheads into its posture. Of course, it's hypothetical, again; but, nonetheless, it helps give an idea.

And I'll end up with some remarks about intents in terms of theories about why they're doing it, thinking about why they're what they're doing, and then end with some recommendations.

First of all, I want to begin from the point of saying, despite China's secrecy, I think, on the nuclear force structure, we actually have more insight today than we've ever had in the public. And what I mean by that is that there's a wealth of information that has become available and has spread with enormous speed over the last couple of decades on the internet. New tools have become available for following these, social media, even cell phones in the hands of Chinese, and also, of course, declassification of a variety of documents. And also the Chinese are actually pretty eager to talk about what they're doing with new nuclear weapon systems or the ones they have when they do exercises, et cetera, et cetera.

So compared to, you know, the 1980s, I think there's a lot more material to work with today.

That's on sort of the nuts and bolts. On the policy and strategy issue, it's a lot more opaque, of course, to try to make sense of what exactly is it that the Chinese leadership thinks and what are their intentions. How would they use these forces if necessary?

So let me start by just saying that we have, as far as I can see, seen four major phases of Chinese modernizations. Over the years, they've introduced, of course, more advanced systems and more types of them. And this is now the fourth phase where we're watching a sort of approach of what looks like a triad of strategic forces.

There's some key elements of that triad, of course, as it emerges. We're not yet there because the bomber leg of it is still sort of in its early phases. But on the ICBM, land-based ICBM and short-range missile force, it's focused on the transition from the first generation of solid road-mobile missiles, the DF-31s, to the new systems, the DF-41, and then last year the first two brigades, I think, became operational with that. Still need some time to build up.

We are also seeing an important new development in regional systems where the DF-26 specifically, the intermediate range system, is coming online in great numbers. Depending on who you ask, a couple hundred, one to two hundred, launchers. There's some disagreement, apparently, between the Department of Defense and some of the military services about exactly how many are there. But those are details. The point is it's an important system that's coming in. It's dual capable, and it has the capability to deliver warheads with an accuracy we haven't seen in the other ballistic missile systems, long-range ballistic missile systems.

We're now talking about a significant build-up of the bases that will host these systems across China, specifically, of course, in the eastern part of China. A great number of new bases are coming in. The extraordinary thing about this development is that, seen from

outside, it's possible to monitor this, to some extent, via commercial satellite imagery to an extent I'm not aware we've had before. So what we fortunately are seeing is a number of people who are following this very closely. I've described a number of these details in my testimony on the ICBM force, the regional systems, the DF-26 and 21, you know, especially this 26 rapid build-up and spread to war units.

It looks like the PLA Rocket Force has something on the order of 40 or so brigade bases of which perhaps half have nuclear capability. And this is in rapid development with new bases that are being built up. We're seeing some very interesting developments with the DF-41 integration.

We also see some extraordinary developments with the construction of a large number of silos for new class ICBMs up in the PLA Rocket Force training area near Jilantai. This is a really important new development because of the capabilities that come with that. We can return to what those intentions are, but it's a significant number of systems.

On the submarine force, we're now up to six ballistic missile submarines of the Jin-class, the Type 094. We're seeing preparations for the first follow-on submarine that will have a system that will have a new ballistic missile, the Julang-3. Unlike the current one, it will be able to reach parts of continental United States from areas, Chinese waters, so to speak. Not all the continental United States. To do that, it would still have to sail far into the Pacific and, obviously, expose itself to anti-submarine warfare.

As I mentioned, the bomber force is in the early phases of becoming reactivated as a nuclear system. And we're seeing production of a new bomber that could come in in the mid to late 2020s.

On the projections of the nuclear force structure, we have seen suggestions that China is planning to double, at least double, its nuclear stockpile over the next decade. In my testimony, I analyze those claims. We have even seen some claims about tripling, quadrupling this. So what I have done is break down these forces in a hypothetical force structure for these options a decade out. And, of course, it's very hypothetical; but, nonetheless, it helps give an impression of what would China need to do in order to fill its launchers with that many warheads. And it's quite a development. I think the quadrupled stockpile is overblown. We'll see about the triple, but the double certainly seems doable. It depends on a lot of factors we can return to.

As for intentions, two main issues are in the public discussion: One, what does the silos, the new silos, mean, especially when combined with early warning systems? Is this an intention for China or an indication that they're moving toward a launch warning where ICBMs would be on alert with nuclear warheads on them; or is it building up a capacity to be able to do that, if necessary?

The other issue is, of course, in the regional systems where both the DF-26 but also the introduction, the pending introduction of bombers, would beef up the profile of regional deterrence, if you will, in the Chinese posture. Regional deterrence is, by no means, new. It was the founding father, so to speak, of the Chinese nuclear posture. It was where it all began. So they've had regional targeting since they started. But we're seeing important new developments both with the DF-26 capability but also, of course, with the air-launched systems where an air launched-ballistic missile is in development.

PREPARED STATEMENT OF HANS KRISTENSEN, DIRECTOR OF THE NUCLEAR INFORMATION PROJECT, FEDERATION OF AMERICAN SCIENTISTS

Prepared Statement of

Hans M. Kristensen
Director, Nuclear Information project
Federation of American Scientists

Before
The U.S.-China Economic and Security Review Commission
Hearing On
China's Nuclear Forces

Let me begin by expressing my appreciation to the Commission for the opportunity to testify here today on China's nuclear force developments. It is an issue that gained increased momentum in recent years in discussions about China's objectives and U.S. defense requirements.

In this testimony I will first describe the status of China's nuclear forces, briefly outline the major phases of the history, and address the modernization currently underway. Next, I will discuss various estimates for the size of the Chinese nuclear warhead stockpile and projections for its potential future development. I will then discuss China's possible intent with its modernization, before ending my testimony with some conclusions and recommendations.

Let me issue a caveat at the outset: I do not have access to classified information and never had. As such I'm not privy to the U.S. Intelligence Community's data other than what is occasionally declassified and published in reports and testimonies. As Director of the Nuclear Information Project at the Federation of American Scientists my job is to analyze that and other information and makes sense of it. We do that in the form of the Nuclear Notebook column published in the Bulletin of the Atomic Scientists since 1987, and the World Nuclear Forces Chapter in the SIPRI Yearbook. As I describe below, that can sometimes be a challenge.

The Status of Chinese Nuclear Forces

China is well underway with its most substantial nuclear weapons modernization effort since it first acquired nuclear weapons in the 1960s. The force is modest compared with U.S. and Russian nuclear forces but significant compared with China's nuclear history and other smaller nuclear-armed states.[1] This is China's fourth modernization phase.

The first phase, in the 1960s and 1970s, introduced bombers and liquid-fuel moveable medium-range ballistic missiles (MRBMs) such as the DF-1, DF-2, and the first version of the DF-3. The second phase, in the 1980s and 1990s, introduced longer-range liquid-fuel moveable and silo-based intercontinental ballistic missiles (ICBMs) that put all of Russia and India and

[1] For a 2020 overview of Chinese nuclear forces, see: Hans M. Kristensen and Matt Korda, "Chinese nuclear force, 2020," FAS Nuclear Notebook, *Bulletin of the Atomic Scientists*, December 2020, https://www.tandfonline.com/doi/pdf/10.1080/00963402.2020.1846432?needAccess=true&

nearly all of the United States within reach. This phase also introduced the first solid-fuel road-mobile MRBM (the DF-21), and an experimental nuclear-powered ballistic missile submarine (SSBN) (Type 092). The third phase, in the first decade-and-a-half of the 2000s, introduced solid-fuel road-mobile ICBMs (the DF-31/A), an upgrade to the liquid-fuel ICBM (the DF-5B) with multiple independently targetable warheads (MIRVs), and a small fleet of SSBNs (Type 094). This phase also fielded significant conventional medium-range missiles (the DF-21C/D) to complement Chinese nuclear forces and provide the country's leadership with regional strike options below the nuclear threshold.

The fourth modernization phase currently underway is fielding a broad set of nuclear weapons systems that appear intended to upgrade older systems, add new types, and eventually develop a triad of long-range strategic forces complemented by medium- and intermediate-range ballistic missiles. The PLARF force structure currently includes at least 40 missile brigade bases of which up to half might have nuclear capability.[2] Let me briefly outline the major programs:

The ICBM force is transitioning from liquid-fuel silo-based and roll-out-to-launch missiles to solid-fuel silo-based and road-mobile launchers. Apart from enhancing military capabilities, which is always a product of modernization, that transition appears to be motivated by an effort to reduce the vulnerability of the ICBM to a surprise attack and safeguard China's retaliatory capability. That mean phasing out the liquid-fuel DF-4 and in the future probably also the silo-based liquid-fuel DF-5 (for now, the DF-5 is still being upgraded; the DF-5B can carry up to 5 MIRV). New or upgraded ICBMs being fielded in this phase include the DF-31AG, which is replacing the DF-31A and DF-31, as well as the DF-41, which became operational in 2020 and is China's first MIRV-capable mobile ICBM (rumors about DF-41 capability range from 3 to 10 warheads; more will reduce range). Rail and silo-based options apparently are also under consideration. In 2019, I reported DF-41 launcher training at PLARF's training area near Jilantai in north-central China, shortly before the launcher was first displayed at a military parade in Beijing.[3]

Coinciding with the introduction of enhanced and new road-mobile ICBMs, the PLARF has also increased the number of launchers assigned to many of its ICBM brigades.[4] As a result, the number of ICBMs has increased from about 35 in 2000 (of which 20 with as many warheads could reach almost all of the continental United States), to just over 100 missiles today (of which nearly all can reach some or nearly all of the continental United States with more than 125 nuclear warheads). The Pentagon stated last year that "the number of warheads on Chinese ICBMs capable of reaching the USA is expected to grow to 200 by 2025. (Note: "USA" does not

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[2] For overviews of PLARF bases, see: Hans M. Kristensen, "China's Strategic Systems and Programs," and Bates Gill, "Organization of China's Strategic Forces," both in James M. Smith and Paul J. Bolt (ed.), *China's Strategic Arsenal: Worldview, Doctrine, and Systems* (Georgetown University Press: Washington, D.C.: 2021), pp. 98-101 and 170; Peter W. Singer and Ma Xiu, "China's missile force is growing at an unprecedented rate," *Popular Science*, February 25, 2020; Decker Eveleth, "Mapping the People's Liberation Army Rocket Force," *aboyandhis.blog*, April 9, 2020; Mark Stokes, *PLA Rocket Force Leadership and Unit Reference*, Project 2049 Institute, April 9, 2018.

[3] Hans M. Kristensen, "New Missile Silo and Df-41 Launchers Seen in Chinese Nuclear Missile Training Area," *FAS Strategic Security Blog*, September 3, 2019, https://fas.org/blogs/security/2019/09/china-silo-df41/

[4] Decker Eveleth, "China's Mobile ICBM Brigades: DF-31 and DF-41," *aboyandhisblog.com*, July 2, 2020, https://www.aboyandhis.blog/post/china-s-mobile-icbm-brigades-the-df-31-and-df-41

necessarily refer to the continental USA but might also include Alaska, Hawaii, and Guam). Not all of China's ICBMs are necessarily targeted against the United States; some cover Russia and India.

The PLARF also operates a force of shorter-range nuclear-capable ballistic missiles apparently intended to cover regional scenarios against targets in Guam, India, Japan, Russia, and South Korea. The Pentagon refers to missiles in this category as "non-strategic nuclear weapons,"[5] even though China considers all of its nuclear weapons to be strategic. This category includes the solid-fuel DF-21 medium-range missile of which the existing DF-21A (CSS-5 Mod 2) is being upgraded with the DF-21E (CSS-5 Mod 6). The DF-21, which was China's first solid-fuel road-mobile ballistic missile, has now completely replaced the older liquid-fueled DF-3A. The new DF-21E has not been displayed; it could potentially be an upgraded missile or the existing DF-21 on a better launcher or a combination. It is important to remind that most DF-21 versions (DF-21C and DF-21D) are not nuclear.

China's regional deterrent force now also includes the DF-26, a dual-capable intermediate-range ballistic missile (IRBM) with improved accuracy that began fielding in 2016. The missile is being fielded in significant numbers, although there appears to be some disagreement about how many: OSD says 200, INDOPACOM says 100. Although the DF-26 is dual-capable, most units are probably assigned conventional missions. In early-2019, I geo-located a DF-26 exercise announced by Chinese media to the new PLARF training area near Jilantai in the Inner Mongolia province.[6] And in early 2020, the DF-26 was first reported at the PLARF training site near Qingzhou in eastern China, as well as in Korla in western China, as well as significant numbers of launchers at production facilities.[7] It is possible that the DF-26 will replace some of the DF-21 units.

The naval portion of the current modernization phase involves expanding the small fleet of Type 094 class ballistic missile submarines, as well as developing a replacement known as the Type 096. The current fleet builds on the single Xia-class (Type 092), which was not successful, never sailed on a deterrent patrol, but was used to develop technology for subsequent nuclear-powered submarines. Whereas the current subs are equipped with the single-warhead JL-2 missile, the new sub will carry the JL-3 missile, which might be capable of delivering multiple warheads.

The current SSBN force is, in my view, somewhat of an oddball in China's nuclear posture. With a range of some 7,400 km (4,600 miles), the JL-2 missile cannot reach the continental United States or Hawaii from waters near China. Nor can it reach western Europe. To provide a hypothetical retaliatory capability against the United States, a Type 094 would need to sail deep into the Pacific Ocean and potentially expose itself to US and allied anti-submarine

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[5] US Department of Defense, "Global Nuclear Capability Modernization: Global Nuclear-Capable Delivery Vehicles," Fact Sheet, February 2, 2018, https://media.defense.gov/2018/Feb/02/2001872878/-1/-1/1/GLOBAL-NUCLEAR-MODERNIZATION.PDF

[6] Hans M. Kristensen, "Chinese DF-26 Missile Launchers Deploy to New Missile Training Area," *FAS Strategic Security Blog*, January 21, 2019, https://fas.org/blogs/security/2019/01/df-26/

[7] Hans M. Kristensen, "China's New DF-26 Missile Shows Up At Base In Eastern China," FAS Strategic Security Blog, January 21, 2020, https://fas.org/blogs/security/2020/01/df-26deployment/

forces (the Type 094 is relatively noisy: similar to 1970s-era Soviet SSBNs). Long-range patrols are rare, so the Chinese SSBN force may instead be intended to operate from a protected bastion in the South China Sea (all six are homeported on Hainan Island). Instead of a viable secure retaliatory capability, the current SSBN fleet for now seems more like a work in progress and more useful for regional targeting against U.S. bases in the region as well as India and Russia.

The new Type 096 SSBN will, once it begins to enter the fleet in the mid-2020s, also have shortcomings. Even with the 10,000+ km (6,300+ miles) JL-3 SLBM, a submarine would not be able to strike the continental United States from the South China Sea (it could reach most of western Europe, though). To target the continental United States, the submarine would have to launch its missile from northern Chinese waters. A launch from the Bohai Sea, for example, would potentially be capable of reaching the entire U.S. west coast and almost all the north-western parts of the country including all three ICBM bases. Striking Washington D.C. would require sailing into waters between Japan and Russia or deep into the Pacific Ocean. Again, it is worth reminding that China can already target all of those areas with its land-based missiles.

The final nuclear effort of the current modernization phase involves the development of an active nuclear role for China's bombers. This includes, in the near term, development of an air-launched ballistic missile for a modified H-6 bomber (H-6N), and development of a long-range bomber (H-20) with nuclear capability for deployment in the mid- to late-2020s.

The Nuclear Stockpile: Status and Projections

To arm all of these modified and new delivery systems, China needs more nuclear warheads. U.S. officials have recently made public projections that they expect China to significantly increase its nuclear warhead stockpile over the next decade. But an increase from what to what?

The size of the Chinese nuclear stockpile has been the subject of much uncertainty and speculation over the years. The Chinese government has, as far as I know, never disclosed the exact size of its nuclear warhead stockpile. In 2004, however, a Chinese Foreign Ministry fact sheet stated: "Among the nuclear-weapon states [the P5], China…possesses the smallest nuclear arsenal."[8] That was a true statement at the time when the British stockpile was around 280 warheads.

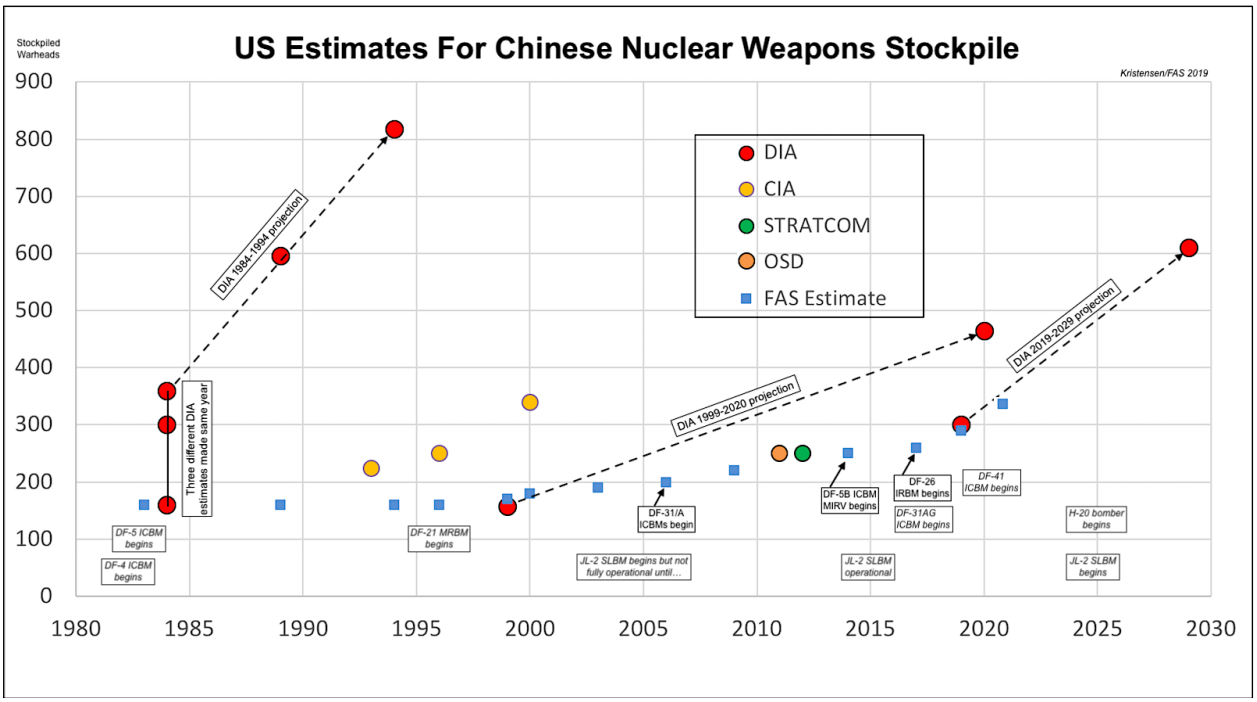
In 2012, when rumors suggested China might have many more warheads (hundreds, even thousands), STATCOM commander Robert Kehler rejected it: "I do not believe that China has hundreds or thousands more nuclear weapons than what the intelligence community has been saying, […] that the Chinese arsenal is in the range of several hundred" warheads.[9]

Seven years later, in 2019, Defense Intelligence Agency director Lt. Gen. Robert Ashley gave a similar number: "We estimate…the number of warheads the Chinese have is in the low

[8] Ministry of Foreign Affairs of the People's Republic of China, "China: Disarmament and Reduction of [sic]," Fact Sheet, April 27, 2004, p. 2, document available at https://fas.org/nuke/guide/china/doctrine/fs042704.pdf

[9] Hans M. Kristensen, "STRATCOM Commander Rejects High Estimate for Chinese Nuclear Arsenal," *FAS Strategic Security Blog*, August 22, 2012, https://fas.org/blogs/security/2012/08/china-nukes/

couple of hundreds."[10] DIA has made several projections about China's nuclear stockpile in the past that proved to be wrong (see image below). But the latest DIA number was repeated in the 2020 DOD report on China's military developments: "China's nuclear warhead stockpile - currently estimated to be in the low-200s…"[11] In the back of the report, however, a fuller statement appeared to include a caveat: "Currently, China probably maintains an *operational* nuclear warhead stockpile in the low-200s."[12] (Emphasis added.)



At FAS, we interpreted "operational" to imply that the "low-200s" number only included warheads assigned to operational launchers with an active nuclear mission. This interpretation was confirmed by a tweet by arms control ambassador Marshall Billingslea: "Caveats are important. Report assigns rough number for "operational" warheads."[13] If so, warheads produced for new launchers that had not become operational - such as the DF-41 and the two additional Type 094 submarines, or a small number of bombs potentially held in deep storage for a secondary contingency mission for a small number of H-6 bombers - might not be included in

[10] "The Arms Control Landscape: *Featuring DIA Lt. Gen. Robert P. Ashley, Jr. on Russian and Chinese nuclear weapons," The Hudson Institute, May 29, 2019,* https://www.hudson.org/events/1694-the-arms-control-landscape52019

[11] US Department of Defense, Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2020*, September 2020, p. 85, https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF

[12] Ibid, p. 87.

[13] Marshall Billingslea, Special Presidential Envoy for Arms Control, tweet, September 4, 2020, https://twitter.com/USArmsControl/status/1301988946449227777

the count. Consequently, at the time of the 2020 DOD report, we put our Chinese stockpile estimate at around 320 warheads.[14]

Whatever the exact warhead number, U.S. officials have been clear that they expect the number to increase significantly over the next decade. China "is likely to at least double the size of its nuclear stockpile" over the next decade, DIA stated in 2019.[15] Just a few months ago, STRATCOM commander Charles Richard said China is "well ahead of the pace necessary to double their nuclear stockpile by the end of the decade,"[16] and projected the stockpile might increase even more: "double (if not triple or quadruple) over the next decade."[17]

Whether such an increase will happen - or can happen - depends on a number of factors and assumptions. Most importantly, what is the Chinese government's own plans? How would the structure of the Chinese nuclear arsenal have to change to accommodate such warhead increases? What is the Chinese capacity for production and integration of significant numbers of additional nuclear weapons? How many facilities can China build to accommodate these additional forces?

Answering these questions in detail goes beyond the scope of this testimony. But to illustrate the potential force structure implications of the various stockpile increases suggested by U.S. defense officials above, the table below shows hypothetical nuclear forces structures for a doubling, tripling, and quadrupling of the Chinese nuclear warhead stockpile.

A doubling of the stockpile seems plausible given the recent and ongoing modernization of the arsenal. But it would a major undertaking potentially requiring increasing the number of DF-31AG brigades, doubling the current number of road-mobile DF-41s with MIRV, deploying a new brigade of silo-based DF-41s with MIRV, fielding at least one Type 096 SSBN with MIRVed JL-3 missiles in addition to the six Type 094 SSBNs already in service, and fielding more than a dozen nuclear bombers. Fewer launchers would require greater MIRV loading.

A tripling of the stockpile would require even greater force structure changes. To accommodate the additional warheads, I had to increase the number of DF-31AG and DF-41 brigades even further, add a number of rail-based DF-41s, add yet another SSBN for a total of eight, double the number of bombers as well as their weapons capacity.

To create the hypothetical force structure necessary for a quadrupling of the stockpile, even more road-mobile and rail-based missiles were needed, more DF-26 units were assigned nuclear warheads, and more bombers were added with greater weapons capacity. Moreover, a

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[14] Shannon N. Kyle and Hans M. Kristensen, "Chinese nuclear forces," in *SIPRI Yearbook 2020: Armament, Disarmament and International Security* (Oxford University Press: 2020), p. 356, https://www.sipri.org/sites/default/files/2020-06/yb20_10_wnf.pdf

[15] Robert P. Ashley, Lt. Gen., Director, Defense Intelligence Agency, "Russian and Chinese Nuclear Modernization Trends," Remarks at the Hudson Institute, May 29, 2019, https://www.dia.mil/News/Speeches-and-Testimonies/Article-View/Article/1859890/russian-and-chinese-nuclear-modernization-trends/

[16] Charles A. Richard, Commander, US Strategic Command, prepared statement before the Senate Armed Services Committee, April 20, 2021, p. 6, https://www.armed-services.senate.gov/imo/media/doc/Richard04.20.2021.pdf

[17] Charles A. Richard, Commander, US Strategic Command, "Forging 21st-Century Strategic Deterrence," *US Naval Institute Proceedings*, February 2021, https://www.usni.org/magazines/proceedings/2021/february/forging-21st-century-strategic-deterrence

quadrupling of the stockpile also required increasing the MIRV loading on some of the DF-41 ICBMs.

Hypothetical Chinese Nuclear Force Structures With Different Stockpile Increases

		2020		2030					
		If "low-200s" stockpile		If "double" stockpile		If "triple" stockpile		If "quadruple" stockpile	
Type	NATO/US Name	Launcher	Warheads	Launcher	Warheads	Launcher	Warheads	Launcher	Warheads
Land-based ballistic missiles									
DF-4	CSS-4	6	6	0	0	0	0	0	0
DF-5A	CSS-5 Mod 2	10	10	0	0	0	0	0	0
DF-5B	CSS-5 Mod 3	10	50	10	50	10	50	10	50
DF-5C	CSS-5 Mod 4			10	10	10	50	10	50
DF-21A/E	CSS-5 Mod 2/6	40	40						
DF-21E	CSS-5 Mod 6			40	40	40	40	40	40
DF-26	CSS-18	80	20	200	20	200	20	200	100
DF-31	CSS-10 Mod 1	6	6	0	0	0	0	0	0
DF-31A	CSS-10 Mod 2	24	24	0	0	0	0	0	0
DF-31AG	(CSS-10 Mod 3)?	24	24	84	84	96	96	108	108
DF-41	CSS-20	0	0	32	96	48	144	48	144
DF-41A (silo)	(CSS-20 Mod 1)?	0	0	10	30	20	60	20	100
DF-41B (rail)	(CSS-20 Mod 2)?					10	30	20	100
Subtotal		*200*	*180*	*386*	*330*	*434*	*490*	*456*	*692*
Sea-based ballistic missiles									
JL-2	CSS-N-14	48	48	72	72	72	72	72	72
JL-3	(CSS-N-15)?			12	36	24	72	24	72
Subtotal		*48*	*48*	*84*	*108*	*96*	*144*	*96*	*144*
Subotal Ballistic Missiles:		*248*	*228*	*470*	*438*	*530*	*634*	*552*	*836*
Air-based weapons									
H-6K (bomb)		20	20						
H-6N (ALBM)				10	10	20	20	20	20
H-20 (ALBM/ALCM)?				10	20	20	40	30	60
Subtotal		*20*	*20*	*20*	*30*	*40*	*60*	*50*	*80*
Total		**268**	**248**	**490**	**468**	**570**	**694**	**602**	**916**
Stockpile increase (%):					*105*		*204*		*302*

* Based on projections made by US Strategic Command, US Defense Intelligence Agency, and the Office of the Secretary of Defense for the increase of China's nuclear warhead stockpile over the next decade.

Hans M. Kristensen, FAS 2021

Potential Intentions

The descriptions of China's nuclear modernization and the projections for the possible increase of the nuclear warhead stockpile are often accompanied by claims about intent. This includes whether China still has a minimum deterrent - or can have it with twice the number of warheads, whether one can trust China's No-First-Use policy and pledge not to attack with nuclear weapons any non-nuclear country, whether construction of new silos and development of ballistic missile warning capabilities signal China is moving to a "launch-on-warning" posture with nuclear warheads loaded on missiles on high alert.

Minimum deterrent is a vague and undefined term. All nuclear-armed states claim they only have the minimum number of nuclear weapons needed for their defense. But as a country that has said for many years that its small arsenal constituted a minimum deterrent, China obviously should explain how a larger arsenal can also be a minimum deterrent. Compared with the arsenals of Russia and the United States, China will of course continue to have a minimum deterrent even when its ongoing modernization is completed.

In addition to stockpile size, however, new and improved military capabilities also raise questions about China's intent. This is specifically the case with the new ICBM silos under construction as well as the dual-capable DF-26 and the decision to reactivate the nuclear bomber mission.

The construction of more than a dozen silos in the PLARF training area near Jilantai, combined with China's efforts to develop some kind of early-warning capability against ballistic missile attacks, caused the Pentagon to publicly declare in 2020 that "China intends to increase the peacetime readiness of its nuclear forces by moving to a launch-on-warning (LOW) posture with an expanded silo-based force."[18] The public statement appeared to be, at least in part, based on my report in September 2019 about construction of new missile silos at Jilantai.[19] Since then, silo construction has increased significantly in the area, with more than a dozen silos detected so far.[20]

Why China is building so many silos in a training area is unclear. It is possible that PLARF is experimenting with different designs and concepts before it begins to construction new silos in the operational missile brigade areas.[21] The silos are too small for the current silo-based DF-5 (even though DF-5Bs have been seen operating in the area), and it is possible that the silos are intended for the DF-41 or a DF-31A ICBM. There are several potential explanations for this development. One is that China feels more vulnerable to surprise attack and has decided to increase the number of silos to safeguard some retaliatory capability. Another potential explanation is that the DF-5 is getting old and needs to replaced by new solid-fuel missiles.

It is potentially also possible that China has decided to place ICBMs on high alert with warheads and is developing an early-warning capability to allow solid-fuel missiles to launch before their silos can be destroyed. This appears to be the interpretation that the Pentagon has made. There is still no public information that confirms China has decided to transition to an actual alert posture under normal circumstance, but it is possible that it is developing capabilities and procedures for being able to switch to such a posture in a crisis.

I frequently hear claims that one cannot trust China's no-first-use pledge. "I think I could drive a truck through the no first use policy," STRATCOM commander Richard ridiculed last year in testimony before the Senate last year. China might have different definitions for what no-

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[18] US Department of Defense, Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2020*, September 2020, pp. 85, 88-90, https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF

[19] Hans M. Kristensen, "New Missile Silo and Df-41 Launchers Seen in Chinese Nuclear Missile Training Area," *FAS Strategic Security Blog*, September 3, 2019, https://fas.org/blogs/security/2019/09/china-silo-df41/

[20] Hans M. Kristensen, "China's Expanding Missile Training Area: More Silos, Tunnels, and Support Facilities," *FAS Strategic Security Blog*, February 24, 2021, https://fas.org/blogs/security/2021/02/plarf-jilantai-expansion/

[21] There are possible indications of construction of silos near Checunzhen (Sundian or Sun-tien) in the western part of the Henan province. See: Scott LaFoy and Decker Eveleth, "Possible ICBM Modernization Underway at Sundian," *Arms Control Wonk*, February 5, 2020, https://www.armscontrolwonk.com/archive/1208828/possible-icbm-modernization-underway-at-sundian/

first-use means than the United States or under what conditions the policy would apply.[22] But the Pentagon concludes for years that there is "no indication that [Chinese] national leaders are willing to attach…nuances and caveats publicly to China's existing NFU policy…"[23]

I personally doubt any country would refrain from using nuclear weapons first if it concluded its survival depended on it, whether it has a no-first-use policy or not. More than a guarantee for anything during a war, the most beneficial and impactful effect of a no-first-use policy is probably its potential to limit the ambitions and readiness of the nuclear posture.

China's fielding of the dual-capable DF-26 with its increased accuracy (although mainly for conventional missions) has raised speculations about its potential use as a nuclear precision strike tactical nuclear weapon. After referring to non-official discussions about a need for low-yield nuclear weapons to reduce collateral damage, the Pentagon in 2020 described the DF-26 as "China's first nuclear-capable missile system that can conduct precision strikes, and therefore, is the most likely weapon system to field a lower-yield warhead in the near-term."[24] As mentioned above, a Pentagon fact sheet in 2018 described the DF-26 as a "tactical nuclear weapon."[25]

Although modern Chinese warheads have lower yield than their first-generation Megaton-yield weapons, there is no public indication that it has decided to use the DF-26 or other nuclear weapons as tactical nuclear weapons. Nonetheless, the DF-26 and China's decision to reactivate a nuclear mission for the bombers is raising questions about whether China is increasing the role of regional weapons in its nuclear strategy. At the same time, there is nothing new about regional-range nuclear weapons in Chinese nuclear planning per ce; regional missiles were one of the very first categories of nuclear weapons China deployed, well before ICBMs.

Conclusions and Recommendations

In conclusion, China's nuclear modernization is significant, important, and requires close monitoring, analysis, and debate. Despite the current modernization and the focus it receives in the public debate, however, the PLARF is - unlike its predecessor the Second Artillery Corps two decades ago - predominantly a *conventional* force, and increasingly so. That fact is often overlooked in the public debate. Statements made by U.S. military and intelligence officials, for example, assert that China has "the most active and diverse ballistic missile development

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[22] US Strategic Command, "U.S. Strategic Command and U.S. Northern Command SASC Testimony," February 13, 2020, https://www.stratcom.mil/Media/Speeches/Article/2086752/us-strategic-command-and-us-northern-command-sasc-testimony/

[23] US Department of Defense, Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2020*, September 2020, p. 86, https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF

[24] Ibid, p. 88.

[25] US Department of Defense, "Global Nuclear Capability Modernization: Global Nuclear-Capable Delivery Vehicles," Fact Sheet, February 2, 2018, https://media.defense.gov/2018/Feb/02/2001872878/-1/-1/1/GLOBAL-NUCLEAR-MODERNIZATION.PDF

program in the world"[26] and "launched over 400 ballistic missiles (more than the rest of the world combined for non-wartime uses)" over the past two years.[27] Most of those missiles are *conventional*, however, and only a smaller portion of the missile tests involved *nuclear* missiles.

The DIA stated in 2019 that China's growing nuclear arsenal "is consistent with Chinese President Xi's vision for China's military, which he laid out at the 19th Party Congress and stated that China's military will be 'fully transformed into a first tier force' by 2050."[28] Although it may be consistent with Xi's vision, it is important to note that the origins of much of the current nuclear modernization dates back to well before he became the Chinese president. The DF-41 program, for example, dates back to the 1990s, and most of the current SSBN fleet was laid down before Xi took control. The DF-26 also dates back to before Xi, although he might have increased the numbers.

Nonetheless, China's significant modernization and its growing warhead inventory raise valid questions about its plans and intent. How much does it plan to produce and deploy and when? The projections made by the U.S. military and Intelligence Community about China's expected increase of its nuclear weapons stockpile over the next decade have created significant discussion. Many questions remain, however, both about the increase, how DIA and STRATCOM make the projections, and what an increase means for Chinese intensions.

There is no authoritative information that I'm aware of that suggests China is seeking nuclear parity with the United States. Even with STRATCOM's most extreme projection of a quadrupling of the Chinese stockpile size described by DOD in 2020, China would only reach up to 1,000 warheads - less than one-third of the current U.S. nuclear weapons stockpile. Even in my exaggerated hypothetical force structure, that would only add up to about 200 ICBMs, half of the U.S. ICBM force, nearly 100 SLBMs compared with 240 for the United States, and 50 bombers compared with 60 U.S. nuclear bombers.

Chinese secrecy is of course an important reason for the uncertainty about the status and future of the Chinese nuclear arsenal. Secrecy has traditionally been a key component of China's effort to protect its relatively small nuclear arsenal, and China still has far to go before it can claim any official degree of transparency about its nuclear arsenal. At the same time it is important to remember that it takes a long time for nuclear-armed states - certainly authoritarian regimes - to become comfortable with some degree of transparency. That was also the case for the United States - and it still has issues, including some that make it harder to monitor and understand Chinese nuclear developments.

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[26] US Air Force, National Air and Space Intelligence Center (NASIC), *Ballistic and Cruise Missile Threat*, July 2020, p. 2, https://media.defense.gov/2021/Jan/11/2002563190/-1/-1/1/2020%20BALLISTIC%20AND%20CRUISE%20MISSILE%20THREAT_FINAL_2OCT_REDUCEDFILE.PDF

[27] Charles A. Richard, Admiral, Commander, US Strategic Command, prepared statement before the Senate Armed Services Committee, April 20, 2021, p, 8, https://www.armed-services.senate.gov/imo/media/doc/Richard04.20.2021.pdf

[28] Robert P. Ashley, Lt. Gen., Director, Defense Intelligence Agency, "Russian and Chinese Nuclear Modernization Trends," Remarks at the Hudson Institute, May 29, 2019, https://www.dia.mil/News/Speeches-and-Testimonies/Article-View/Article/1859890/russian-and-chinese-nuclear-modernization-trends/

Until 2010, for example, the annual DOD report on Chinese military developments included a table with a detailed breakdown of the Chinese missile force. In the 2011 issue, however, the table was changed so it only showed overall missile categories. In 2013-2015, even the abbreviated table disappeared completely, until it returned in 2016. It would help the public debate considerably if future reports would include a breakdown of the Chinese missile force.

Likewise, until 2010, the Office of Naval Intelligence would declassify and release the annual number of Chinese general-purpose and ballistic missile submarine patrols. In 2010, however, the office suddenly began to classify the precise numbers and instead released a range. Initially the range was five (11-13, for example), but in 2013 all data was denied. It would help the public debate if ONI restored its previous long-held declassification policy and released the annual submarine patrol numbers again.

With this I end my prepared testimony. Thank you for the opportunity to testify. I look forward to your questions.

OPENING STATEMENT OF PHILLIP C. SAUNDERS, DIRECTOR OF THE CENTER FOR THE STUDY OF CHINESE MILITARY AFFAIRS, NATIONAL DEFENSE UNIVERSITY

COMMISSIONER WONG: Mr. Kristensen, thank you for -- I apologize to interrupt. We are a bit over time, but we will definitely get back to the very interesting statistics and particularly on the intent discussion. Very interested in that.

But let's move on to Dr. Saunders.

DR. SAUNDERS: Thank you for the opportunity to testify today. China's undergoing an ambitious strategic modernization that's transforming its limited ground-based arsenal into a larger advanced nuclear triad that will provide new strategic options.

In addition to more accurate and survivable delivery systems, this includes improvements to nuclear command and control and communications and strategic intelligence, surveillance, and reconnaissance systems that will give PRC leaders greater situational awareness, support development of ballistic missile defenses, and enable possible shifts in PRC nuclear doctrine.

Decisions about nuclear weapons use are existential questions that will be made by senior Chinese Community Party civilian leaders. They have consistently emphasized negative control, ensuring that nuclear weapons are never used without explicit authorization, over positive control, ensuring that nuclear weapons will always work when ordered. This manifested in operational practices such as keeping nuclear warheads demated from their missiles and centralized control over nuclear forces.

The Central Military Commission would control any nuclear operations. The CMC would also support and possibly influence civilian decisions by providing intelligence and threat analysis, formulating plans and response options, and providing military advice to civilian leaders.

The Rocket Force is the key part of the Chinese nuclear deterrent. They operate an automated command system that's reportedly interoperable with the systems used by other services and which includes support for its extensive mobile missile force. They operate a variety of redundant systems to transmit orders to operational units, including radio, relay, cable, fiber-optic, and satellite means.

We're moving toward a Chinese triad. A lot less is known about nuclear command and control for the navy and the air force. The navy operates China's nuclear SSBNs and would convey launch orders via a super low-frequency transmitter. They've also conducted research into other very low-frequency and satellite comm systems.

The air force is developing nuclear capabilities that Hans talked about. Probably, the PLA air force headquarters will maintain operational control of these assets, as they do with other strategic assets such as conventional bombers. And the Central Military Commission would likely issue deployment, alert, and attack orders for the naval and air force systems.

China's development of a triad makes its deterrent more survivable but poses some new challenges for command and control. First, the navy and air force have to develop their own doctrine, personnel reliability systems, and nuclear warhead handling facilities. Second, submarines will not be able to follow the Rocket Force practice of keeping warheads and missiles demated when they deploy on patrol. Third, the increasing numbers of dual-capable DF-26 MRBMs creates challenges in terms of whether these brigades respond to Rocket Force headquarters' orders for nuclear missions or theater command orders for conventional missions. And, finally, the growing size, diversity, and complexity of China's deterrent increases the risk of accident and the challenge of ensuring effective control.

One of the new developments in the PLA is the establishment of the Strategic Support Force which took over responsibility for a range of cyberspace, electronic warfare, and political warfare functions. They operate China's space-based strategic ISR systems and communication satellites that support Rocket Force operations.

They also operate China's four ground-based phased array radar systems which can potentially be used to track incoming strategic missiles.

In the 2015 white paper, the PLA discussed its intent to improve strategic early warning, referring to the deployment of a satellite-based system to detect ballistic missile launches. Current status of this system is unclear from open sources, but, in October of 2019, Russia announced its intent to help China develop this system. This would be central to support development of ballistic missile defenses capable of intercepting incoming ICBMs or to move toward a launch warning doctrine.

Another emerging issue is conventional nuclear entanglement, which occurs when nuclear and conventional force operations overlap. This can take the form of geographic entanglement when conventional and nuclear forces operate in the same areas; operational entanglement when both kinds of forces are operated by or rely on the same military support institutions, such as command and control systems; or technological entanglement when the conventional and nuclear force delivery systems are identical or undistinguishable.

Conventional nuclear entanglement can introduce escalation risks into a crisis or conflict if efforts to strike conventional forces inadvertently degrade adversary nuclear capabilities. Recent research suggests that current conventional nuclear entanglement in the Rocket Force is moderate but somewhat less extensive than previous analyses have suggested. However, ongoing trends may increase entanglement in the future.

China's interest in ballistic missile defense systems dates back to the Mao era. The CMC appropriated funds for a ten-year development plan in the mid-1990s, including early warning capabilities, a patriot-like surface-to-air missile with limited BMD capabilities, and eventual development of longer-range interceptors to provide theater missile defense capabilities.

The PRC currently fields numerous Russian and indigenous long-range SAM systems that give it a limited capability against tactical and medium-range ballistic missiles. These include the S-300 and HQ-9 systems, roughly equivalent to the U.S. Patriot, and the HQ-19, which has completed tests that demonstrate a capability against 3,000-kilometer range missiles. With improvements, particularly in space-based launch detection systems, China may eventually be able to target longer-range systems as part of an integrated ballistic missile defense.

Some implications of this. One important implication is that a potential shift in China's nuclear policy toward a nuclear war fighting doctrine. As Chris Twomey points out, and you'll hear from him in the next panel, the technological constraints that have prevented such a shift have eroded as the PLA has developed more accurate and survivable missiles, improved command and control, and strategic ISR systems. The apparent lack of an operational space-based launch detection system is the principle remaining constraint, and the PLA appears to be taking steps to develop and deploy such a system.

Although a number of analysts and some U.S. officials see a shift toward a launch on warning posture likely, I confess I am somewhat skeptical. Civilian CCP leaders have always insisted on tight political control over strategic capabilities and are unlikely to pre-delegate launch authority to the Central Military Commission. The other implication is that conventional nuclear entanglement is present and may be increasing. The U.S. should improve its ability to differentiate between PLA conventional and

nuclear systems and think through its declaratory policy and crisis messaging in advance. This is an issue that's been discussed in past U.S.-China Track 1.5 dialogues and should also be discussed at the official level.

A final point is the interactive nature of the U.S.-China strategic competition. PRC conventional missiles, U.S. missile defenses, and U.S. and China nuclear arsenals have previously been relatively loosely coupled so that changes in one area did not necessarily prompt changes in the others. I think this is no longer the case as strategic developments appear to becoming more interdependent and the system is more tightly coupled.

I have two recommendations. The first is that Congress and the Commission should hold regular hearings such as this one and fund research on China's strategic modernization, broadly defined, but especially on the potential for strategic competition to change and drive the dynamics of strategic force modernization in both countries.

The second is that Congress and the Commission should encourage the administration to conduct and support U.S.-China strategic dialogues at both the official and unofficial levels, including exploration of crisis management mechanisms.

Thanks very much for the opportunity to testify today.

PREPARED STATEMENT OF PHILLIP C. SAUNDERS, DIRECTOR OF THE CENTER FOR THE STUDY OF CHINESE MILITARY AFFAIRS, NATIONAL DEFENSE UNIVERSITY

Testimony before the U.S.-China Economic and Security Review Commission
Hearing on China's Nuclear Forces

June 10, 2021

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The views expressed are those of the author and do not necessarily represent those of the National Defense University, the Department of Defense, or the U.S. government.

Introduction

The People's Republic of China (PRC) is in the midst of an ambitious strategic modernization that will transform its nuclear arsenal from a limited ground-based nuclear force intended to provide an assured second strike after a nuclear attack into a much larger, technologically advanced, and diverse nuclear triad that will provide PRC leaders with new strategic options. China also fields an increasing number of dual-capable medium and intermediate-range ballistic missiles whose status within a future regional crisis or conflict may be unclear, potentially casting a nuclear shadow over U.S. and allied military operations. In addition to more accurate and more survivable delivery systems, this modernization includes improvements to the People's Liberation Army (PLA) nuclear command, control, and communications (NC3) and strategic intelligence, surveillance, and reconnaissance (ISR) systems that will provide PRC leaders with greater situational awareness in a crisis or conflict. These systems will also support development of ballistic missile defenses (BMD) and enable possible shifts in PRC nuclear doctrine and nuclear policy such as a shift to a "launch on warning" posture or a policy that envisions "nuclear warfighting" rather than just deterrence of an adversary first strike.[1]

This testimony reviews what is known about the PRC NC3 system and how that system may adapt to new naval and air force nuclear capabilities, considers how new technologies and operational practices may pose challenges for NC3 and supporting strategic ISR systems, reviews the issue of conventional-nuclear entanglement, assesses evolving PRC ballistic missile defense (BMD) capabilities, and considers the policy issues these raise for the United States.

Nuclear Command, Control, and Communications (NC3)

Decisions about nuclear weapons use are existential questions for the PRC. They will almost certainly be made by senior Chinese Communist Party (CCP) civilian leaders at the Politburo or Politburo Standing Committee level. The CCP's longstanding insistence that "the party must control the gun" continues, as does its emphasis on the primacy of political objectives over military objectives. Political guidance from civilian leaders has shaped PRC nuclear policy, including the "no first use" policy and the views that the utility of nuclear weapons lies primarily in deterring an adversary nuclear first strike and reducing China's vulnerability to nuclear

coercion and that the destructiveness of nuclear weapons means that even a few nuclear weapons delivered on adversary territory are sufficient to deter a nuclear first strike.[2]

This emphasis on CCP control has shaped PLA nuclear force structure and command and control arrangements. CCP leaders tasked the Chinese defense establishment and the PLA to produce a "lean and effective" nuclear deterrent that would deter an adversary first strike without the large force structures and high costs that characterized the U.S.-Soviet nuclear arms race.[3] Consistent with its general approach to controlling the use of military capabilities, the CCP has emphasized "negative control" (ensuring that nuclear weapons are never used without explicit authorization) over "positive control" (ensuring that nuclear weapons will always work when ordered).[4] This manifested in PLA operational practices such as keeping nuclear warheads demated from the ground-based missiles that would deliver them and centralized control over the alert status of PRC nuclear forces.[5] In terms of nuclear doctrine, this meant emphasizing assured retaliation (even if it took days or weeks for surviving PLA nuclear forces to respond to a first strike), rather than timely retaliation that required maintaining nuclear forces on high levels of alert.

This approach was compatible with the primitive technological state of the PLA's small nuclear missile forces from the 1980s to the early 2000s, its underdeveloped NC3 system, and the lack of strategic ISR systems to provide warning that an adversary nuclear attack was underway. Under these conditions, the PRC focused on building nuclear forces that could survive an adversary's first strike and deliver a retaliatory strike. Survivability was to be achieved through a variety of means, including ambiguity about the total number of ICBMs and their locations, extensive use of camouflage, and the use of caves and tunnels to protect ICBMs and warheads from attack. China's second generation of ballistic missiles (DF-21 and DF-31) incorporated solid fuel technology and added mobility, improving survivability by complicating an adversary's task of locating and targeting missiles once they deployed from garrison. As the United States invested in advanced research into ballistic missile defense (BMD) in the 1980s and eventually began to deploy operational missile defenses that might have some capability against Chinese intercontinental ballistic missiles (ICBMs), PLA strategists added the need to penetrate current and future U.S. BMD systems when thinking about how large a nuclear force was necessary to provide assured retaliation. According to PRC academics, these calculations focused on how many warheads would survive an initial adversary strike and the ability of the surviving warheads to penetrate U.S. missile defenses.[6]

While civilian CCP leaders would be the critical actors in deciding whether to authorize a nuclear strike, the Central Military Commission (CMC), headed by CCP General Secretary Xi Jinping, would exercise centralized control in the authorization and execution of any Chinese nuclear operations. The CMC would also support, and possibly influence, civilian decisions by providing intelligence and threat analysis, formulating plans and response options, and providing military advice to civilian leaders who mostly have limited experience with military and nuclear matters. These channels would provide senior PLA officers opportunities to influence PRC nuclear decision-making even if they are not the ultimate deciders.[7]

The PRC is developing a nuclear triad that includes ground-based missiles, a nuclear submarine (SSBN) force, and an air component that involves nuclear air-launched ballistic missiles and a future long-range bomber.[8] Much more information is available about NC3 arrangements for the

ground-based missiles controlled by the PLA Rocket Force (PLARF), so I will begin by describing those NC3 arrangements and then consider what is known (and unknown) about NC3 arrangements for naval and air nuclear forces.[9]

The PLARF operates an automated command system that is reportedly interoperable with the automated systems used by other PLA services, and which includes support for the mobile missile force. Fiona Cunningham writes that, "CMC orders to alert or use nuclear weapons are likely transmitted to the CMC Joint Operations Command Center [in the Western Hills outside Beijing], then to the Rocket Force Headquarters, then to missile bases and down the chain of command to launch companies. Alternatively, orders may be transmitted directly from the Rocket Force Headquarters to missile brigades, battalions or launch companies, making use of the skip-echelon function of the automated command system."[10] According to the *Science of Second Artillery Campaigns*, the PLARF operates a variety of redundant systems to transmit orders to operational units, including radio, relay, cable, fiber-optic, and satellite means. The Rocket Force also operates basic, reserve, and rear command posts to provide redundancy; the latter two are only staffed at higher alert levels.[11]

The 2015-2016 PLA reforms gave the five newly established theater commands operational control over PLARF conventional missile units in their areas of responsibility. New communication links between the theater commands and PLARF bases and brigades appear to supplement existing command and control links between PLARF headquarters and operational units. Chinese press reports suggest that these new communication links initially did not provide full integration between PLARF C2 systems and those of the theater commands, but such integration would logically be an eventual goal.[12]

Much less is known about NC3 arrangements for the PLA navy's nuclear submarine force, which currently consists of six *Jin* class Type 094 SSBNs, each of which can carry 12 JL-2 nuclear missiles. China is also developing a follow-on Type 096 SSBN, which will carry a longer-range missile and may be deployed by 2030.[13] China's SSBN force is based at Longpo Naval Base on Hainan Island. The complex includes a large underground facility which is probably capable of housing several submarines and loading them with missiles.[14] The PLA Navy operates China's SSBNs and would presumably receive alert and launch orders from the CMC and convey those orders to SSBNs on patrol. Communications with SSBNs on patrol are a significant operational challenge, especially if submarines are deployed into deep ocean. The PLA has built a super low frequency (SLF) transmitter capable of communicating with submarines at frequencies of 30–300 hertz, and has also conducted research on extremely low frequency and satellite communications, which would facility communications with SSBNs submerged to 100 meter depths or below.[15] The effectiveness of these naval NC3 systems in an operational environment is unknown. Some analysts assess that the potential unreliability of these communications systems in a crisis or conflict might lead China to pre-delegate launch authority to SSBN commanders and political commissars, although such a decision would be inconsistent with the CCP's emphasis on negative control and insistence on controlling key military decisions.[16]

The PLA Air Force (PLAAF) has designated the air-refuellable H-6N as a nuclear capable bomber that will likely carry air-launched ballistic missiles derived from the DF-21. It is also

reportedly developing a new long-range strategic stealth bomber that would likely also be nuclear capable.[17] Because these systems are not yet operational, there is no definitive open source information on likely NC3 procedures. PLAAF headquarters will likely maintain operation control of these nuclear assets, as they do with other strategic assets such as conventional bombers, some special mission aircraft, transports, and the Airborne Corps.[18] As with the ground-based and sea-based legs of China's deterrent, the CMC would likely issue deployment, alert, and attack orders for air force nuclear systems.

China's development of a nuclear triad and the increasing number of mobile medium-range, intermediate-range, and intercontinental ground-based missiles makes China's nuclear deterrent more survivable, but also poses new challenges for nuclear command and control. First, the navy and air force will need to develop their own operational doctrine, personnel reliability systems, and nuclear warhead handling facilities to support their nuclear operations. Second, SSBNs will likely not be able to follow the PLARF practice of keeping nuclear warheads and missiles demated when they deploy on patrol. China expressed an interest in acquiring permissive action link (PAL) technology that would guard against unauthorized nuclear launches from the United States and Russia, but it is not clear whether currently deployed nuclear systems incorporate such safeguards.[19] Third, the increasing proportion of China's ground-based nuclear force that is mobile (and which would be deployed from garrison in a crisis or conflict) will create new challenges for NC3 systems. Fourth, the deployment of increasing numbers of DF-26 MRBMs, a dual-capable missile capable of hot-swapping between nuclear and conventional warheads, creates challenges in terms of whether brigades equipped with this missile respond to PLARF orders (for nuclear missions) or theater command orders (for conventional missiles).[20] Finally, the growing size, diversity, and complexity of China's nuclear deterrent increases the risk of accidents and the challenge of ensuring effective negative controls that prevent unauthorized use.

Intelligence, Surveillance, and Reconnaissance

The 2015-2016 PLA reforms established a new organization, the PLA Strategic Support Force (PLASSF), which took over responsibility for a range of cyber, space, electronic warfare, and political warfare functions that had previously been scattered throughout the PLA. The PLASSF operates a number of space-based strategic ISR systems and cyber collection capabilities that support PLARF operations.[21] These include electro-optical and synthetic-aperture radar imagery satellites, electronic intelligence (ELINT) satellites to detect electronic signatures, and communications satellites to support PLA operations.[22] Given its ISR responsibilities, the PLASSF likely also operates the PLA's four ground-based large phased-array radar systems, which can potentially be used to track incoming strategic missiles.[23] The PLASSF likely provides information derived from its ISR systems directly to the CMC and PLARF headquarters. It has also established five regional support bases to provide information directly to each of the five theater commands.[24]

In the 2015 Defense White Paper, the PLA discussed its intent to "improve strategic early warning," which would likely involve deployment of a satellite-based system to detect ballistic missile launches.[25] At the time, a RAND study assessed that development of such a system might take a decade.[26] Some analysts suspect that satellite launches in 2015 and 2017 might be part of such a system, but definitive evidence is not available in open sources.[27] In October 2019,

Russia announced its intention to help China develop an early warning system that may include space-based sensors.[28] A satellite-based early warning system would be essential to provide cuing to long-range radars and interceptors if China intends to develop a ballistic missile defense system capable of intercepting incoming ICBMs and SLBMs. It would also be essential if China decides to move toward a "launch-on-warning" doctrine where alerted PLA forces would launch a counter-attack before incoming ICBMs and SLBMs from an adversary first strike landed on Chinese territory.

The PLA navy, air force, and army operate early warning radars, radars associated with surface-to-air missile systems, airborne intelligence collection systems, and unmanned reconnaissance systems that provide ISR support. The air force and navy also operate earning warning systems, such as the KJ-500 aircraft and Yuan Wang space support ships, that extend China's coverage beyond the range of its ground-based radar.[29] According to Shinji Yamaguchi, the 2015-2016 PLA reforms appear to have given the theater commands responsibility for integrating intelligence collected within their area of responsibility. The theater command JOCC intelligence center likely operates some intelligence collection operations directly and integrates information collected and processed by intelligence centers under the theater service component headquarters.[30] Presumably this information is also forwarded to the CMC JOCC for national level use.

Conventional-Nuclear Entanglement[31]

Entanglement refers to a range of circumstances in which the operations of nuclear forces may overlap with those of conventional forces. U.S. scholars have expressed concerns about the degree of entanglement in the PLARF and the potential for this to generate escalatory pressures for possible nuclear use in a conventional conflict.[32] Entanglement may occur across three dimensions: *geographic*, *operational*, and *technological*.[33]

Geographic entanglement refers to a state positioning its conventional and nuclear forces within the same geographic spaces. This can be done in peacetime when conventional and nuclear forces are garrisoned together or in crisis or conflict if conventional and nuclear forces are operating in the same areas.

Operational entanglement refers to a condition in which conventional and nuclear forces are operated by or rely on the same military institutions or practices. Conventional and nuclear forces may be operated by the same personnel, subordinated to overlapping command and control structures, employed with the same operational doctrine, share the same supporting maintenance and logistics infrastructure, or assigned against similar targets and mission sets.

Technological entanglement occurs when the delivery systems of conventional and nuclear forces are identical or indistinguishable. Dual-use weapons systems (such as the DF-26 MRBM) increase a state's technological entanglement as do conventional and nuclear variants of weapon systems (such as the conventional and nuclear variants of the DF-21 MRBM) that exhibit the same detection signatures to adversary ISR assets.

Conventional-nuclear entanglement can introduce escalation risks into a crisis or a conflict in at least three ways: *heightened vulnerability*, *target ambiguity*, and *warhead ambiguity*.[34]

Heightened vulnerability is the risk that attempts to attack a state's conventional capabilities might also erode its nuclear capabilities. If significant enough, these strikes could pose a "use it or lose it" dilemma and create incentives to launch. Even if well short of eliminating the target state's second-strike capability, heightened vulnerability could increase its concerns about the survivability of its nuclear deterrent in the face of a potential adversary first strike.

Target ambiguity refers to a misperception of intentions. An entangled state may be unable to determine whether an adversary's strikes are aimed at its conventional or its nuclear assets. This is particularly true for shared infrastructure and supporting components. If a state believes its adversary might be targeting its nuclear capabilities or its ability to command them, this can heighten pressures to alert forces to increase their survivability (which could potentially be misinterpreted as preparations for launch) or to use them before they are lost.

Warhead ambiguity is the risk of misidentifying an incoming conventional strike as a nuclear one.[35] This escalation pathway results from the targeted state misperceiving an entangled state's conventional missile attack as a nuclear strike. This is especially likely if dual-use delivery systems are being used for a conventional attack. If one side in a conflict misperceives a conventional strike—or preparations for one—as nuclear, this may provide incentives to target the entangled state's nuclear arsenal in an attempt at damage limitation or to utilize one's own nuclear arsenal in the mistaken belief that the nuclear threshold is about to be or has already been crossed. Warhead ambiguity is especially dangerous if a country has a "launch on warning" doctrine.

A recent study found that conventional-nuclear entanglement and resulting escalation risks varied across the PLARF's silo-based ICBMs, mobile ICBMs, and theater ICBMs.[36]

Silo-based ICBMs have the lowest entanglement risks but high escalation risks. Silo-based ICBMs are stationary, mitigating any potential geographic entanglement with China's conventional missile forces. Most of China's silo-based ICBMs are assigned to missile bases which do not command a significant number of conventional missile units. However, to the extent that all Rocket Force units may rely on the same strategic (headquarters to base-level) or operational (base to brigade-level) command and control infrastructure, these units may have some operational entanglement with conventional forces. The basing arrangement, operational practices, and technical features of silo-based ICBMs clearly distinguish them from China's conventionally-armed mobile SRBMs, MRBMs, and IRBMs. However, the escalation risks of inadvertently striking these forces are very high considering their importance to China's strategic nuclear deterrent (ICBMs hold the U.S. homeland at risk) and the fact that several of the silo-based ICBMs carry MIRVs.

Mobile ICBMs have moderate entanglement risks and high escalation risks. Due to their mobility, mobile ICBMs are more likely to be geographically entangled with conventional forces. Mobile ICBMs are assigned to more bases, including bases that have brigades with conventional and dual-use missiles, increasing operational entanglement. The operational

practices and technical features of mobile ICBMs, however, should still largely distinguish them from conventional systems. The escalation risks of inadvertently striking mobile ICBMs are high. China likely highly prioritizes mobile ICBMs; conventional strikes against these forces might be seen as the start of a disarming first strike, before an adversary targets the more visible and vulnerable silo-based ICBMs.

Regional nuclear forces exhibit high entanglement risks but low escalation risks. These forces are mobile and shorter-range, increasing risks of geographic entanglement with conventional systems. They are operated by several missile bases, including the Rocket Force's key conventionally-oriented Base 61 located opposite Taiwan, potentially introducing operational entanglement through overlapping command and control. Some systems, such as the DF-21, have both nuclear and conventional variants; these and true dual-use systems like the DF-26 are more likely to share operational practices and technical features, complicating U.S. efforts at identification and discrimination. Dual-use systems may also share a common logistics and maintenance infrastructure, especially if conventional and nuclear missiles are deployed in a single brigade. However, because China does not depend heavily on these forces for its strategic deterrent, the escalation risks of inadvertently striking a regional nuclear unit are relatively low.

Overall, current conventional-nuclear entanglement in China's land-based missile forces is moderate but less extensive than previous academic analyses have suggested. The extent to which entanglement generates pressures for nuclear use will depend in part on how Chinese leaders value the relative contributions of ICBMs and more entangled theater nuclear forces to its deterrent and on China's perception of the minimum threshold for a survivable nuclear force in the face of a potential U.S. first strike. U.S. strikes which inadvertently destroy a handful of Chinese ICBMs or severely degrade PLARF strategic command and control systems could significantly heighten Chinese threat perceptions and create "use or lose" pressures that encourage nuclear use. At the same time, a larger and more diversified nuclear deterrent, including China's nascent SSBN fleet and future strategic nuclear bomber, could mitigate some of the nuclear escalation pressures experienced by the PLA, though similar risks of conventional-nuclear entanglement may also be present in these other services.

Ongoing trends may increase entanglement in the PLARF in the future. Solid-fueled road-mobile missiles make up an increasing proportion of China's ground-based deterrent, including some with off-road capabilities able to fire without requiring pre-surveyed launch sites. As China retires some of its older silo-based ICBMs and replaces them with mobile ICBMs such as the DF-41 and DF-31AG, the increasing mobility of the ICBM force may increase geographic entanglement.[37]

Trends in command and control may also alter operational entanglement. As discussed earlier, giving the theater commands operational control over conventional missile units will create new command and control arrangements. However, these units are likely to also retain existing (and potentially entangled) command and control channels to PLARF headquarters and bases, since the PLARF will retain administrative control over all missile forces.[38] Recent PLA texts also emphasize the importance of integrating command and control of both conventional and nuclear forces, suggesting that operational entanglement could increase in the future.[39]

New weapons systems may increase technological entanglement. Currently, the relatively clear distinctions between China's ICBMs and its regional nuclear forces help to limit technological entanglement risks at the strategic level. However, if China develops and deploys conventional- and nuclear-armed hypersonic glide vehicles on ICBMs and theater missiles, warhead ambiguity risks could extend beyond the theater to the strategic level. Similarly, the continued growth of dual-use DF-26 forces may further blur the lines between nuclear and conventional systems, especially if DF-26 brigades train for both conventional and nuclear missions. Mixed brigades would significantly increase geographic, operational, and technological entanglement among theater missile forces.

Ballistic Missile Defenses[40]

China's interest in ballistic missile defense (BMD) systems dates back to the Mao era, with an initial research program running from shortly after the PRC's first nuclear test in 1964 until it was cancelled in 1983.[41] Chinese researchers continued to explore the potential impact of the United States' Strategic Defense Initiative (SDI) on China's nuclear deterrent.[42] Despite formal opposition to BMD deployments, which PRC officials regarded as a threat to the viability of China's nuclear deterrent, PRC scientists continued research to understand the underlying technologies and to keep pace with the United States and the Soviet Union.[43] The CMC appropriated funds for a 10-year development plan for a missile defense system in the mid-1990s, including early warning capabilities, a "Patriot-like" surface-to-air missile (SAM) with limited BMD capabilities, and eventual development of longer-range interceptors that provide theater missile defense capabilities.[44] China's BMD research and development efforts have roughly followed this plan of action.

This section briefly outlines China's BMD systems, identifies their respective targets and distribution among the PLA services, and speculates on future deployments. The PRC currently fields numerous Russian-built and indigenous long-range SAM systems that, when combined with advanced interceptors and supporting ISR infrastructure, offer a limited capability against tactical and medium-range ballistic missiles. The Chinese have shown progress on BMD operations, successfully executing a land-based midcourse missile intercept test as recently as February 2021.[45] With further improvements, particularly in space-based launch detection systems, China may eventually be able to target longer-range systems as part of an integrated BMD system.

A comprehensive BMD system typically involves an integrated, "layered" architecture, with each layer targeting the flight profile of a specific category of missile. The most developed aspect of the PRC's BMD system builds upon the radars and SAMs in its existing Integrated Air Defense System (IADS). The OSD 2020 annual report on the Chinese military notes: "The PLAAF possesses one of the largest forces of advanced long-range SAM systems in the world."[46] In addition to fielding advanced Russian SAMs, including the S-300 and S-400, the PRC currently produces its own indigenous long-range SAMs based on modified Russian designs. According to media reports, the HQ-9 has a range of 300 kilometers and a speed of over Mach 4.[47] In the event of a conflict, this system may be able to intercept the U.S. Tomahawk and other cruise missiles. The 2020 OSD report states the Chinese HQ-9 "likely has a limited capability to provide point defense against tactical ballistic missiles."[48] China has also developed

the HHQ-9, a shipborne version of the HQ-9.[49] If successfully integrated with the land-based IADS, destroyers fitted with the HHQ-9 could potentially act as a first line of defense, extending the reach of the IADS offshore.[50]

The HQ-19 is the latest iteration of the HQ-9 system and has completed tests that demonstrate a capability against 3,000 km-range ballistic missiles.[51] Chinese media reports claim the HQ-19 can target missiles in the midcourse and terminal phase of their trajectory with a range of 1,000-3,000 km.[52] The HQ-19 is roughly analogous to the US Terminal High Altitude Area Defense (THAAD) system. China is also pursuing a number of ASAT weapons that have BMD capabilities. A China Aerospace Studies Institute report concludes: "studies on the PRC's BMD program strongly suggest that the PLA might use a BMD program as a cover for ASAT programs given the poor press associated with ASAT tests."[53] China's February 2021 test of a midcourse interceptor could be an extension of completed research on the DN-2 or SC-19 ASAT systems, both of which can engage targets in space. Frequent testing and media reports suggest that the PLA has some capability to engage both short-range and medium-range ballistic missiles, although intercepts of longer-range missiles may be constrained by the speed of the interceptors and by limited PRC launch detection capabilities.

U.S. experience suggests the technical challenges to constructing an effective national missile defense system are significant and that developing and deploying a system capable of reliably intercepting ICBMs is very expensive.[54] Security analysts should continue to monitor Chinese progress toward deployment of a launch-detection system and efforts to develop, test, and deploy systems and technologies with BMD and ASAT capabilities. They should also monitor possible Chinese development and procurement of advanced SAM systems, such as the new Russian-built S-500, which can reportedly target IRBMs, satellites, and hypersonic weapons, and also has a limited capacity against ICBMs.[55] China is also developing a series of indigenous laser weapons that it claims can target IRBMs.[56] Progress in these areas could indicate a shift from technology development and deployment of limited BMD capabilities toward the development of a more ambitious and comprehensive system.

Implications

The expansion and modernization of China's nuclear forces, improvements in NC3 and strategic ISR systems, and the development of complementary conventional strategic capabilities such as accurate conventional ballistic missiles, anti-ship ballistic missiles, hypersonic weapons, counter-space capabilities, and offensive cyber capabilities will give CCP and PLA leaders new options in the event of a crisis or conflict.[57] A full analysis is beyond the scope of this testimony, but it is worth pointing out a few implications tied specifically to the PLA's emerging NC3, strategic ISR, and BMD capabilities.[58]

One important implication is the potential for a shift in China's nuclear policy and nuclear doctrine toward a nuclear war-fighting capability or a launch-on-warning posture. PLA theorists have repeatedly raised the possibility of a shift away from "no first use" toward a more flexible nuclear doctrine that might contemplate nuclear warfighting, only to have CCP leaders end the debate and reaffirm existing policy.[59] However, as Chris Twomey points out, the technological constraints that prevented such a shift have eroded as the PLA has developed more accurate and

more survivable missiles, improved NC3 systems, and strategic ISR that would provide better awareness on a nuclear battlefield.[60] The lack of an operational space-based launch detection system is the principal constraint, and the PLA appears to be taking steps to develop and deploy such a system. A PRC shift away from "assured retaliation" toward a more flexible nuclear doctrine would be a significant change with major implications for the dynamics of a U.S.-China crisis or conflict.

Although a number of analysts and some U.S. officials see a PLA shift toward a "launch on warning" posture and doctrine as likely, I am somewhat skeptical. The CCP has always insisted on tight political control over strategic military capabilities and on making military decisions with important political consequences itself. Given the heightened risks of escalation or accidental nuclear conflict and some degree of civilian distrust of the military, CCP leaders are unlikely to pre-delegate launch authority to the CMC or even to the sole authority of the CCP General Secretary. Despite concerns of some Chinese analysts, the risks of the U.S. launching a disarming nuclear first strike is extremely low and does not warrant the risks inherent in such a shift. There would be considerable value in dialogue to discuss such issues, perhaps even in a trilateral U.S.-China-Russia format that could incorporate lessons learned from Cold War crises and incidents.

A third implication is that conventional-nuclear entanglement is present in the current PLARF posture and may be increasing with changes in the PRC nuclear force structure. This would increase escalation risks in a U.S.-China conflict, especially if the United States conducts strikes into mainland China against PLARF units firing at U.S. bases, ports, and aircraft carriers. The PLA has choices about the degree of future entanglement and could take steps to reduce the extent of nuclear entanglement and to improve crisis management mechanisms. The United States should also improve its ability to differentiate between PLA conventional and nuclear systems and think through its declaratory policy and crisis messaging in advance. Conventional-nuclear entanglement has been discussed in past U.S.-China "Track 1.5" nuclear dialogues, and should also be discussed at the official level.

A final point is to note the interactive nature of U.S.-China strategic competition, and the implications for the nuclear domain. PRC conventional missiles, U.S. missile defenses, and the U.S. and Chinese nuclear arsenals have previously been relatively loosely coupled so that changes in one area did not necessarily prompt major changes in the others. This is no longer the case, as strategic developments appear to be becoming more interdependent and the system is becoming more tightly coupled. This suggests increased—and more complex—strategic competition is likely in the future, and that developments in one side's nuclear and non-nuclear forces (including missiles and missile defenses) may increasingly affect the other side's nuclear force structure and posture.[61]

Recommendations

- Congress and the U.S.-China Economic and Security Review Commission should hold regular hearings and continue to fund academic and open-source research on China's strategic modernization (broadly defined to include nuclear modernization, missile defenses, hypersonic weapons, and other capabilities), and especially on the potential for

strategic competition to change the nature of the U.S.-China relationship and the dynamics of strategic force modernization in both countries.

- Congress and the U.S.-China Economic and Security Review Commission should encourage the administration to conduct and support U.S.-China strategic dialogues at both the official and unofficial levels, including exploration of crisis management mechanisms. Dialogue is critical to understanding the other side's perspectives and conveying strategic messages in a private setting. The PRC side has historically been reluctant to engage on these issues at an official level, but the U.S. government has sometimes created obstacles as well.

[1] Christopher P. Twomey, "China's Nuclear Doctrine and Deterrence Concept," in James M. Smith and Paul J. Bolt, eds., *China's Strategic Arsenal: Worldview, Doctrine, and Systems* (Washington, DC: Georgetown University Press, 2021), 45-62.

[2] M. Taylor Fravel and Evan Medeiros, "China's Search for Assured Retaliation: The Evolution of Chinese Nuclear Strategy and Force Structure," *International Security* 35, no. 2 (Fall 2010), 48–87; Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Strategy and U.S.-China Strategic Stability," *International Security* 40, no. 2 (Fall 2015), 7-50.

[3] Fravel and Medeiros.

[4] Peter D. Feaver, "Command and Control in Emerging Nuclear Nations." *International Security*, 17, no. 3 (Winter 1992/1993), 160–187 and Fionna Cunningham, "Nuclear Command, Control, and Communications Systems of the People's Republic of China," Tech4GS Special Reports, July 18, 2019, 8-9.

[5] Mark A. Stokes, *China's Nuclear Warhead and Handling System* (Arlington, VA: Project 2049, 2010).

[6] For example, see Wu Riqiang, "Living with Uncertainty: Modeling China's Nuclear Survivability," *International Security* 44, no. 4 (Spring 2020), 84-118.

[7] See Phillip C. Saunders and Andrew Scobell, "Introduction: PLA Influence on Chinese National Security Policymaking," in Phillip C. Saunders and Andrew Scobell, eds., *PLA Influence on China's National Security Policymaking* (Stanford, CA: Stanford University Press, 2015), 1-30.

[8] Hans M. Kristensen, "China's Strategic Systems and Programs," in *China's Strategic Arsenal*, 93-124.

[9] The PLA's ground-based missiles were originally operated by the Second Artillery Corps, which was renamed the PLA Rocket Force in military reforms at the end of 2015. For clarity, this testimony uses PLA Rocket Force.

[10] Cunningham, 4-5, 9.

[11] Yu Xijun, ed., *Di'er pao bing zhanyi xue* [*The Science of Second Artillery Campaigns*] (Beijing: Jiefangjun chubanshe, 2004), cited in Cunningham and Fravel, 44-45.

[12] See David Logan, "Making Sense of China's Missile Forces," in Phillip C. Saunders, Arthur S. Ding, Andrew Scobell, Andrew N.D. Yang, and Joel Wuthnow, eds., *Chairman Xi Remakes the PLA: Assessing Chinese Military Reforms* (Washington, DC: National Defense University Press, 2019), 410-412. Also see Roderick Lee, "Integrating the PLA Rocket Force into Conventional Theater Operations," *China Brief* 20, no. 14 (August 14, 2020), 24-31, https://jamestown.org/program/integrating-the-pla-rocket-force-into-conventional-theater-operations/

[13] *Military and Security Developments Involving the People's Republic of China 2020* (Washington, DC: Office of the Secretary of Defense, 2020), 45 and Kristensen, 108-110.

[14] Kristensen, 108-110.

[15] Tong Zhao, *Tides of Change: Nuclear Ballistic Missile Submarines and Strategic Stability* (Washington, D.C.: Carnegie Endowment for International Peace, 2018), 37.

[16] Tong Zhao, 81-82.

[17] *Military and Security Developments Involving the People's Republic of China 2020*, 51 and Kristensen, 110-112.

[18] See China Aerospace Studies Institute, *PLA Aerospace Power: A Primer on Trends in China's Military Air, Space, and Missile Forces*, 2nd edition (Montgomery, AL: China Aerospace Studies Institute, 2019).

[19] See Steve Coll, "The Man Inside China's Bomb Labs," *The Washington Post*, May 16, 2001 and Cunningham, 8-9.

[20] Kristensen, 102-105, 112-115.

[21] John Costello and Joe McReynolds, "China's Strategic Support Force: A Force for a New Era," in *Chairman Xi Remakes the PLA*, 437-515.

[22] *Military and Security Developments Involving the People's Republic of China 2020*, 60-65.

[23] Kristensen, 115-116.

[24] John Chen, Joe McReynolds, and Kieran Green, "The PLA Strategic Support Force: A "Joint" Force for Information Operations," in Joel Wuthnow, Arthur S. Ding, Phillip C. Saunders, Andrew Scobell, and Andrew N.D. Yang, eds., *The PLA Beyond Borders: Chinese Military Operations in Regional and Global Context* (Washington, DC: NDU Press, 2021), 151-182.

[25] *China's Military Strategy* (Beijing: State Council Information Office of the People's Republic of China, May 2015).

[26] Eric Heginbotham, et al, *The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power*, 1996–2017 (Arlington, VA: RAND, 2015), 143.

[27] Kristensen, 116.

[28] Dmitry Stefanovich, "Russia to Help China Develop an Early Warning System," *The Diplomat*, October 25, 2019, https://thediplomat.com/2019/10/russia-to-help-china-develop-an-early-warning-system/ and Military and Security Developments Involving the People's Republic of China, 2020, 89.

[29] "Military and Security Developments Involving the People's Republic of China, 2020," 75.

[30] Shinji Yamaguchi, "Chinese Intelligence, Surveillance, and Reconnaissance Operations in the Near Seas," in *The PLA Beyond Borders*, 127-150.

[31] This section draws upon previous joint research by David C. Logan and the author.

[32] See Thomas J. Christensen, "The Meaning of the Nuclear Evolution: China's Strategic Modernization and U.S.-China Security Relations," Journal of Strategic Studies 35, no. 4 (2012), 447-487 and Caitlin Talmadge, "Would China Go Nuclear? Assessing the Risk of Chinese Nuclear Escalation in a Conventional War with the United States," *International Security* 41, no. 4 (Spring 2017), 50–92.

[33] This framework is adopted from David C. Logan, "Are They Reading Schelling in Beijing? The Dimensions, Drivers, and Risks of Nuclear-Conventional Entanglement in China," *Journal of Strategic Studies*, 2020, DOI: 10.1080/01402390.2020.1844671.

[34] These distinctions are drawn from the terminology of experts exploring similar risks in the U.S.'s conventional prompt global strike program. See M. Elaine Bunn and Vincent A. Manzo, "Conventional Prompt Global Strike: Strategic Asset or Unusable Liability?" *INSS Strategic Forum*, No. 263 (February 2011); and James Acton, *Silver Bullet? Asking the Right Questions About Conventional Prompt Global Strike* (Washington DC: Carnegie Endowment for International Peace, 2013).

[35] James Acton, *Is It a Nuke? Pre-Launch Ambiguity and Inadvertent Escalation*, (Washington, D.C.: Carnegie Endowment for International Peace, 2020).

[36] Logan, "Are They Reading Schelling in Beijing?"

[37] Kristensen, 106-108.

[38] Logan, "Making Sense of China's Missile Forces," 415-417.

[39] The 2017 edition of the NDU Science of Military Strategy appears to call for a further integration of conventional and nuclear systems: "The integration of nuclear and conventional strike capability refers to, in the course of constructing a strategic missile force combat capability, organically integrating nuclear counterattack capabilities and conventional strike capabilities, in order that tactical combat units will be under the command of a unified information platform support and command system." See 肖天亮 (Xiao Tianliang), 战略学 (The Science of Military Strategy), 国防大学出版社 (Beijing: National Defense University Press, 2017), 380-381.

[40] INSS research intern Jake Rinaldi conducted research and wrote an initial draft of this section.

[41] Brad Roberts, *China and Ballistic Missile Defense: 1955 to 2002 and Beyond* (Institute for Defense Analyses, September 2003), 7, https://apps.dtic.mil/sti/pdfs/ADA418710.pdf.

[42] Bonnie S. Glaser and Banning N. Garrett, "Chinese Perspectives on the Strategic Defense Initiative," *Problems of Communism* 35, no. 2 (1986), 30.

[43] Roberts, *China and Ballistic Missile Defense*, 13.

[44] Bruce W MacDonald and Charles D Ferguson, *Understanding the Dragon Shield: Likelihood and Implications of Chinese Strategic Ballistic Missile Defense* (Federation of American Scientists, 2015), 11, https://fas.org/wp-content/uploads/2015/09/DragonShieldreport_FINAL.pdf.

[45] "China Successfully Executes Land-Based Midcourse Missile Interception Technology Test [中国成功实施陆基中段反导拦截技术试验]," Xinhua, February 4, 2021, http://www.xinhuanet.com/politics/2021-02/04/c_1127065881.htm.

[46] "Military and Security Developments Involving the People's Republic of China, 2020," Annual Report to Congress (Office of the Secretary of Defense, n.d.), 52.

[47] "China's Most Advanced Air Defense Missile in Service [中国最先进防空导弹服役]," Tou Tiao, accessed May 22, 2021, https://kknews.cc/zh-my/military/yj2zyxj.html.

[48] *Military and Security Developments Involving the People's Republic of China, 2020*, 73.

[49] "Hai Hongqi-9 (HHQ-9) [海红旗-9]," Wuqi Baike, accessed May 22, 2021, http://www.wuqibaike.com/index.php?doc-view-4726.

[50] Thomas R McCabe, "Air and Space Power with Chinese Characteristics: China's Military Revolution," *Air and Space Power Journal*, Spring 2020, 29.

[51] *Military and Security Developments Involving the People's Republic of China, 2020*, 75.

[52] "The HQ-19 Is Combat Ready and Can Intercept Missiles at a Range of 3,000km. Westerners Speculate This Is Not the Most Sophisticated System [HQ-19 战备值班，可拦截 3000 公里导弹，西方推测这还不是最尖端的]," September 27, 2017, 000, https://baijiahao.baidu.com/s?id=1579669076731520221&wfr=spider&for=pc.

[53] McCabe, "Air and Space Power with Chinese Characteristics: China's Military Revolution," 2.

[54] "US Missile Defense Timeline," Explainer (Union of Concerned Scientists, March 29, 2019), https://www.ucsusa.org/resources/us-missile-defense-timeline.

[55] "Russian S-500 'Space Defense System' to Be Deployed This Year," defenseworld.net, July 3, 2020, https://www.defenseworld.net/news/27340/Russian_S_500__Space_Defense_System__to_be_deployed_this_year#.YKp2RGb0k0p.

[56] "What Is the Power of China's Laser Weapons: They Can Burn through Intercontinental Missiles, and They Can Target Satellites. [中国激光武器威力如何：能烧穿洲际导弹还能反卫星]," Sina Military News, February 13, 2019, http://mil.news.sina.com.cn/jssd/2019-02-13/doc-ihqfskcp4741744.shtml.

[57] On the latter point, see Phillip C. Saunders and David C. Logan, "China's Regional Nuclear Capability, Non-Nuclear Strategic Systems, and Integration of Concepts and Operations," in *China's Strategic Arsenal*, 125-157.

[58] For a more comprehensive look, see Smith and Bolt, *China's Strategic Arsenal*.

[59] For an example, see Alastair Iain Johnston, "China's New 'Old Thinking': The Concept of Limited Deterrence," *International Security* 20, no. 3 (Winter 1995/96), 5–42. For an updated assessment, see Twomey, "China's Nuclear Doctrine and Deterrence Concept," 45-62.

[60] Twomey, "China's Nuclear Doctrine and Deterrence Concept," 45-62.

[61] See Phillip C. Saunders, "The Military Factor in U.S.-China Strategic Competition," forthcoming in Evan S. Medeiros, ed., *Managing Competition: Rethinking U.S.-China Relations in the 21st Century*.

OPENING STATEMENT OF MARK HIBBS, NONRESIDENT SENIOR FELLOW, CARNEGIE ENDOWMENT FOR INTERNATIONAL PEACE

COMMISSIONER WONG: Dr. Saunders, thank you very much. Our third witness is Mr. Hibbs.

MR. HIBBS: I wish to thank the Commission for its invitation to speak at this hearing today. China began pursuing nuclear science applications 70 years ago for both nuclear weapons and peaceful uses. The most important of the peaceful-use applications is power generation.

Today, there are four main reasons why China's peaceful-use nuclear development raises questions with respect to protecting the U.S. national interest against the challenges from MCF. First, nuclear materials, equipment, and technology are inherently dual use, meaning they can be deployed for both nuclear weapons and for peaceful-use nuclear applications. Secondly, China's central government exerts a high degree of control over both peaceful and non-peaceful nuclear development. Third, China has relied greatly upon foreign technology inputs, including from the U.S., to replicate the achievement of advanced nuclear countries. And, lastly, China's nuclear power program is at a crossroads and decisions that the Chinese will make about its future direction could have implications for the future production of nuclear materials for its nuclear weapons program.

That said, facing these concerns, there are reasons to believe that the United States should be capable of defending its interests in competition with China, given the following background. The dual use nature of nuclear trade has informed U.S. negotiation of a bilateral nuclear cooperation agreement with China since the 1980s. Significant nuclear cooperation by U.S. entities with China is not permitted under U.S. law outside the confines of this agreement. Centralized decision making in China concerning all nuclear activities is a long-time historical reality. It is not a recent development.

China has been a nuclear weapons possessor state since 1964. Should China, in the future, expand its production of nuclear weapons, it would not require any technology or assistance from the United States or any other foreign country. Predictions about the future of Chinese nuclear weapons building are and remain speculative, but, in any case, China has sufficient weapons plutonium inventories and uranium enrichment capacity and knowhow to significantly increase its arsenal of nuclear weapons without resorting to capacity additions, to the use of foreign supply technology, or the diversion of nuclear material from its nuclear power program.

A future decision by China to produce more nuclear weapons material, especially if production relies on technologies heretofore used or planned by China for electricity production might, for reasons we can discuss, set back its efforts to strengthen nuclear security and to educate Chinese scientists in foreign countries. In that regard, it's also unlikely, in my view, that China would violate its bilateral agreement with the United States to produce nuclear weapons material that it could make by itself.

The Chinese bilateral agreement that I refer to since the 1990s has been reviewed and amended to address emerging concerns raised by the Congress about the risk of nuclear non-proliferation in China, particularly the concerning plutonium production and the protection of U.S. intellectual property. If there will be a greater focus on MCF by the U.S. government, that may warrant lawmakers and the Executive Branch to further review the terms and implementation of bilateral trade understandings with China, including the nuclear cooperation agreement I mentioned specifically with regard to Chinese peaceful-use assurances and U.S. end user verification for items exported to China and, importantly, for the identification of China's

technology requirements, both nuclear and non-nuclear, for military nuclear applications, including naval propulsion. Congress may also want to review the record, including the recent record, of U.S.-China bilateral nuclear R&D and technology cooperation to draw lessons in the national security interest.

The extent to which Chinese MCF will challenge the United States' nuclear industry will depend on the degree of the U.S. industry's future engagement in the Chinese nuclear power program. In my view, the U.S. industry in the future may be less at risk in China because it is likely, for reasons that I will explain if we discuss, the U.S. industry will become less engaged.

In addition, the Chinese themselves will have fewer demand for foreign inputs, including from the United States, as it deploys increasingly technologies for which it can claim ownership of the intellectual property.

On balance, I would say that U.S. vigilance is warranted about MCF in the civilian nuclear sector. But compared to some other areas, nuclear cooperation may be less of a challenge in this field because of its essential dual use nature, which has informed U.S. interactions with China for many years.

The U.S. and other states already have fairly robust mechanisms in place, including the agreement, bilateral agreement, with China and the United States, to prevent nuclear cooperation that could assist the PLA because the potential for MCF is inherent in the dual-use nature of the technology.

Finally, I would just add that there is so far no publicly-available evidence to support the conclusion that future nuclear power activities in China, including the operation of fast reactors, would be devoted toward the nuclear arsenal. If Chinese capacity to produce plutonium is a concern for the United States government, then the U.S. government should pursue discussions to clarify China's intention. More generally, the U.S. government should intensify engagement with other nuclear weapon states toward the goal of nuclear arms reductions, considering issues of missile defense and the comparatively modest size of China's nuclear weapons inventory, such to discourage China from expanding its future nuclear weapons production.

Thank you for this invitation.

PREPARED STATEMENT OF MARK HIBBS, NONRESIDENT SENIOR FELLOW, CARNEGIE ENDOWMENT FOR INTERNATIONAL PEACE

CARNEGIE
ENDOWMENT FOR
INTERNATIONAL PEACE

Congressional Testimony

China's Nuclear Forces

Mark Hibbs
Nonresident Senior Fellow
Nuclear Policy Program
Carnegie Endowment for International Peace

Testimony before the U.S.-China Economic and Security Review Commission

June 10, 2021

The United States government in recent years has paid greater attention to the status of military-civil fusion (MCF) in China's economic and technological development and its potential implications for U.S. trade and cooperation with China. In a hearing conducted by the U.S.-China Economic and Security Review Commission on June 7, 2019, participants documented and discussed this concern regarding a number of specific industry and technology areas.[1] Today I will consider some aspects of China's peaceful use of nuclear energy, including China's cooperation with U.S. government and industry in this field, in the light of the Commission's concern about MCF.

Military-civil integration, according to Chinese state media, was "upgraded to a national strategy in March, 2014."[2] Nuclear cooperation between the United States and China began more than twenty years before this date, and it has continued to the present; MCF, depending on how it is conceptualized or defined by U.S. government agencies,[3] may therefore be pertinent to the appropriation or diversion of nuclear technology, equipment, and materials, developed or acquired for the peaceful use of nuclear energy, to make nuclear weapons, and especially, nuclear weapons materials.

Nuclear technologies and materials are relevant to considerations of MCF because they are inherently dual-use: They can be employed for making nuclear weapons and/or for generating electricity. Furthermore, some nuclear-related technologies may be useful to other military uses, such as naval nuclear propulsion.

In light of the dual-use nature of nuclear technology and materials, since the end of World War II the United States led the way in the creation of a multilateral governance framework to control the spread of sensitive nuclear items from nuclear-armed states to states that do not have nuclear weapons. Most countries that developed nuclear energy and nuclear weapons joined the U.S. in this effort. China supported these efforts beginning in the mid-1980s, when it joined the International Atomic Energy Agency (IAEA), the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the NPT's Zangger Committee for nuclear export controls, and the Nuclear Suppliers Group (NSG), a global export control association of the world's leading vendor countries for nuclear technology, materials, and equipment. It was not a coincidence that China joined these critical multilateral organizations and mechanisms after the Chinese central government decided to establish a nuclear power industry in China.

Both China and the U.S. are recognized by the NPT as nuclear weapon-possessor states. While Article I of the NPT prohibits a nuclear-armed state from transferring nuclear weapons to any recipient, in practice the international trade elements of the global nonproliferation governance system, including both the NPT and the NSG, are primarily concerned with the threat of

[1] https://www.uscc.gov/hearings/technology-trade-and-military-civil-fusion-chinas-pursuit-artificial-intelligence-new
[2] http://eng.chinamil.com.cn/view/2017-01/23/content_7462990.htm
[3] https://cset.georgetown.edu/wp-content/uploads/CSET-Assessing-the-Scope-of-U.S.-Visa-Restrictions-on-Chinese-Students.pdf p. 23

uncontrolled spread of sensitive nuclear technologies, materials, and equipment to states that are not already nuclear-armed.

Nuclear commerce between China and the U.S. is governed by a bilateral Agreement Between the United States and the People's Republic of China Concerning Peaceful Uses of Nuclear Energy. This agreement has a 30-year term and was renewed by the U.S. government on 29 October 2015. The agreement has been amended twice: once during the period 1985-1998, and again prior to its renewal in 2015, in part to address specific concerns by Congress and the Executive Branch about China's potential use of U.S.-origin technologies in its nuclear weapons program.[4]

A Dual-Use Industry

China has pursued mastery of nuclear technology for civilian and military purposes for seventy years. Over this period, peaceful-use and defense interests coexisted in critical Chinese nuclear energy organizations, all of which were ultimately controlled by the Chinese central government and the Chinese Communist Party (CCP). In some cases, control may have been indirect through government personnel who were party members. Whereas the People's Liberation Army (PLA) reported directly to the CCP, China's nuclear laboratories reported to government ministers.

Chinese scientists in R&D and academic organizations were initially interested in the peaceful uses of nuclear energy; after the Chinese Politburo decided in 1955 to produce nuclear weapons, many scientists were put to work on China's nuclear weapons program. After China successfully tested a nuclear weapon in 1964, the Cultural Revolution interrupted nuclear power development; China began building nuclear power plants only during the 1980s, following decisions by the state and CCP to launch a massive modernization drive for China.

As in the other NPT nuclear weapon states after World War II, including the U.S., in China development of nuclear technology for electric power and other peaceful uses relied upon the cadres of scientists and engineers that had established the foundations of China's nuclear defense program. Maoist China was a rigidly, centrally controlled state; from the outset, only organizations controlled by the Chinese state were involved in nuclear power development and deployment. This is still the case today. Beginning in the 1970s Chinese leaders advocated nuclear power to overcome increasingly crippling energy shortages, and nuclear scientists articulated an R&D vision to strengthen China's energy independence and use uranium and plutonium to generate nuclear power for hundreds of years. Since the 1980s China has promulgated official "strategic plans" for nuclear power development that suggest that, next to defense, the provision of nuclear power is a quasi-strategic activity. Secondarily, the government's resolve to assign organizations and cadres responsible for nuclear weapons production the role of developing nuclear power was consistent with its desire during the 1980s under "modernization" to allocate

[4]An excellent account of the history and contents of the agreement was published by the Congressional Research Service in 2015: https://fas.org/sgp/crs/row/RL33192.pdf

resources, on margin, away from China's defense sector and into industrial applications that would aid national development and generate national wealth.

The dual-use nature of nuclear science was reflected in the shared peaceful-use and nuclear defense functions of organizations responsible for China's production of nuclear fuel materials; these materials were associated with nuclear reactors (both for production of weapons plutonium and for power generation) and with uranium enrichment plants (both for production of reactor fuel and for nuclear weapons material). As was the case in all other NPT nuclear weapon states, scientists and engineers trained in Chinese universities and academies have found employment in nuclear defense-related establishments and/or organizations and companies focused upon peaceful uses of the technology. The science behind nuclear peaceful uses and nuclear defense applications is identical; as in other states, personnel may cross over between peaceful and non-peaceful employment.

Since the genesis of China's nuclear program, the most important nuclear industry organization in China, responsible for peaceful applications and also for producing nuclear materials for non-peaceful uses, has been the China National Nuclear Corporation (CNNC), one of two large state-owned enterprises (SOE) that dominate the Chinese nuclear power landscape. CNNC, its subsidiaries, and affiliated companies have long been responsible for the processing and production of nuclear fuel for both peaceful and military applications in China. They are also deeply engaged in technology R&D, waste management, nuclear power engineering, and nuclear power plant construction. In 2020 the U.S. Department of Defense included CNNC on a list of 20 Chinese companies linked to the Chinese military, as required by the 1999 National Defense Authorization Act.[5] A second large nuclear SOE, China General Nuclear (CGN), was established during the 1990s by the Chinese state to function separately from CNNC, initially to partner with foreign, especially French, industry in the development, construction and operation of modern nuclear power plants. Over the last three decades, CGN has grown in size and stature, and it has objected to CNNC's tight grip over activities in the nuclear fuel cycle.[6] In 2018, NNSA and the U.S. Department of Energy issued a "presumption of denial" for nuclear export license applications to CGN, its subsidiaries, and related entities.[7] In 2019, the U.S. Department of Commerce included CGN on its Bureau of International Security Entity List.[8]

Some institutions also have specific dual-use histories. A CNNC affiliate, the China Institute of Atomic Energy (CIAE), has long played a leading role in the development of new and advanced nuclear fuels. Beginning in the 1950s, its scientists "concentrated largely on basic research and the

[5] https://www.axios.com/defense-department-chinese-military-linked-companies-856b9315-48d2-4aec-b932-97b8f29a4d40.html

[6] Mark Hibbs, *The Future of Nuclear Power in China*, Washington, D.C.: Carnegie Endowment for International Peace, 2018, p. 75.

[7] https://www.energy.gov/sites/prod/files/2018/10/f56/US_Policy_Framework_on_Civil_Nuclear_Cooperation_with_China.pdf

[8] https://asia.nikkei.com/Economy/Trade-war/US-adds-China-s-biggest-nuclear-company-to-entity-list

development of peaceful uses of atomic energy" including research reactor projects. However, "at some point before July 1960 the Defense Science and Technology Commission [a central government agency] turned to the Institute of Atomic Energy to initiate research and development" on production of uranium hexafluoride (UF6), which was needed for China's nuclear weapons program.[9] When China launched its nuclear power program in the 1980s, CIAE was again assigned a key strategic role, for R&D activities for the development of future fast reactors, including for the plutonium fuels that would eventually be needed for these reactors.

China continues to confine participation in nuclear energy activities to selected organizations, led by CNNC and CGN and their related entities. In recent years, the Chinese state has allowed more firms to invest in the ownership of new nuclear power plant projects, in particular cash-rich utility companies from the country's non-nuclear electric power sector; they might not have a key role in strategic decision making about technology development, procurement, or deployment. For companies involved in strategic industrial production including nuclear power, the CCP is involved in all top-level personnel decisions. Senior SOE managers are promoted into central and provincial governments where they retain influential links to the companies. SOEs have a CCP hierarchy parallel to the management hierarchy in which the party secretary may have more authority than senior managers. That said, since the 1990s, the corporatization of China's electricity industry sector has to a certain extent challenged the authority of the CCP at the business management level. [10]

Foreign Cooperation

During two distinct phases beginning in the 1980s, China relied upon cooperation with foreign countries to develop nuclear power. For most of this time, it would appear that conventional expectations in the U.S. and other Western governments and industry were that China's political relations with these countries would over time normalize and intensify in step with China's economic globalization. Concerns about the potential for foreign-supplied technologies aiding China's nuclear weapons program were presumably dampened by the relative stasis in China's nuclear weapons enterprise. During the 1980s and 1990s, China implemented "boutique" projects to build modern, commercial-scale nuclear power plants, in partnership with experienced foreign companies from Canada, France, and Russia. The foreign firms, backed by their governments, helped China build and operate the power plants. These foreign firms, all government-owned, also assumed the project risk. Separately and in parallel, private U.S. industry set up what became a more long-trajectory partnership with Chinese firms in support of China's aim to acquire intellectual property and know-how for design and construction of modern nuclear power plants based on the pressurized water reactor (PWR) model. In previous decades, U.S. industry already had transferred such knowhow to Japanese and European firms, and China represented an important new market. Under U.S. law, until 1998 U.S. companies were not

[9] John Wilson Lewis, Xue Litai, *China Builds the Bomb,* Stanford University Press, 1988, p. 99
[10] Mark Hibbs, *The Future of Nuclear Power in China;* Washington, D.C.: Carnegie Endowment for International Peace, 2018, p. 64

permitted to engage in significant nuclear cooperation with Chinese entities because there was no bilateral nuclear cooperation agreement in force between the U.S. and China.

The nature of China's foreign nuclear power cooperation changed significantly after 2003-2005. Then, China's central government dramatically accelerated its plans to deploy power reactors in China, increased domestic investment to support nuclear power plant construction, and organized a competition among foreign vendors for what was widely touted would become the technology blueprint for a massive future nuclear power program in China. In 2006, China selected Westinghouse Electric Company to build an initial four nuclear power plants based on its AP-1000 design. It was widely believed that Westinghouse clinched the deal in part because it was more generous than French and Russian competitors in its offer of technology transfer to China.

During construction of the reactors, problems arose in the U.S.-China commercial relationship. By 2010, Westinghouse faced what sources in China described as a decision between trying to remain in the Chinese market for future new reactor projects, or instead focusing on providing services for future Chinese reactors. Strategic dilemmas for U.S. firms were affected by two developments: the 2011 severe accident that destroyed three nuclear power reactors in Fukushima Dai-Ichi in Japan, which led to a significant reduction in expectations for future nuclear construction in China; and China's unveiling of a new "indigenous" PWR design, the HPR-1000, representing a further iteration of technology previously developed by industry in France and the U.S. During the 2010s, advocates in the Chinese government and industry favoring the deployment of HPR-1000 would begin to challenge Westinghouse's future market prospects in China.

Westinghouse's status in China was further compounded by revelations that China's military had stolen the U.S. firm's nuclear engineering knowhow. In May, 2014 the U.S. Department of Justice (DOJ) charged a PLA officer on counts of cyber espionage; DOJ asserted that he "stole confidential proprietary technical and design specifications for pipes, pipe supports, and pipe routing within the AP-1000 plant buildings," and also purloined Westinghouse internal e-mails relating to its negotiation with its Chinese counterpart for supply of future nuclear power plants. According to DOJ, Westinghouse was one of several U.S. companies in various industries that were targeted by Chinese spies.[11] According to media reports, in 2016 the U.S. government was preparing to charge others in an investigative case that appeared to show that a Chinese nuclear firm had hired former Westinghouse personnel to steal the U.S. company's information.[12] In October 2018 the DOJ also charged that officers from Russia's GRU intelligence agency likewise had hacked into computer files at Westinghouse.[13]

[11] https://www.justice.gov/opa/pr/us-charges-five-chinese-military-hackers-cyber-espionage-against-us-corporations-and-labor

[12] https://www.post-gazette.com/business/powersource/2017/04/05/Trump-Chinese-Westinghouse-toshiba-pittsburgh/stories/201704050137

[13] https://www.scmp.com/news/world/united-states-canada/article/2167065/us-indicts-russians-hacking-nuclear-company

By 2017 Westinghouse had in addition suffered blows from troubled nuclear power plant projects in the U.S. and filed for Chapter 11 bankruptcy protection under U.S law. The administration of President Donald Trump reportedly intervened to prevent Chinese interests from acquiring Westinghouse through third parties, after the U.S. had concluded that China might acquire "national security sensitive" technology through such a transaction.[14]

Separately, in April 2016, the DOJ charged a naturalized U.S. citizen born in China, Ho Szuhsiung, with having perpetrated espionage on behalf of the Chinese SOE CGNPC, a subsidiary of CGN, between 1997 and 2016. According to DOJ, Ho illegally sought technical information for an array of items including nuclear reactors, computer codes, and nuclear fuel technology, with the intent of using purloined information in China.[15]

After a period of forty years, the fruits of U.S investment in China's nuclear sector appear to be modest, while market prospects remain highly uncertain. China obtained considerable know-how assistance from the U.S., but cooperation in new projects has stalled since the 2010s. Most recently, a partnership between CNNC and TerraPower, a venture financed by Microsoft founder Bill Gates, to develop an advanced experimental power reactor project that many experts describe as a fast reactor, was closed down.

The U.S. was not alone during the 2010s in raising concerns about the national security implications of cooperation with China in nuclear peaceful-use activities. Several years after France and China in 2006 had agreed in principle that French industry would construct a large-scale plant to reprocess power reactor spent fuel in China, the French government conditioned the future export upon specific actions China must take concerning the siting and operation of the plant to prevent the project from assisting China's military.[16] In the United Kingdom, the government's enthusiasm during the 2010s for including CGN as a major participant in the UK's nuclear power sector has been challenged by rising concern about potential information security and geopolitical risk.[17]

In October 2018, the U.S. government announced that it had completed an internal policy review of U.S. approvals for applications for nuclear equipment and nuclear technology transfers to Chinese entities. The review established the policy to consider for approval requests related to existing and ongoing cooperation between U.S. and China regarding light-water reactors: but it also set forth that a "presumption of denial" would govern requests for transfers concerning small and medium-size/modular reactors (SMR), non-light-water advanced reactors, and any Chinese light-water reactor competing with U.S. models, including China's "indigenous" HPR-

[14] https://www.post-gazette.com/business/powersource/2017/04/05/Trump-Chinese-Westinghouse-toshiba-pittsburgh/stories/201704050137
[15] https://www.justice.gov/opa/pr/us-nuclear-engineer-china-general-nuclear-power-company-and-energy-technology-international
[16] Mark Hibbs, *The Future of Nuclear Power in China*, p. 81.
[17] https://www.csis.org/analysis/hitachis-exit-compounds-geopolitical-complexity-uk-plan-revitalize-its-nuclear-fleet

1000 design. SMRs were included in the denial policy in part over concern that CNNC was responsible for development of PWR technology for both civilian power generation and for naval propulsion, and in the wake of discussion during the 2015 U.S. government review of the U.S.-China nuclear cooperation agreement, about whether pump technology associated with Westinghouse PWRs built in China could be diverted by China for use in naval propulsion.[18]

Three decades after U.S. nuclear power companies took aim at the Chinese market, their prospects in China appear to have considerably diminished. Future U.S. business may decline in part because China now owns the rights to use intellectual property in China for technology developed by Westinghouse, and also because China has begun deployment of its "indigenous" advanced PWR. In the wake of the Fukushima accident in Japan, China may build 200 fewer power reactors by mid-century than had been anticipated in 2005 when China's nuclear power drive began. Concern has also been raised about the risk posed by Chinese government-directed efforts to obtain proprietary know-how.

The Future of Nuclear Materials in China

China is now at a crossroads in its long-term development plan for the peaceful-use of nuclear energy that may be relevant to considerations about MCF. Beginning in the 1980s, China's nuclear R&D sector, supported by the central government, established a "three-step" development plan for nuclear power in China. Step one called for the deployment of conventional PWR-type nuclear power plants such as those in most countries including the U.S. Step two foresees the use of fast reactors including "breeder" reactors. These are to be fueled initially with the plutonium generated during operation of China's PWRs using uranium fuel and recovered through reprocessing of the spent fuel. In addition, China may use some recovered plutonium as fuel for its PWRs. China plans to make a transition from the PWR to the fast reactor from now until about mid-century. Amidst speculation that China will increase the size of its nuclear weapons arsenal, it is plausible, though not necessarily likely, that ongoing technological development of China's nuclear power enterprise might further augment China's nuclear weapons program.

Nuclear Power Materials

With a few exceptions, China's nuclear power program is based on light water reactor technology, similar to the United States. China's PWRs are all fueled with uranium dioxide (UO2). China's power reactor population currently stands at just under 50 units, and may expand to 100 or more sometime after 2030. Over time, these reactors will give rise to increasing amounts of irradiated or "spent" fuel. Today, China's spent fuel inventory is approximately 10,000 metric tons heavy metal (MTHM); depending on assumptions the discharged amount could increase by

[18] https://www.uscc.gov/sites/default/files/8.13.08Mladineo.pdf

2050 to 110,000 MTHM.[19] (By comparison, the cumulative current spent fuel inventory in the U.S. based on operation of about 100 power reactors over a period of nearly seventy years is about 83,000 MTHM.[20]) Whereas in the U.S. spent fuel is stored and (in theory) will be disposed of in a geological repository, China has plans to reprocess the spent fuel to recover the uranium and plutonium (generated in the spent fuel during reactor operation), and use the recovered plutonium for fuel in future fast reactors. However, these plans are moving forward prudently: so far, China has separated very little of its power reactor spent fuel. Nearly all of it is stored at reactor sites.

Nuclear Weapons Materials

According to open-literature accounts, China currently is not producing nuclear material—uranium or plutonium—for use in nuclear weapons. When China embarked on nuclear weapons-making in the 1950s it pursued both uranium enrichment, using gaseous diffusion technology, and plutonium production, using reactors and reprocessing. China set up two industrial complexes, each with a so-called "production" reactor to generate plutonium in spent fuel, and a chemical reprocessing plant to separate the plutonium. The first complex, in Gansu Province, began operating in the 1960s. The second complex, in Sichuan Province, began operating in the 1970s. When the Soviet Union withdrew support for China's nuclear program in January 1960, China experienced some difficulties in operating the facilities but eventually learned how to overcome problems. Because of these difficulties, China did not utilize plutonium until its eighth nuclear weapon test, carried out in 1968, four years after China's initial test using enriched uranium. Both plutonium complexes were closed permanently in the mid-1980s.[21]

How much plutonium China produced before these facilities were closed, and how much it has used in nuclear weapons is not publicly known. According to unofficial reports, the U.S. DOD in 1999 estimated China's defense plutonium inventory as between 1.7 MT and 2.8 MT; non-official estimates reported by the Stockholm International Peace Research Institute, by the Union of Concerned Scientists, and most recently by researchers at Harvard University place the total production between 2 MT and 6 MT, 2 MT and 5 MT, and between 2.3 MT and 3.5 MT, respectively.[22]

Some observers have speculated about China's future nuclear weapons production, following a report from the US DOD in 2020 that estimated the number of nuclear weapons in China's

[19] https://www.stimson.org/2020/spent-nuclear-fuel-china/ The inventory of spent fuel in 2016 was reported at 5,850 MTHM, with 48 power reactors in operation.
[20] https://www.energy.gov/ne/articles/5-fast-facts-about-spent-nuclear-fuel
[21] Lewis and Xue, p. 113.
[22] D. Albright, F. Berkhout, and W. Walker, *Plutonium and Highly Enriched Uranium 1996; World Inventories, Capabilities, and Policies,* Stockholm International Peace Research Institute/Oxford University Press, 1997, p. 77; Hui Zhang, *History of Plutonium Production in China,* Project on Managing the Atom, Harvard University https://www.belfercenter.org/sites/default/files/files/publication/ChinaPu-INMM2017-hzhang.pdf; David Wright and Lisbeth Gronlund, Estimating China's Production of Plutonium for Weapons, January 16, 2003 https://www.ucsusa.org/sites/default/files/2019-09/china_pu_production-revised-011603_1.pdf

current nuclear weapons arsenal as in the "low 200s" and predicting that China will double the number of its nuclear weapons without producing more nuclear material.[23]

Should in the future China decide to increase its nuclear weapons arsenal it would not need to produce additional fissile material to double the size of the arsenal. China's decision making would be relevant to a consideration of the possible status of MCF in China's defense nuclear sector, because the technology options available to China for production of nuclear weapon material are currently used or are under development to produce electricity and power reactor fuel.

Existing Plutonium Inventory: In principle, China could draw down its existing plutonium inventory. Assuming that Chinese weapon designs required eight kilograms per weapon (an extremely conservative estimate from the IAEA using a measure for a "threshold quantity" of elemental plutonium for one nuclear weapon), China might be able to produce an additional 200-350 nuclear weapons using its estimated plutonium inventory. A less conservative and likely more accurate estimate, based open source information about nuclear weapon design requirements, would be that China might be able to produce between 400 and 800 nuclear weapons using this material. These figures are within the bounds of open-source citations of DOD's estimate of the future size of China's nuclear arsenal, meaning that it is quite plausible that China would not in the future require production of additional fissile material for nuclear weapons and thus not seek to draw upon technologies or materials used in its civil nuclear power program.

Uranium enrichment: China enriched uranium to weapon-grade beginning in 1964 at a plant in Lanzhou and also at a second plant in Sichuan during the 1970s. Both plants were based on gaseous diffusion technology. China likely halted production of weapons grade uranium in 1987, roughly at the same time that China had likewise ceased operation of its dedicated reactors for plutonium production as discussed above.[24] Separately, China has set up uranium enrichment plants based on gas centrifuge technology, which provide low-enriched uranium fuel for its nuclear power reactors. I have not found any open-source literature asserting that China has resumed production of uranium for weapons. According to one non-official estimate, as of the late 1990s China may have accumulated perhaps 15-25 MT of weapon-grade uranium; according to this estimate, that amount would suffice to produce perhaps at least 500 nuclear weapons.[25] A researcher at Harvard University in 2015 reported that China is operating one centrifuge enrichment plant in Sichuan Province for "military or dual-use" purposes to enrich uranium for non-weapons applications.[26] In principle, China could use existing or future uranium enrichment capacity for production of future nuclear weapons material.

[23] https://www.armscontrol.org/act/2020-10/news/pentagon-warns-chinese-nuclear-development

[24] Mark Hibbs and Ann Maclachlan, "China Stops Production of Military Fuel; all SWU Capacity now for Civil Use," *Nuclear Fuel,* 13 November, 1989.

[25] Albright, Berkhout, and Walker, p. 129-130.

[26] Hui Zhang, China's Uranium Enrichment Capacity: Rapid Expansion to Meet Commercial Needs, Belfer Center for Science and International Affairs, Harvard University, 2015, p. 28.

Production Reactor: China could plausibly increase its plutonium inventory by building and operating a new plutonium production reactor. China has built and operated two such reactors between the 1960s and the mid-1980s. China initially encountered difficulties in operating these facilities, but China since 1980 has accumulated considerable reactor design, construction and operating experience, and today should have no problem in constructing and then effectively operating a new reactor. Unofficial estimates would suggest that each of the two former reactors may have been rated at several hundred megawatts (thermal); A new reactor, rated at between 250 and 500 MW (thermal) might, depending on assumptions, be able to generate between 50 and 100 kilograms of weapons plutonium per year—sufficient for perhaps between 10 and 20 nuclear weapons per year. Alternatively, China could repurpose an existing Chinese research reactor to operate in a mode to favor production of weapon-grade plutonium.

Fast reactor: China could in principle construct and operate a fast reactor to "breed" plutonium, by irradiating a fertile material in the "blanket" that surrounds the core of such a reactor, giving rise to plutonium by neutron capture. Since the 1980s, China has aimed to develop future industrial-scale fast reactors for power generation. According to China's R&D blueprint for its future nuclear power development, by about 2050 China aims to design, construct, and operate a series of fast reactors with the goal of effecting a transition from the PWR to the fast reactor for power production. In principle the fast reactor would be able to "breed" more plutonium than would be consumed during routine operation, and thereby generate more nuclear fuel for an expanding fleet of fast reactors. It is also plausible that some plutonium from the fast reactor cycle could be utilized for nuclear weapons.

China's fast reactor program has benefitted from Russian assistance, particularly in the design and construction of a pilot fast reactor and a pilot reprocessing plant completed a decade ago. During the late 2000s following the establishment by the U.S. of the Global Nuclear Energy Partnership program for international nuclear cooperation, China and the U.S. initiated a technical cooperation that considered the development of fast reactor metallic fuels.[27] Currently, China is constructing two 600-MW (electric) fast reactors. In doing this, China appears to be replicating the efforts of other advanced nuclear countries, including the U.S., during the last century to establish the fast reactor on an industrial-scale and commercial basis. Challenges of cost and technology-related risk severely set back these efforts in France, Germany, Japan, the United Kingdom, and the United States. Current efforts are ongoing in India and Russia. The plan for constructing China's first industrial-scale prototype fast reactor was announced in 2005, perhaps between seven and twelve years before China likely decided to step up nuclear weapons production.[28]

[27] Mark Hibbs, *The Future of Nuclear Power in China*, Washington, D.C.: Carnegie Endowment for International Peace, 2018, p. 47.

[28] Hibbs, p. 29-30. China's 2005 Medium- and Long-Term Plan for Development of Nuclear Energy set forth that China, after commissioning its pilot-scale fast reactor (CEFR), by 2025 would construct a prototype industrial-scale unit. The decision to begin reactor construction was preceded, and may have been delayed, by internal debates about

Implication for U.S. Interests

The subject of MCF is relevant to a consideration of China's future peaceful-use nuclear development and its implications for the United States: Nuclear technology and materials are inherently dual-use, implying that items used for peaceful applications may be used for military applications. Chinese experts trained in universities and academies may find employment in either the defense or the peaceful-use sectors. In China the boundaries between the two sectors may be fluid, including within critical organizations responsible for nuclear materials management. Whereas in the U.S. private industry companies prevail in the nuclear power sector, until now China's central government has maintained control over strategic decision making in China's nuclear program, for both energy production and weapons. The Chinese central government and the CCP will take decisions on how and when China will deploy technology to manage its growing power reactor spent fuel inventory and to attempt to affect a transition from conventional PWR technology toward fast reactor technology.

In parallel, China will take decisions about its nuclear weapon requirements. The estimates of future Chinese nuclear weapons production prompting the concern of the Committee are speculative. Should China in the future seek to double its nuclear weapons arsenal, China could achieve this without resorting to new capacity investments. In any case, China would not require technology or equipment from the U.S. or other foreign countries to produce more nuclear weapons materials, and it is unlikely that China would violate a legally-binding agreement with the U.S. to produce nuclear material that it could make by itself. [29]

China's leadership knows that international cooperation with foreign governments and industries has been essential to the success of China's nuclear power development because China had replicated the prior achievement of advanced nuclear countries including the U.S. Without the help of foreign states and industries, China's achievement would not have been possible. (This is in contrast to India, which is nuclear-armed but for three decades subject to international nuclear trade restrictions, and which despite 60 years of effort has been challenged to develop an indigenous and modern nuclear power infrastructure). Including for reasons of foreign cooperation, and because China aims to export many power reactors and other peaceful-use nuclear wares in coming years, Beijing may prefer not to take decisions about its nuclear program that would eliminate demarcations between peaceful and non-peaceful uses of technology, equipment, and materials. China would not likely elect to set back its ongoing and considerable effort to strengthen its nuclear security, including in cooperation with the U.S. Nor would China want to deprive Chinese scientists and engineers future access to educational opportunities in the U.S. and other foreign countries.

China's future bilateral nuclear cooperation with Russia, and about the power level of the reactor; some participants favored a 600-MW design and others a 1,000-MW design. During an IAEA webinar held in June 2021, a Chinese expert said that China is simultaneously building two 600-MW reactors to more quickly develop the human resources needed for the fast reactor program.

[29] https://thehill.com/blogs/congress-blog/homeland-security/239479-addressing-risk-in-chinese-nuclear-cooperation

China's nuclear cooperation with the U.S. is governed by an existing bilateral cooperation agreement. Because of the top-down role of the Chinese state over policy making and operations of nuclear energy organizations, a higher future profile for MCF in Chinese government decision making may challenge the implementation of the U.S.-China agreement beyond the policy adjustments made by DOE and NNSA in 2018. But concern in the U.S. government about China's proliferation risk is not new. Since 1985, the agreement has been amended in several areas, such as U.S. consent rights and U.S. government access to nuclear activities in China for verification; under the current agreement, some U.S. access and verification activities may still rely on informal understandings with Chinese counterparts.[30]

Greater focus on MCF may warrant lawmakers and Executive Branch agencies to further review the terms and implementation of bilateral trade understandings with China, including the nuclear cooperation agreement, specifically with regard to Chinese peaceful-use assurances and U.S. end-user verification for items exported to China, and for identification, as appropriate to U.S. industry firms, of China's technical requirements for both weapons and non-weapons applications including naval propulsion. Congress may also want to review the record of U.S.-China bilateral nuclear R&D and technology cooperation to draw lessons in the national security interest.

The inherent dual-use nature of nuclear technology and material has informed U.S. cooperation with China since the 1980s. Concerns about assisting the PLA have circumscribed US-China nuclear cooperation, but little evidence is available suggesting that the PLA has obtained any assistance from past cooperation. U.S. concerns may have succeeded in preventing US nuclear industry firms from acting in ways that would have helped the PLA. In the future, concern about the impact of MCF on U.S. nuclear commerce with China may be less than for some other U.S. industry sectors, particularly those where there is less awareness about the challenges of controlling dual-use items.

How significant a challenge MCF in China will present to the United States in the nuclear power area will depend to a considerable extent on how deeply engaged the U.S. nuclear industry will be in China's future nuclear power program. On that basis the threat to U.S. industry may decline. The aspirations of U.S. industry, articulated by its industry representatives including to the U.S. Congress and to the Executive Branch during the 1990s and 2000s, will not likely be

[30] In June, 1985, for example, the Arms Control and Disarmament Agency informed Congress that, following a review, "a favorable net assessment of the adequacy of the provisions of the proposed agreement to ensure that any assistance furnished thereunder will not be used to further any military or nuclear explosive purpose." https://fas.org/sgp/crs/row/RL33192.pdf According to U.S. export control personnel, one area where the U.S. relied on informal understandings with China, at least prior to 2015, concerned U.S. verification of declared end users of U.S. nuclear dual-use exports to China.

attained. U.S. firms told Congress in 1997, for example, that the future Chinese nuclear power market might be worth $50 billion to U.S. companies.[31] Looking toward the 2015 renewal of the U.S.-China agreement, in December 2014 China announced that it would be spending $11.2 billion per year on new nuclear power plant construction for the next ten years.[32] When Westinghouse was awarded contracts for four nuclear power plants in China in 2007, industry representatives asserted that more than 30 more such plants were "planned."[33] Today that future does not look so bright. In the wake of the Fukushima accident, and China's efforts to deploy "indigenous" technology for nuclear power generation, U.S. nuclear power plant equipment vendors may shift their sights away from a China market that looks increasingly risk-laden and toward efforts to launch nuclear power projects elsewhere including in the U.S., depending on government support. For the U.S. nuclear industry, the political risk deriving from U.S.-China relations, and the project risk component associated with aggressive Chinese business practices, may increase the overall risk profile for doing business in China.

[31] https://fas.org/sgp/crs/row/RL33192.pdf p. 20
[32] https://fas.org/sgp/crs/row/RL33192.pdf p. 11
[33] https://fas.org/sgp/crs/row/RL33192.pdf p. 3

PANEL I QUESTION AND ANSWER

COMMISSIONER WONG: Mr. Hibbs, thank you for your testimony. And we will now move to questions, but let me turn to my co-chair and see if you want to begin with your questions, Jeff, or do you want to move to the list that is growing, I see, below your hand there.

COMMISSIONER FIEDLER: Let me first take the opportunity to thank you. Mr. Hibbs, I have a question about the Chinese Academy of Engineering Physics. They are not, are they not the developers of most of the weapons, nuclear weapons? The primary developers, the scientists behind the nukes.

MR. HIBBS: I prefaced my remarks today by pointing out that I am not an expert on the production of nuclear weapons in China --

COMMISSIONER FIEDLER: Okay.

MR. HIBBS: -- nor about their policies for nuclear weapons deployment.

COMMISSIONER FIEDLER: Okay, okay.

MR. HIBBS: That said, it is my understanding informally that the organization that you named is very significantly involved in the weapons program. This organization does not come up in frequent discussions about the development of nuclear energy for peaceful use in China.

COMMISSIONER FIEDLER: Dr. Kristensen -- anybody have a comment about the Academy of Engineering Physics?

No?

DR. SAUNDERS: It's my understanding that you're correct, that they're heavily involved in nuclear warhead design.

COMMISSIONER FIEDLER: And do we know much about their interaction with the rest of the world and scientists in the United States? It's my understanding that we've had two espionage cases involving them in the past 20 years. I mean, are they visiting our labs?

DR. SAUNDERS: I don't think any Chinese are visiting our labs right now because I believe that's prohibited by congressional law. I don't know all of the details on the context. I think most of them have been in the context of discussions about nuclear arms control and non-proliferation, not about technical aspects of bomb design.

But, again, I haven't looked too specifically about that. That's certainly the only context in which I've ever encountered people from that institute.

COMMISSIONER FIEDLER: Okay. Dr. Kristensen, we cut you off. Would you like to tell us what your recommendations are to us and to the Congress?

MR. KRISTENSEN: Well, there are a couple of them, not many, but there are a couple of them. I mean, one has to do with getting a better picture, of course, of what is buried in the projections that we hear for the Chinese stockpile. And the reason I just urge this is that we've heard some very wild, broad statements about even a quadrupling of the stockpile. And as I said, I think that's a little overblown; but, nonetheless, it would be useful, I think, to get a clear view about how U.S. agencies, in the public at least, how U.S. agencies make these estimates and what it is that drives the particular elements of this. So that would be certainly one recommendation from me here.

The other one has to do with the transparency, of course, in the broader sense, especially in our interaction with the Chinese. As I mentioned early, I think the Chinese are, obviously, they're more transparent today or the information coming out about China is greater today, I think much greater, than it was during the 1980s and periods like that. And there are many reasons for that.

But as we discuss with the Chinese or seek to have greater insight on it, of course, one thing would be to better understand their specific future plans for how many they're going to deploy and why. But another one is also trying to sort of share, what you could say, performances in transparency. And, here, I think right now or for several years, we've had officials in the United States pushing very hard for China to become more transparent about its nuclear stockpile, for example. And that is good, but I also think it needs to be balanced with a U.S. willingness to disclose its nuclear weapons stockpile. We have, unfortunately, seen a step back during the Trump administration of classifying, again, the size of the U.S. stockpile, and I just don't think that's helpful and I think we could have a better conversation with the Chinese if we changed that again.

COMMISSIONER FIEDLER: Thank you very much. I'll come back to it in a second round. I do have more thoughts and questions on transparency. Thank you. Alex.

COMMISSIONER WONG: Thanks, Jeff. Let me just go to Mr. Kristensen again. You mentioned that there's been some discussion in the policy community about a quadrupling, which you feel is perhaps not warranted by the evidence that you've seen. But it doesn't sound like you're dismissing the idea that there could be a tripling or a doubling or a considerable increase in the stockpile; is that right?

MR. KRISTENSEN: Yes. Well, so we've seen, over the last decade we've seen a number of statements from the U.S. intelligence community regarding the Chinese stockpile and its development. And you can go back to around 2012 or so, I described this in my testimony with former STRATCOM Commander Kehler sort of rejecting rumors at the time about a much larger stockpile, and he said, you know, we were talking about this, a few hundred nuclear weapons. That is what DIA seems to have been repeating over the last several years, starting in 2019 and, of course, the 2020 DoD report on Chinese military developments talked about in the low 200s.

In our descriptions and our research of it, we've gone a bit higher because we think that the DoD stockpile was the operational warhead inventory. And there is probably more in there somewhere, not the least warheads produced for systems that are coming online. And I don't think that was in the DoD overview.

So we're landing right now on a number of about, you know, 350 or so warheads in the stockpile. But, yes, if you look at the influx of bases and systems, it is possible, of course, that you can have a doubling of the stockpile, so something in the order of 450 to 500 warheads in just over a decade. We'll have to see if it pans out. We've seen estimates of projections for Chinese nuclear weapons in the past that turned out not to be the case at all.

And so we'll have to see what happens and how far the Chinese are interested in going and for what purpose. And, of course, as part of that, I just want to mention the degree to which they MIRV their systems, of course, is highly important, more so than the launchers, in terms of getting the numbers up.

And here, one uncertainty, of course, is why? What is the objective for China to put MIRV on its missiles? Is it to get around missile defense systems? Is it to increase the ability to strike a significant number of targets fast? What is it? I'm leaning toward the first one, but we will have to see how far MIRV goes across the board, across the force right now.

COMMISSIONER WONG: Thank you. Just a follow-up question for me, as well. Mr. Kristensen, I'm hoping I'm pronouncing your name right. I think I've been saying Christiansen. I apologize. And, Dr. Saunders, you've mentioned, you know, some pretty considerable improvements not just to the expansion of the arsenal but improvements to its

capability, precision, you mentioned MIRVs, and other elements of the improvement of the Chinese arsenal. Can you give us, just to be clear, in what time frame do you both see this improvement occurring? When did this begin, what is the trend line, and from what time period? Did this begin in 2011? Did this begin in 2015? Where do you see the line going up in both capability and in size of the arsenal?

MR. KRISTENSEN: Well, let's see. Let's begin with the size of the arsenal. As far as I can see, it started changing in the mid, early - mid part of the 2000s where we started seeing trickling up. And the reason for that increase at the time was the introduction of a new class of ICBMs, for example, that they had been working on, you know, fielding ever since, the DF-31 and the DF-31A. So that ticked up at that point.

Also, with the arrival of the Jin-class ballistic submarine. You have to remember that it's not long ago that they didn't have a real SSBN fleet, and we can question how capable it still is. But that's where I saw the beginning of this development.

Then we got to 2016, '12, '13 and '16, something in that time frame, which I think is where we saw the first MIRV ending up on the DF-5, the all-liquid fuel in the silos. And so now, just last year, we're seeing the introduction of the first two brigades of the DF-41 that is MIRV capable.

Again, what's missing from this, of course, is how widespread is the MIRV deployment on the force? In public discussions, people tend to assume, well, if it can carry five warheads, then there's five on everything. We don't know if that's how it's structured.

So there's a lot of uncertainty in projecting force growth and force developments with MIRVing.

COMMISSIONER WONG: And just quickly, Dr. Saunders, do you agree with that time line, or do you have a different perception?

DR. SAUNDERS: I broadly do. I think you can look at it in three ways. One is a shift to a mobile force, which starts in the late 1980s with the DF-21. It takes time for that to scale up to the ICBMs until you get to the mobile DF-31, 31A, and 41. So that's kind of one trajectory.

A second time line is accuracy which I think comes more out of the conventional ballistic missiles, which, because they don't have nuclear warheads, they need to be more accurate. So there's a lot of effort put into improving that capability and it kind of spills over to the ICBM force because that's a logical improvement to make in ICBMs.

And I'd probably agree with what Hans said about the time line of the MIRVs, which start with the DF-5 and then appear to have spread, you know, there's technological constraints that have to be overcome with shrinking the warhead and putting them, you know, having an ICBM that's powerful enough to launch them. Initially, they could only do that with liquid fueled missiles. They've gradually built the capability to do that on solid fuel. So all of these things have a technology trajectory.

I'll highlight what Hans said and just kind of reinforce it. You know, there is a question about the move to MIRVs. You know, that increases the numbers, but, in terms of strategic stability, that's generally seen as a destabilizing thing, especially to put MIRV missiles in silos where they're pretty vulnerable to a nuclear first strike and they're pretty lucrative targets because if you kill one missile you kill multiple warheads. So I think, generally, that's viewed as a destabilizing development and force structure.

COMMISSIONER WONG: Thank you. Let me turn to Chairwoman Cleveland for her question.

VICE CHAIRMAN CLEVELAND: Thank you. And thanks to the Chairs for organizing this, and, Alex, well done. First hearing. It's terrific.

I have a question that I'm going to put in for the record on circular error probable, reflecting my very dated experience with arms control issues in the 70s. But I have two questions, one for Mr. Kristensen and one for Dr. Saunders.

Mr. Kristensen, you mentioned in your testimony that there was this shift to new silos, and you've talked about MIRVs and what that might mean, and you said is it building capacity, is it launch on warning, building a launch on warning capability. I'm wondering, given the shift that we're seeing from rail and road and mobile capabilities into silos, whether or not it also reflects a shift from counter value to counter force targeting in doctrine. That's the question for you to talk about your comments on silos.

And then, Dr. Saunders, you describe a system of skip echelon for the leadership in the event of a nuclear attack, and I'm wondering what your views are on doctrine in the event of a decapitating nuclear attack and what the thinking is in the event of, as I said, a decapitating nuclear attack on leadership.

Those are my two questions. Thank you.

MR. KRISTENSEN: If I begin with that, the silos are a sign of -- and the MIRVing, of course is part of it -- silos are a sign of, perhaps a sign of a development from counter value to counter force strategy.

Well, we know that, if you look at U.S. intelligence testimonies back in the early 2000s, they said that what motivated China to move to development of road mobile ICBMs at the time was the U.S. deployment of the Trident system in the Pacific. They basically concluded, you know, they can take out our 20 silos with that system.

And so for the longest time they've just had these 20 or so silos. And most overwhelming of their effort has been on making their ICBM force mobile.

And so that is a development that now sees, you know, several incarnations, both at the DF-31 first, which has a limited off-road capability; and now the DF-41 that has improved off-road capability, but it's a big launcher. And so it will still need both solid ground but also a lot of support infrastructure to make it operational.

Whether that indicates a move toward counter force, I don't think so, in and of itself. You could easily argue that, no, what the Chinese are doing is that they're looking at the capabilities that can hold their silos at risk and that they concluded they need a spread of capability, one being some more silos, and we will have to see where it goes. So far, I've counted, I think, 15, 14 or 15 new silos up in the Jilantai area in central China, in addition to the 20 they have. But also where are they going to go with it? Is it going -- you know, they're going to continue, obviously, also having road mobile, as well.

So I think it's more accurate to say that they're continuing to do this or building it out because they are looking to secure their retaliatory capability and they've become concerned about increasing U.S., and Russian to some extent, capabilities. Keep in mind that the Chinese have to plan against three adversaries around them, U.S. and Russia and India. So, you know, their force structure has to be seen in that triangular picture, but, of course, with emphasis on its standoff with the United States.

So I don't see on nuclear forces yet a move to counter force if counter force means using nuclear weapons to hunt down other nuclear forces to achieve certain strategic objectives. China's targeting, I think, already includes planning, you know, potential attacks against missile bases, air fields, what have you. You could call that counter force, but it's less of a dynamic capability in that direction than I think, you know, the ability just to be able to hit military targets.

So I don't think they're there yet, but it's something that's very important, of course, to follow.

DR. SAUNDERS: To try to very concisely answer this, the skip-echelon capability is intended to have kind of the military chain of command from the Central Military Commission down to operational units and to make sure that if bases are hit it doesn't cut off their subordinate missile brigades and they can still fire.

There are concerns about decapitation. We know from early on China invested in civil defense. They built a separate subway line to evacuate leaders from downtown Beijing to the west so they would be more survivable. Some of that stuff is no longer used, but I think one would assess that they built equivalent capability to try to protect and evacuate their civilian leadership. And, of course, there's the military command post in the Western Hills and a variety of alternate and backup command posts for that purpose.

I haven't seen recent writing about concerns about civilian decapitation or updated writings on plans to evacuate the civilian leadership, but it's certainly something they've been concerned about in the past.

COMMISSIONER WONG: Thank you, Robin. Let's turn to Commissioner Wessel.

COMMISSIONER WESSEL: Thank you all for being here. Thanks to our Chair and Co-Chair and, Alex, thank you for your opening comments. Deeply appreciate it. Working as a group, we do try and look ahead to see what Congress and the public should be concerned about.

Let me go to, I guess, what, for me, is a core issue, and I appreciate entanglement and all the various issues relating to doctrinal approaches, et cetera. But I want to ask about capabilities and the potency of the arsenal and the competency of the delivery systems. You know, whether it's 200 or 400 weapons, for me, you know, one that reaches the U.S. mainland is enough of a worry, and I understand that goes into defense systems, missile defense, et cetera.

Could each of you give a letter grade on what you believe the Chinese missile forces on any of the platforms, how you would grade them, A through F? What should Congress be viewing as the threat, understanding the intent to use those weapons, the command and control, all those, you know, are integral issues. But as to the potency of the arsenal and the competency of their delivery systems, how would you rate China's forces?

Do you want to go in order of testimony? Mr. Kristensen first.

MR. KRISTENSEN: Oh, boy, how to rate it. I can give you some very general observations. I certainly don't claim to have any technical insight into specifics of these systems to be able to give sort of a technical assessment of it.

Instead of the various systems, the various missiles, I think it's more interesting to look at the very systems, so to speak. The point being, I think the silo development is very interesting for a number of reasons, and I don't think they only have to do with, you know, is China getting more or less nuclear offensive.

The silos, I think, also have to do with the Chinese Rocket Force's perception or lessons learned from operating road mobile systems over all these years. I think there is, there has been a realization that, not only is it complex, these systems are very vulnerable. You know, they require a lot of infrastructure. It's not just sort of a single, you know, launcher disappearing into the wilderness. There's a large footprint of supporting structure and what have you. All it needs today is a flat tire for that launcher to be out of commission.

But in addition to that, we're seeing some interesting development of it in the Jilantai area, which I have been very focused on, I admit, where we're watching construction of what

looks like sort of underground tunnels or, yes, tunnel systems that appears to be intended for launchers to drive through, maybe to pick up missiles, maybe to store, et cetera.

What I've heard is that one of the motivators of some of these developments is that they have run into issues regarding vulnerability of missiles, and warheads for that matter, when rumbling around on the terrain, in different climates, in different humidity, and different altitudes, et cetera. Not that it makes it not functioning but that there's an effect from that.

So, to me, that shows a little about potential limitations and strength of the various systems. And --

COMMISSIONER WESSEL: I appreciate that. Let me go to Dr. Saunders and, again, Congress wants to know, I think, how do we evaluate the risk, and the risk, again, is, to me, a question with many other issues going below that is potency and competency.

Dr. Saunders, do you have a grade?

DR. SAUNDERS: So I looked first at the question of survivability. Can they preserve their force through a first strike and be in position to retaliate? I guess, for me, that's a B, B-minus. And noting that, even though we haven't seen the SSBN force operate a lot, one of its purposes is probably to preserve a retaliatory capability that makes sure China's (audio interference) is not disabled. So I think they've made considerable progress in that respect over the last 10 to 20 years in a more survivable force.

Competency in terms of able to operate it in sophisticated ways, that's tough to say. I mean, they practice a lot to do this under adverse conditions after a nuclear attack when undergoing electromagnetic jamming. I guess, for me, that's also a B - C, but noting that the submarine force is probably a significantly lower grade because it's a new capability and they don't seem to have deployed to practice that very regularly. So I differentiate between the ground-based force and the submarine force. And, of course, the air force doesn't seem to have deployed those new systems yet, so it's not really appropriate to judge.

COMMISSIONER WESSEL: Thank you. With the leniency of the Chair, Mr. Hibbs, could you give a letter grade?

MR. HIBBS: I really wouldn't want to do that. I don't know very much about development and deployment and policies for nuclear weapons in China. I came to this committee requested to discuss the interface between their nuclear material production and --

COMMISSIONER WESSEL: Okay. Thank you.

MR. HIBBS: -- and their nuclear weapons program.

COMMISSIONER WESSEL: Understand. Thank you.

COMMISSIONER WONG: Thank you, Commissioner. Let's turn to Senator Talent out there in TV land.

COMMISSIONER TALENT: Yes. Thank you, Mr. Chairman. Sounds like everybody is having a good time. I wish I could be there. So two quick questions, and thanks to all the witnesses.

First of all, I don't think, I may have missed it, but I don't think any of you discussed spending. And I'd be interested to know how much the Chinese are spending on their strategic nuclear arsenal. I think, if we know, I think it might give an indication of how greatly they are committed to this program.

The second question is for Mr. Hibbs. I found your testimony very enlightening, and I thought it was very useful. You made the points about how all this technology is dual use or most of it, that the Chinese are developing both peaceful and military applications through the same SOEs, that in working with foreign companies they prioritized getting technology, that

there's very heavy CCP control of these companies. And then you went through the Westinghouse case where, as we all know, the PLA actually illegally stole some technology.

So I was confused by your statement in the implication section that you thought there was little evidence suggesting that the PLA has obtained any assistance from past cooperation. And I don't ask the question to be provocative. I have a feeling I misunderstood what you said in the implications section, so if you could clarify or explain further I'd appreciate it.

And as to question one, whoever wants to answer that can answer it. Do we know anything about their spending?

DR. SAUNDERS: There's not a good answer on that. There's no public information that breaks out the spending specifically on nuclear weapons. For the U.S. that's a DOE function to develop and maintain those. So, we have a separate budget that's released.

China doesn't release defense budget information in that level of detail. So, there's not concrete information in the open source world on it.

And I think the one thing I would say along those lines is that in the past, it's been guidance political guidance from the party that China will not engage in nuclear arms races. And there's been an effort to constrain the amount of spending on the nuclear deterrent, partly because they saw what happened to the Soviet Union and they didn't want to repeat that mistake.

What we do see is a very significant expansion of the force, in terms of what's deployed and what's coming. That is going to be very expensive to build out that force, to maintain it, and to continue to operate. And that implies a significant amount of increased spending on the nuclear deterrent.

And then, I think that gets to a question that Chris Twomey I know has raised in his recent writings, and will testify to you later, does that speak in a change of attitude among the Chinese civilian leadership?

In the past, they thought one or two warheads on target is sufficient to deter an adversary, and there wasn't much to be gained from a much larger nuclear force.

Now, they're building a much larger nuclear force. Does that reflect a change in the perceived value of more nuclear warheads? And a first order explanation is, that's very plausible, because they have approved it and they're spending the money on it.

COMMISSIONER TALENT: And that's why I asked. I mean, I could see this change or this buildup as being substantially motivated by the internal politics within the PLA after the reorganization.

But if they're putting a lot of money against it and I would agree the extent of it suggests they are then there's probably a strategic rationale.

I don't want to go over my five minutes though, so Mr. Hibbs, could you address my question?

MR. HIBBS: Sure. Basically, I would answer it this way. There's no question that in the case that I reported in my testimony, that the representative in the PLA was able to get access to information of a proprietary nature from Westinghouse.

What we don't know about, and what I have not seen, is any information seen in this case or others, that any information has been purloined by China, which has benefitted their nuclear weapons program.

I don't want to cut this too finely, but these issues began arising before the U.S. Chinese Nuclear Cooperation Agreement was up for a replacement agreement in 2015, which involved the Congress and the Executive Branch, and going over the unit and essentially vetting it for weaknesses.

During this point in time, the Congress and Executive Branch amended the agreement to address issues of this nature, having to do with intellectual property protection.

They basically imply that if the Chinese were to obtain intellectual property by purloining it from a U.S. entity, that it would no longer, as in the past, be a problem between the U.S. and Chinese entities in court.

That abuse would expressly violate a bilateral, legally binding agreement between China and the United States. And it also provided for information and access of the United States to China to establish or reestablish the end-user of the information and the technology that's provided.

So, there's a number of things that we could talk about that essentially put nuclear trade in this area of intellectual property on a legal footing.

These are things that are now in place. And the problem, as you say, however, the risk is that China is moving into a situation where they are a potential adversary of the United States. They are less transparent, and it will be a challenge to make sure that the United States is able to assure that intellectual property is being protected under the agreement.

So, it isn't a non-problem by any means. But what we've seen is, because of the issue that I had pointed to in the testimony, that the U.S. Government and the Congress are moving forward to upgrade these agreements to strengthen them as we go forward.

COMMISSIONER TALENT: Okay. I imagine my five minutes is up, Mr. Chairman. Thank you.

COMMISSIONER WONG: Thank you, Senator Talent. Let's move to Commissioner Kamphausen.

COMMISSIONER KAMPHAUSEN: Thanks so much to our hearing co-chairs, and thanks to our panelists.

Dr. Saunders, Phil, I have a couple of questions for you. I appreciated your discussion of the entanglements feature. And I guess the first question is, to what extent do you think this is an intentional feature, or are there alternative explanations?

And that will then lead to a second question I'll have of you. But is this by design? Are the entanglements intended to delay and disrupt potential adversary attacks? Or are there other things we should think about?

DR. SAUNDERS: There is another explanation, which is operational utility and efficiency. So, for example, with the DF 26, which is a dual-capable missile, it can have a nuclear warhead; it can have a conventional warhead.

You can use a common set of support systems, you can use common training for how to operate most of the missile, and it's only the nuclear warhead aspects, the nuclear firing procedures, and those things that are specific to nuclear operations, that you have to do separately.

So, you can make an argument that's a cost-effective way of operating. If you build a bunch of these, you get some economies of scale, you get some economies of training, and I think that's a plausible explanation for why you would move in this direction.

That said, it is certainly the case that in Track 1.5 dialogues, this is an issue that's been discussed with China. U.S. concerns about it (audio interference) entanglement.

At least in those discussions in 2017, 2018, the Chinese seemed to deny that this was (audio interference) suggests that it is a significant problem. But they certainly were cognizant of the fact that on the margins, it deterred the U.S. from striking systems, if it wasn't sure whether they were conventional or nuclear.

And that was a benefit of doing this. Or, to put it a different way, why should they solve this problem for the United States if it reduced deterrence of a strike against those forces?

I think that was what we heard from civilian and military Chinese participants in those dialogues.

Now, it's a more complicated question than that. Should we let those be off-limits? I'm of the view that if PLA systems are firing at U.S. forces, U.S. bases, U.S. carriers, they should expect to be struck back.

And if they are entangled and there's some risk of nuclear attack, that's the challenge. But I don't think it puts you we can afford to put them in a sanctuary position.

That's an issue we have to think how to deal with differently, both in terms of distinguishing them conventional and nuclear systems more precision in how we attack them, but also what U.S. declaratory policy is, and finding ways to make clear that if there is some accidental striking of nuclear systems or nuclear infrastructure, it's not part of a U.S. nuclear first strike, and thinking through how to make those assurances credible.

That's one of the reasons why I think it's important to talk to the Chinese about this in both official and unofficial settings.

COMMISSIONER KAMPHAUSEN: Thanks very much. You've anticipated my second line of questioning, which is, you focused on the challenges that this system poses for the United States.

I guess the follow-up question I had is, to what degree might the entanglement feature be a way station, or an indicator, of the pathway towards a nuclear war-fighting doctrine that we might see the PLA develop.

In other words, do they judge that conventional and nuclear weapons or missiles commingling to be an essential feature in any emerging nuclear war-fighting doctrine?

DR. SAUNDERS: Is that an essential feature? I'm not sure of that. They're aware that it provides a marginal increase in deterrence, and that's a useful thing.

In the past, the PLA has expressed interest in a shift toward a change in policy, a move away from no-first-use, thinking about more flexible options that would allow some degree of nuclear war fighting. And the civilians have always slapped them down when they tried to get a change in doctrine.

What we've seen though, is that the force structure of the command and control, the ISR, are developing in the way that they're no longer the same technological constraints.

Now, it's a policy issue. And the question is sort of will the civilians continue to hold the line.

I don't think commingling is essentially related to development of a nuclear war-fighting capability. And in fact, I can imagine if the PLA wants to persuade the civilians to loosen the reins on them, Chinese civilians are going to ask that question.

What is the risk that this gets out of hand? What is the risk that a conventional conflict escalates to the nuclear level? If it does start going to the nuclear level, what's the ability to control nuclear escalation?

And in the past, the Chinese view has been it's not much. Once you go nuclear, it gets bad really, really quickly.

So, I can even imagine a circumstance where if the PLA is pressing again for that kind of shift in nuclear doctrine and the civilians ask the question, how are you going to maintain escalation control, part of the answer might be, well, it's to disentangle those forces.

It's to treat them like the DF 21s, where you have conventional units and nuclear units,

and they're in different places with different missions.

That is a way that the PLA Rocket Force could disentangle those forces, if they chose to do so, or if they were told to do so.

And that's again part of the reason for wanting this kind of detailed strategic dialogue with the Chinese, because that's the kind of thing we ought to be imparting to their civilian leadership, that there are concerns, and that this isn't necessarily a good thing for you.

Similarly, that a shift to launch-on warning is not a stabilizing thing. That increases risks, and that's something you probably don't want to do.

And we'd like to get those ideas into the Chinese civilian system, rather than have them only listening to the military or their own civilian academics.

DR. SAUNDERS: Thanks very much. Very, very helpful.

COMMISSIONER WONG: Thank you, Roy. Commissioner Borochoff.

COMMISSIONER BOROCHOFF: Thank you very much. The nuclear discussion, from a weapons viewpoint, is new to me. I come to this Commission from the business world, some 40 years of working and owning businesses.

So, it's refreshing and informative for me to hear, particularly on the weapons side, from Mr. Kristensen and Dr. Saunders about your analysis as to what's happening over there.

And building a little bit on what Commissioner Wessel said, and in a very difficult manner trying to follow Commissioner Kamphausen, two folks who are very, very knowledgeable in this area, I think that what and Mr. Hibbs, I understood everything that you said and wrote but my question is about weaponry.

And the reason is, I guess, because probably like most Americans who hear about what we're discussing today, I have the fear that Commissioner Wessel brought up, that he thinks the Congress is going to ask us directly about, when we explain our recommendations.

And as an American and a business owner and a person with a family, listening to the two of you describe what's happening over there and reading everyone's testimony, it sounds like the Chinese are improving their numbers of weapons, the variety of weapons, the efficacy of the weapons, their ability to survive.

And yet, all of us read this and say, but we're not really sure they're trying to achieve parity, and we're not really sure that that's an offensive position. So, I understand why you said what you said, because you're giving us an analysis that says we don't really know why they're doing it.

In the business world, when my competitors buy up new locations and expand horizontally their real estate, and then vertically improve their businesses because they bring in new departments, if one of my competitors created something equal to the new Rocket Force, and then told me, but don't worry, I'm just doing this in case you expand, I know what my staff would say to me in private.

I would like to know what your personal opinions are. I understand we need to talk to them, but let's suppose we do and they just tell us don't worry about it?

What is the opinion of you, Mr. Kristensen, and you, Dr. Saunders, as to what their intent is, realizing we don't know? Do you have a personal opinion?

MR. KRISTENSEN: Yes. I think their core intent is to ensure that China has a nuclear force that is survivable, and it's capable and credible, in deterring adversaries, even if those adversaries are throwing a lot at them.

So, that's still the core mission, I think. We can discuss all sorts of nuances, of course. The no-first-use policy, is it credible? Can you trust it?

Personally, I don't think any country would stick to its no-first-use policy if it had one, if it were under an attack that was so severe that its survival was at stake.

That said, I think it can serve an important role in trying to sort of limiting, under certain circumstances, the ambitions of the nuclear force in peace time.

But I don't think it can prevent anything. Why are they doing it? Well, I think the most interesting phase right now, I think, is that the Chinese have always argued that they just needed a minimum force, without defining, of course, what that is. And I doubt it's plausible to define.

But also, that they didn't want to be, and were not, part of any nuclear arms race. The development that's happening right now, in my view, is definitely departing from a minimum force, if there was a minimum force.

That doesn't mean that, therefore, they're going all out and will reach parity with the United States and Russia. I don't think that's in their interest.

But they certainly are arms-racing if it's about capability. Not numbers, necessarily, but capabilities. They're trying to improve their force. They're trying to make it more efficient to do the core mission, which is to deter adversaries from attacking them.

And so, I still think that's the core issue. But I'm all-ears if people have other insight that show that they're sort of moving in a more war fighting direction, or otherwise. But so far, I haven't seen clear evidence of that.

COMMISSIONER BOROCHOFF: Thank you.

DR. SAUNDERS: Five years ago, I would have said it's pretty clear that the focus is on a survivable second strike. That a lot of what they were doing, in terms of mobility, survivability, some expansion of the force, diversifying to have a sea-based leg, all of that can be understood in terms of increased survivability.

And that's a calculus that bears in mind U.S. conventional precision strike capability, potential improvements in U.S. intelligence, surveillance, and reconnaissance to locate mobile missiles, which U.S. academics have written about potential breakthroughs which would significantly improve that, and what the U.S. does with its national level ballistic missile defense.

Those are three variables that influence how much of the Chinese force is likely to survive, and its ability to penetrate and maintain a credible deterrent.

So, five years ago, I would say pretty much everything you see in their force modernization was consistent with that.

I think today we're starting to see a quantitative expansion that calls that into question. We're starting to see what Hans talked about, increased deployments and silos, which are not particularly survivable.

So, that's not so consistent with that focus on survivability. And Hans says, we've discussed, about an increased value placed on nuclear weapons. About seeing those Chinese concepts such as integrative strategic deterrents, but contributing to national power in a way that goes beyond sort of prestige, or goes beyond a nuclear deterrent that protects you against nuclear intimidation or a nuclear first strike.

I think that's the open question is, is it a real change in attitude toward nuclear war-fighting.

Then, I'd add two pieces. As Senator Talent suggested, there is a service dynamic here, that the Navy wanted to be in the nuclear business and the Air Force wanted to be in the nuclear business. And that's part of the dynamic here, doing that.

I think there's also an element of this which is driven from the PLA, that they're looking for logical improvements in capabilities. They're arguing, why do you want to be ignorant of

what is happening in a possible nuclear conflict? Why is it better to be blind and not know if the adversary has launched?

And there's not a good answer to that question. But incrementally, that's built out the capabilities that you would need for a shift toward a nuclear war-fighting doctrine, or toward a launch on warning posture.

I don't think we've seen a political decision to go that way, but the technological constraints have eroded.

And so, that really gets us to the question of what do the civilians think, what are they willing to approve, how much leeway are they willing to give the PLA?

And I think that's the critical question, and I don't think we have a good answer to it. Something's changed and we don't have a good sense of exactly why, and the extent to which the civilian leadership is onboard with it.

COMMISSIONER BOROCHOFF: Thank you.

COMMISSIONER WONG: Thank you Commissioner. Commissioner Glas.

COMMISSIONER GLAS: Thank you so much. And thanks to all of you for your testimony. It's very enlightening. It's an area that I have never personally focused on. So, I've learned a lot from reading your testimony and hearing from you all this morning.

A couple of quick follow-up questions. And I might start with you, Mr. Hibbs, since you detailed the Westinghouse issues in your testimony.

And sort of building on what Senator Talent was raising, do you have a sense of U.S. firm investment right now in the nuclear civilian sector of China, on how much investment is going into China from U.S. companies, given the fact that these are dual-usage issues?

Also, the other follow-up question for you, and maybe this is more broadly, to what extent do we know that that civilian sector is maybe working closely coordinated with the Chinese military?

Do we have a sense about that at all? Is there anything that you have observed in your research or analysis? And I can open that question to everybody, but I'll start with you, Mr. Hibbs.

MR. HIBBS: Thank you for the question. U.S. investment in the nuclear power program in China over the years has increased, and based on expectation in China during the 2000s, that the Chinese nuclear market would considerably increase over time.

At this point in time, and this is between the area of 2000 and 2005, the United States anticipated, based on informal and quasi-official predictions and assessments in China, that between 2005 and 2050, China would build somewhere between 400 and 500 power reactors. That is a power reactor population four to five times the size of the population currently in the United States.

For a number of reasons, U.S. industry geared up to supply a market that was assessed at that level. What happened, in fact, was that after Westinghouse was awarded contracts to build an initial set of four power reactors, with the understanding on Westinghouse's part that they may buy an additional 30-plus reactors, that these projects have not so far concretely materialized.

And that's happened for a number of reasons. One of the reasons is that in the meantime, the Chinese have been indigenizing technology that they have largely obtained from the United States and France during the period between about 1980 and 2010, to essentially iterate that the basis of this technology is to produce a nuclear power plant design which China claims intellectual property ownership to.

And what we're seeing now is essentially a challenge to Westinghouse's future market in the Chinese nuclear power program by the forced development and deployment of this Chinese technology.

In addition, the other point that's important is that when the Chinese experienced the aftermath of the Fukushima Daiichi reactor accident in Japan, China reacted by essentially establishing red lines for nuclear reactor construction which limited the construction of these reactors to a small number of sites in a geographical location on the east coast of China.

Plans originally to expand the nuclear program to the western shore had been put on hold. And to date, they are still on hold. These red lines are holding.

So, that has essentially implied, when you do some arithmetic, that the number of reactors that China is likely to build between now and 2050, may be somewhere in the neighborhood of 250 units less than they had originally planned.

These things, and in addition to the problem having to do with risk in the Chinese market in part because of aggressive Chinese business practices these issues, in my view, may deter Westinghouse and other firms from expanding the nuclear commitment in this area.

So, the commitment to the U.S. of the U.S. industry in China in this sector, may decrease over time, reducing its risk.

The last thing I just want to say before closing here, is in response to Senator Talent's question, it's important to realize that the point that he raised regarding Westinghouse and the espionage case, that resulted in charges from the Department of Justice against a PLA officer in 2014.

The next year, the Congress and Executive Branch upgraded the U.S. Cooperation Agreement to deal with espionage and the threat against intellectual property. So, the Westinghouse case was important in that regard.

COMMISSIONER GLAS: Thank you, Mr. Hibbs. I know we're up on time, maybe in other comments people could talk about the coordination between the civilian nuclear industry and China, if there is coordination with the military in China. So, thank you so much, Mr. Hibbs.

COMMISSIONER WONG: We do have some time if you want to

COMMISSIONER GLAS: Yeah. I'm just curious. I mean, I'm not trying to lead down a path, but I just am not clear right now if those civilian firms in China are coordinating heavily with the military, or vice-versa.

MR. HIBBS: Well, what we know in this regard is that there's a number of firms and organizations in the Chinese civilian nuclear complex that work also in the military complex.

A good example is the company CNNC, which has been largely responsible for the development of naval propulsion reactor technology.

This technology is essentially at the same time being marketed by China as SMR reactor technology for civilian applications.

So, at a certain point somewhere in these companies, there has to be a discussion between the military side, or the people who are interested in military applications, and the people who are interested in civilian applications, to decide strategically how to go forward in the deployment and development of these technologies.

This is one example, but there are probably quite a number.

COMMISSIONER GLAS: Thank you.

COMMISSIONER WONG: Thank you Commissioner. Turn to my fellow Commissioners. Anyone else have a further question?

COMMISSIONER FIEDLER: I have a sort of comment. There seems to be a lament

that the Chinese are not transparent. I'm cynical enough to believe that that's going to be a permanent condition, especially as it comes to nuclear weapons.

Now, that is not to say that I would discourage the U.S. Government from seeking the Chinese out to discuss these matters, because when we had the last hearing, we were not really faced with a scenario of potential use of nuclear weapons like we are today, as people talk about a Taiwan conflict and the Chinese leadership's prospect or decisions once they realize they may be losing, to resort in a desperate manner to nuclear weapons. At least tactical nukes in theater.

So, do you guys think that the risks are greater today than they have been in the last ten years, when the Chinese actual forces were not particularly threatening to us?

(Simultaneous speaking.)

MR. KRISTENSEN: Well, I can offer some thoughts on it. So, on transparency, first of all, and then I'll end on the issue of the risk.

Yes, the Chinese have always seen secrecy on the forces as a means of aiding their posture and the survivability of their force.

And mind you, all nuclear weapon states do that to a greater or lesser extent. And we have lots of secrets about our nuclear plan.

That said, of course, there are some overall issues where it would be helpful they could become more open about it. And just like Dr. Saunders has been emphasizing, I think this comes back to the issue of the importance of ongoing conversations and outreach, etc.

Except about the risk. In my assessment, I don't think there's a greater risk that China will use nuclear weapons certainly, not out of the blue sort of short of an extraordinarily extreme scenario in which they lose a conflict, or are up against the wall.

So, that said, of course, as the conventional force grows and China's ambitions in the near China area, you could of course imagine scenarios increasing where conventional force scenarios could escalate that could bring in nuclear weapons.

And I'm more worried about that transition, that development, with greater conventional forces, greater capabilities, create ambitions perhaps in what you can do with that having an effect on the increase of risk for use nuclear escalation. So, that's how I would look at the risk issue.

COMMISSIONER FIEDLER: Phil? Can't hear you.

DR. SAUNDERS: First of all on the issue of transparency, I think they're using noticeable shift that occurs around 2010, 2011. Prior to that point, China tried to downplay military capabilities, both conventional and nuclear.

After that point, you start to see a greater willingness to display capabilities, which I interpret as trying to shape the security environment.

And so, that has included displaying capabilities in parades, various newspaper reporting about them, reporting on exercises, a variety of things that shows a lot of this increase in capability.

What we haven't seen is details on the capability of weapons systems, or details on the overall force structure, or where they intend to go with that force structure. That's been an area that they haven't been willing to discuss in much detail.

They have been willing to talk about doctrine. They have been willing to talk about arms control. They have been willing to talk about other issues. And in a Track 1.5 setting, there have, I think, been some very useful discussions about issues of strategic stability, interaction between force structure and missile defense, escalation, crisis management.

Those are things that can be discussed. So, there has been a shift in that way.

When we come to kind of the main point, have the risks changed? Yes, they're more capable than they were. But more importantly, it's a more competitive U.S.-China relationship. And the chances of a conflict over Taiwan, while I don't believe they're high right now, they certainly have increased over where they were before.

So, that increases the chances of a military conflict breaking out in the first place. And if it does happen, there will be a nuclear shadow over it and that increases the relevance of nuclear weapons, nuclear policies, nuclear doctrine, nuclear posture, and the chance that something might go wrong.

So, I guess that's my answer, that I think it has gotten worse.

COMMISSIONER FIEDLER: Thank you very much.

COMMISSIONER WONG: Let's turn to Chairwoman Bartholomew.

CHAIRMAN BARTHOLOMEW: Thank you very much, and thank you to our witnesses, thank you to our co-chairs.

I'd like to go back to the issue of entanglement. I think, Dr. Saunders, it was you who said that there might be a civilian constraint on military use of, or considered I suppose you used military implementation of an entanglement.

But I wonder what evidence there is that the civilian leadership would actually serve as a constraint on that? I just think of it in the context of both the rising nationalism and China's aggressive stomping around the world, misjudging its global position.

So, do we have any evidence that actually the civilian structure would serve as some sort of a break?

DR. SAUNDERS: So, it's inferential. But we know, for example, that Xi Jinping directed the PLA. He got independent advice on U.S.-China military relations and escalation-control issues.

He directed the PLA to engage with the U.S. military in mil-to-mil channels. He directed them to talk to the United States about confidence building and crisis communication measures.

And some of the fruits of that are the agreement on air and naval encounters. So, that's a case where there was a direct intervention by Xi Jinping himself, ordering the PLA to do things that would create new channels for crisis management and confidence building. So, that's a case where he intervened and the PLA followed orders.

Now, there isn't that much evidence that China's civilian leaders have thought deeply about these nuclear issues. Xi Jinping probably has, because he has direct responsibility.

But they do care about escalation control. They do care about crisis management. And I think if this issue of conventional nuclear entanglement comes to be understood in that context, how is this affecting the chance that a conventional conflict might escalate to the nuclear level, and is that in China's interest, I think there's the potential for the civilian leadership to get involved.

As I said in the beginning, they do keep tight political control over strategic weapons capabilities, including nuclear weapons. And so, part of this perhaps is an issue of education, to make them understand the ways in which this might operate, and ways that are against China's interests, or that delegate too much power and authority to the military.

CHAIRMAN BARTHOLOMEW: Thank you.

COMMISSIONER WONG: With one minute remaining, Chairwoman Cleveland.

VICE CHAIRMAN CLEVELAND: Thank you. Dr. Saunders, I think it was you who said that as China considers its nuclear strategy or nuclear posture, they have to plan for the U.S., Russia and India.

If it wasn't you, whoever said that this is the question for you. What's missing from that in my mind is North Korea. And how do they calculate North Korean capabilities into their planning scenarios?

DR. SAUNDERS: Hans, I think that's you. Although, let me give a quick answer. This is something we talked about with Chinese military officers and nuclear experts.

The answer for a long time, they did not see that as a direct threat. Really, what the concern was, was that a North Korean nuclear and missile capability would stimulate ballistic missile defense cooperation between the U.S., Japan, and South Korea, and perhaps stimulate Japan and South Korea to develop their own offensive capabilities.

There's been something of a shift in that attitude, which I date back three or four years ago, where they started noting that this was a capability that might possibly be used against them.

Certainly that if there was a military conflict involving North Korea where nuclear weapons were going off, that would have implications for nearby Chinese provinces.

But I think there's been some modest shift in attitudes towards seeing that as a capability that might, under some circumstances, directly threaten China.

VICE CHAIRMAN CLEVELAND: Mr. Kristensen, did you have anything to add to that?

MR. KRISTENSEN: Not really, except just remarking that there's also the broader issue, of course, of viewing North Korea sort of as a buffer between South Korea and just in terms of sheer territory, in terms of South Korea.

And of course, we know that the issue of unification on the Korean peninsula has been an issue for Chinese in their discussions in terms of what happens if there's a unified South Korea. And suddenly, you have South Korea, and potentially U.S. military forces, standing on the Chinese border.

But I'm not sure that is a particularly strong and driving issue when it comes to nuclear forces, but it's one to keep in mind about security interests as well.

COMMISSIONER WONG: Thank you. And thank you to our panelists. We will now take a ten-minute break and reconvene for Panel 2 at 11:20. Thank you.

(Whereupon, the above-entitled matter went off the record at 11:12 a.m. and resumed at 11:23 a.m.)

PANEL II INTRODUCTION BY COMMISSIONER JEFFREY FIEDLER

COMMISSIONER FIEDLER: Thank you. Thank you. We will resume with Panel II. Our second panel will explore why China is modernizing its nuclear forces, and how these motivations may be reflected in its doctrine as well as its thinking about nuclear escalation.

First we'll hear from Dr. Christopher Twomey, Associate Professor in the Department of National Security Affairs at the National -- I mean, the Naval Postgraduate School. He'll speak on the drivers of China's nuclear ambitions.

Next, we'll hear from Dr. David Logan, a candidate, a Ph.D. candidate in security studies at Princeton University School of Public and International Affairs, who will speak to changes in Chinese nuclear doctrine.

And, finally but not least, we will hear from Dr. Caitlin Talmadge, Associate Professor in the School of Foreign Service at Georgetown University, as well as a Senior Non-Resident Fellow in Foreign Policy at the Brookings Institute.

She will focus her testimony on Chinese thinking on nuclear deterrence and escalation and potential regional contingencies.

Thank you very much. And Dr. Twomey, we'll start with you. We'll remind folks about the seven-minute rule: keep your testimony to seven minutes.

And we will go have questions for five minutes each with the Commissioners. So, there will be plenty of time to get into things.

Thank you very much. Okay, Dr. Twomey.

OPENING STATEMENT OF CHRISTOPHER TWOMEY, ASSOCIATE PROFESSOR, NAVAL POSTGRADUATE SCHOOL

DR. TWOMEY: Great. Well, thanks to the Commission for inviting me. Thanks to the staff for helping me get into the pipeline here.

And I really appreciate the opportunity to talk about this important issue set. I'm going to try to focus on some areas maybe of comparative advantage, building off of the comments that you had before.

And I guess as a preamble, I should clear my throat and note that I'm speaking for myself and not for the DoD or any USG office. I'll give you my personal views on this issue set.

Let me, let me focus in on some things that have been discussed a little bit less, right. And so, we've talked a lot about the hardware evolution, and a fair amount of discussion about some of the shifts in doctrine that have already, has already been discussed.

I want to flag the ones that I see as most problematic. And maybe highlight the ones that were not dealt with as much in depth, right.

So, there certainly hasn't been a repudiation of, no first use, or an abandonment of assured retaliation as a core, the core strategy for China.

But there are, as the last panel talked about it, I think some signs that Chinese strategists are moving beyond that. And I'd highlight kind of four or five key areas.

One that didn't get talked about a lot in the last panel is conventional strikes on strategic assets. Dr. Saunders alluded to this to some extent.

Right. That the Chinese are worried that U.S. advances with PGMs and so on, hold at risk those fixed silos that Hans talked a lot about.

That's an area of evolution where the Chinese don't want to be bound by a no first nuclear use. That that's crossing the nuclear threshold from their perspective.

Second, much discussed was this development of launch on warning capability. The ISR, intelligence, surveillance and reconnaissance assets to support that, are coming about perhaps for other reasons, as Phil kind of noted.

But, that's creating new capabilities and therefore, you know, new strategic options for the Chinese.

Two that were discussed less, and I think are really important, one is the way that Chinese leaders are talking about strategic systems contributing to China's great power status. Right.

And that's something beyond just avoiding being coerced by a nuclear power. And understanding more about what that means to the Chinese, I think, is really important and, you know, certainly worrisome from the American perspective.

And then lastly, we see now, I think, very clearly, signs that the Chinese are talking about trans-war deterrence. About keeping a nuclear war limited. Right.

And this should be juxtaposed to thinking about nuclear war as essentially unwinnable, uncontrollable.

That if you cross the nuclear threshold, all bets are off, and you sort of target the other side's cities. And it's game over for, you know, mankind.

But instead, we're seeing the Chinese talk about having different waves of retaliatory forces.

About sizing, you know, the preliminary retaliation in such a way that you kind of communicate through a limited use of nuclear force against the adversary 5hat more is to come, but also, that things might de-escalate from -- from this point.

And so I think that, you know, is new. It goes well beyond traditional Chinese thinking. Is worrisome, in all of these ways.

I should note, the Chinese are kind of learning from us, right, the co-location, the intermixing of conventional and nuclear forces that was appropriately discussed in the previous panel, was something we did by design in the early Cold War. Launch on warning, also a contemporary U.S. policy.

So, you know, these are not unique to the Chinese. They're more commonplace. But, nevertheless, it's disturbing that the Chinese are moving in this direction.

I want to turn quickly to talk a little bit more about the drivers for both the hardware and kind of doctrinal thinking. Again, these were kind of discussed in the previous panel.

I would really foot stomp a lot on U.S. missile defense capabilities as an important driver. That the Chinese need to think, you know, from a good conservative defense planner's perspective, that they're going second.

That the, you know, in a Taiwan scenario, things might escalate. The U.S. might use nuclear weapons first.

And what would the Chinese have left after a disarming U.S. first strike, and would that residual force be large enough to penetrate what the U.S. regards as a somewhat modest missile defense capabilities?

So, that's one important driver, is the continued development of GBIs and SM3 Block 2As in the U.S. missile defense posture.

Other aspects are, you know, U.S. being perceived by Beijing to lower the nuclear threshold through the deployment of the W76 Mark II, or Block II warhead, a lower-yield warhead on our SSBNs, which give us, again, additional warfighting options that are newly returned to the Navy, I suppose.

All of this is relevant kind of only in a Taiwan scenario. And you know, that raises, I think, an important issue of thinking about the military balance across the Taiwan Strait.

And with the U.S. involvement in it, which has shifted quite dramatically. And really, you know creates additional sets of concerns.

Quickly, I would also flag the Indian nuclear arsenal as an important driver for the Chinese, as the previous panel did. But, let me just kind of put in perspective. Right.

If we are sitting here having a, you know, all day long panel discussing the danger posed by China's nuclear arsenal that sits at 5 percent of the U.S. warhead total today, or maybe 10 percent if it doubles, the Chinese look across at the Indian arsenal that is 75 percent of the Chinese arsenal in total number of warheads.

And have to take that into consideration before we even get to the great question on North Korea or concerns about Russia.

Let me just highlight in the three seconds I have left, some of the congressional, kind of recommendations I tried to flag in the written testimony.

You know, I think one of the issues to recognize is our language in things like the Strategic Competition Act, you know, smacks of hypocrisy.

Right. We're criticizing the Chinese for doing what we've always done in the nuclear arena.

I tried to make some concrete recommendations about ways that some congressional restrictions have challenged our ability, the U.S.'s ability to engage with the Chinese on this issue set in terms of restrictions on communications.

Missile defense, again, is an important area. And Congress plays a major role in, you

know, adapting and promoting different aspects of the missile defense. I think we need to think about how that is viewed by Beijing.

And then finally, we need to kind of bring in our thinking about that cross-straits balance in conventional terms to this dialogue. Right.

That we're put in a position of potential nuclear escalation by virtue of the conventional balance not being to our liking. And the weapons that we sell to Taiwan have an important effect on that. And I think we could do better there.

Sorry, I'm over time. Turn it over to the next panelist. Thank you.

PREPARED STATEMENT OF CHRISTOPHER TWOMEY, ASSOCIATE PROFESSOR, NAVAL POSTGRADUATE SCHOOL

June 10, 2021

Dr. Christopher P. Twomey

Associate Professor of National Security Affairs, Naval Postgraduate School

Testimony before the U.S.-China Economic and Security Review Commission

Hearing on "China's Nuclear Forces"

This written testimony will discuss why China is shifting its nuclear posture.[1] It will begin by highlighting the key elements of China's strategic posture today both in terms of capabilities and "doctrine" to provide a foundation for explaining the drivers behind that. External factors—primarily developments in the United States—and shifting dynamics within China combine to pressure for continued posture changes. Congress should minimize exacerbating these changes, avoid overstating the dangers of them, and work to bolster conventional deterrence in the region.

Key New Elements of China's Strategic Posture

Although we focus significant attention on the change in Chinese nuclear posture, it is worth recognizing that there are some elements of continuity as well. Before discussing the *sources* of the changes, it is important to lay out a baseline of what this analyst sees to be the key aspects of contemporary Chinese nuclear posture.

There are important continuities in Beijing's approach to strategic affairs that should not be ignored. First, China has long focused on ensuring that it has the ability to retaliate if ever struck with nuclear weapons; this is often called an "assured retaliation" posture. While the specific force requirements for this change given a potential adversary's own capabilities (both conventional and nuclear), the underlying logic can remain constant. Second, China perceives the nuclear arms race between the USSR and United States to have been both dangerous and a costly waste of resources. As such, China is reluctant to engage in such competition today. Finally, the People's Liberation Army (PLA) has a long tradition of opacity and ambiguity regarding strategic affairs. As with all countries, specifics about nuclear weapons are highly classified. But in the context of China's authoritarian restrictions on politically sensitive speech and China's small (relatively) arsenal, these elements are particularly strong.

Other areas of contemporary strategic posture have undergone more substantial change. As discussed in other panels, the land-based leg of China's nuclear force has significantly expanded and modernized. The development of road-mobile, solid-fueled systems that can reach the United States (DF-31A, DF-31AG, and soon, the DF-41) has greatly enhanced the survivability of China's forces, but also raises new challenges for the PLA with regard to command and control. More accurate missiles across both conventional and nuclear forces and at different ranges provide new capabilities but also require new intelligence, surveillance, and reconnaissance capabilities to be utilized to their full potential. Multiple, independently targetable reentry vehicles (MIRV) have finally joined the PLA-Rocket Force's (PLARF's) inventory in the DF-5B and (soon) the DF-41. While this increases warhead size, it also creates new vulnerabilities (particularly for the silo-based and liquid-fueled) DF-5B.

Other developments also pose new dangers. For the first time, in the last decade China possesses a viable sea-based nuclear force. This creates new potential threat axes for potential adversaries and may be relatively survivable (although this depends heavily on the nature of the adversary).

[1] This testimony represents the views of this author and do not necessarily align with the official views of the Department of Defense or other parts of the U.S. government. For a more detailed articulation of these views, see this author's chapter: "China's Nuclear Doctrine and Deterrence Concept," in Paul Bolt and James Smith, eds., *China's Strategic Arsenal: Worldview, Doctrine, and Systems* (Washington, DC: Georgetown University Press, 2021).

Even more than with the road mobile systems, it poses significant new command and control challenges for Beijing. Additionally, China is rounding out a triad of nuclear delivery capabilities with the addition of an—as yet, vague—role for its air force. Finally, more niche capabilities are important as well, such as various altitudes of missile defense systems, hypersonic weapons systems that can overcome missile defenses, increased strategic ISR capabilities, and continued development of capabilities that militarize outer space.

Emerging New Elements in China's Strategic Thought

As China deploys the new capabilities discussed above, and shaped by the internal and external drivers discussed below, there are signs that China's strategic thought is also undergoing some change. While far short of repudiation of China's NFU slogan, these steps are nevertheless disconcerting. It should be noted that in most cases, China is moving its policy closer to that of the United States and Russia (and historically the USSR).

Two elements of conventional doctrinal evolution are paramount in today's PLA: enhancing joint operations and deepening use of information technology (or "informationalization"). While neither center on strategic, nuclear affairs, both will have implications for it. The creation of a joint structure within the newly created "theater commands" includes, unsurprisingly, representatives from the PLA-RF. This will inevitably increase thinking within the PLA-RF about potential contributions to any conflict. While most of that will be PLA-RF conventional contributions, it seems unlikely that it would be limited to that. Reforms to enhance informationalization includes PLA-RF force. By creating more flexible command and control and deepening ISR capabilities, this initiative will open new doors for a responsive PLA-RF contribution.

Other areas of Chinese strategic thought are also evolving. Four broad baskets include conventional strikes on strategic assets, the potential to develop a launch on warning capability, various elements of transwar deterrence, and a broad contribution of strategic systems to China's status. Each is discussed in turn.

It has become quite clear that the Chinese are signaling that a conventional strike on nuclear assets (and potentially nuclear command and control) would be grounds for nuclear retaliation. Indeed, this is not surprising; the United States and Russia hold similar views. However, coupled with the deliberate intermixing of conventional and nuclear capabilities, this suggests that the Chinese are trying to find new ways to get some advantage from their nuclear force. The DF-26 was deliberately designed to be easily switched from carrying a nuclear and a conventional asset. This is almost certainly intended to complicate U.S. targeting decisions against a weapon that could either hold a carrier battle group at risk, or destroy Tokyo. (The U.S. engaged in similar co-mingling of nuclear and conventional forces throughout the cold war, and arguably does today). China feels under no obligation to take steps that facilitate an expansive U.S. precision guided munition attack on its key A2/AD assets, its ballistic missile force. Further, given the ambiguity over what constitutes a strategic target, this raises other challenges as well.

There are several signs that China is moving away from a traditionally very relaxed view on the pace of its retaliation. We see discussions among experts that a launch on warning posture does not violate a NFU (since the U.S. or other adversary would have launched a nuclear weapon, constituting "use" of some sort). The PLA-RF has touted its ability to respond quickly, under fire; this is a contrast to traditional Chinese approaches. Increased Chinese ISR capabilities are enabling some situational awareness that might support such a shift. We see both increased calls for ISR from the PLA-RF, nascent development of such capabilities in outer space, and this aligns with the broader trend toward informationalization. Again, this—launch on warning— has long been U.S. and Russian policy, but is new for the Chinese.

Third, there are a group of discussions with regard to using nuclear weapons to stem escalation that have recently emerged. Discussions of distinct waves of retaliation suggest new thinking about controlling nuclear escalation. Writings about optimizing choices made about the scale of those different changes highlight the depth of engagement with those issues. The accuracy of Chinese weapons has increased over time. While bureaucratic politics probably contributes to this development to some extent, the effect is to give Chinese nuclear weapons capability against counter force (both conventional and nuclear) targets in ways that only make sense in a warfighting context. And finally in this vein, there are a few spare references in Chinese writings regarding the PLA's nuclear arsenal deterring at least intense conventional wars. Again, thinking about reestablishing deterrence is not unique to the Chinese; this was a centerpiece to U.S. thinking throughout the cold war.

Finally, there are some signs that there is a limited, but not absent, role for China's strategic capabilities in its national identity as a major global power. Again, as noted repeated above and as is clear from the size of the PLA arsenal, nuclear weapons are not central to China's advancing its national interests in contested territory near its shores, protecting its economic interests further afield, nor in promoting alternative norms of governance and developmental models in international institutions. Nevertheless, Chinese leaders have started to talk of broad (and vague) ways that its nuclear arsenal helps ensure its core interests and advance its status as a great power.

External Drivers

So what accounts for this pattern of change and continuity in China's strategic posture? Several external drivers play important roles.

Foremost among them are developments by the United States (and its allies). Most important of these is the continued deployment of advanced missile defenses. Continued refinement of the ground based interceptors in Alaska (and California), the joint development of the SM-3 block IIA system with Japan, and exploration of multi-object kill vehicles all pose threats to China's ability to retain an assured retaliation capability, or more particular to deter a potentially disarming first strike by the United States. From the perspective of a conservative defense planner in Beijing, one might assume that noisy SSBNs are sunk early in a conflict, fixed silo based systems destroyed with conventional weapons, warhead depots similarly destroyed, and garrisons of mobile systems hit with a small number of nuclear weapons. The "over a hundred" warheads that the U.S. worries can target CONUS might rapidly be degraded to a dozen (i.e., just any surviving, alerted/pre-scattered DF-31As). These would need to run the gauntlet of sixty

GBIs and however many SM-3s are deployed on the seventy-odd Aegis capable destroyers in the U.S. Navy.

The United States also appears to Beijing to be lowering the nuclear threshold (e.g., deploying a low yield W76-2) while continuing to strive to dominate the ladder of escalation through an expensive recapitalization of its main nuclear force. There is also a broad sense, particularly given the previous administration's anti-China rhetoric, that the United States opposes China's rise in general and wants to deny it a natural place as a leading power in Asia.

Under what scenarios might this set of concerns be relevant? Most worrisome for Beijing would be a Taiwan scenario, where China worries that US will respond to increasing conventional challenges in the way we planned to in the Cold War: by crossing the nuclear threshold first, early in the war.

Beyond these concerns about the United States, China faces regional competitors in the strategic arena as well. India is particularly salient. If the United States worries about the growth of China's arsenal to 5 percent of its today, and perhaps 10 percent of the U.S. arsenal at the end of the decade, how should China view India, which already has 75 percent of China's arsenal? When India first tested in 1998, its defense minister explicitly flagged China as a potential adversary. Obviously, the recent deadly battles along their contested border have amplified this sense of security threat.

Further, it is objectively the case that China has three other nuclear powers on its borders: Russia, North Korea, and Pakistan. Its relations with each vary in comity today, but cannot be assumed away as security concerns even in the short term. At the very least—and despite rhetorical/costless support expression between Russia and China today—the vast Russian arsenal requires China to ensure it has a strategic nuclear insurance policy to ensure that does not provide Moscow coercive leverage on issues where the two sides' interests diverge (Central Asia seems most relevant in that regard). Beyond that, nascent and latent programs in South Korea, Japan, and—most worryingly—in Taiwan, further complicate the simple geometry of bilateral strategic competition with the United States.

Internal Drivers of Changes in Chinese Strategic Posture

While these factors are all clearly important to Beijing's thinking, and indeed resonate with how traditional realist political science thinkers would analyze the problem, there are other factors—unique to China—at play.[2]

The legacy of Chinese strategic thought on these issues serves as a continued restraint on the scale of change. As noted above, the desire to avoid the unproductive excesses (from Beijing's perspective) of Cold War arms races loom large. Chairman Mao's portrait remains enshrined above the entrance to the traditional imperial palace: so too do his utterances on nuclear policy,

[2] On such traditional approaches, see Kenneth N. Waltz, *Theory of International Politics* (McGraw-Hill Publishing, 1979) and John J. Mearsheimer, *The Tragedy of Great Power Politics*, Updated Edition (New York: W. W. Norton & Company, 2014).

the "no first use" policy. While no serious strategist would take such declaratory propaganda as constraining in a serious crisis, it is clear that in many ways China's nuclear weapons posture and development in peacetime have been and remain guided by this totem. To justify this point a bit further, how else should we understand the fact that while China has 70 percent of the U.S.'s GDP and the largest population in the world, it has an arsenal smaller than France and about the same size as Britain? Certainly, the legacy of history contributes in some way to this extreme anomaly.

Beyond that, there are other worrisome influences. Two stem from organizational politics of the PLA-RF as an institution.[3] Conventional missile forces are central to how China prepares to conduct operations along its periphery against advanced powers like the United States and its allies. These systems would be used heavily and early in any such conflict, in a quite offensive fashion. This is quite different from the way that China has traditionally thought about its nuclear forces. However, given that the officers move back and forth across the force, it is likely this leads to some desire to think about how China's nuclear forces might be used in less traditional ways.[4]

Second, in general, we know very little about how budgetary priorities are assessed and comparative prioritization conducted. There is a remarkable consistency within defense budgets as a percent of GDP or of government spending in China across time. However, beginning in the Hu Jintao period, the PLA-Navy was clearly getting a larger share resources within the budgets. It is likely that given the steady elevation of what is now called the PLA-Rocket Force in institutional heft has also given it greater voice in internal debates over priorities. That likely will lead to some added budgets, but also more of a voice in shaping doctrine.[5] Coupled with the above, this is more grounds for concern.

Recommendations

The situation describe above should be unsettling. China, in response to external pressures and following its own internal incentives, is developing new capabilities and strategic approaches that threaten strategic stability and increase the prospects of unthinkable nuclear exchanges. A few recommendations seem warranted based on the analysis above.

First, the United States should recognize that China views Washington through a competitive lens, and that security dilemma dynamics can be hard to avoid. At the very least, avoiding excessively confrontational language in this area makes sense. Much of what China is doing that we regard as destabilizing in this area has been done for decades by the United States. Our pleas that "we have to do it to assure allies" ring hollow to Beijing, who see those allies as threats. The policy recommendations in Title V (Ensuring Strategic Stability) of the Strategic Competition Act should be more modest. Demanding trilateral arms control will not get

[3] Eric Heginbotham, Jacob L. Heim, and Christopher P. Twomey, "Of Bombs and Bureaucrats: Internal Drivers of Nuclear Force Building in China and the United States," *Journal of Contemporary China* 28, no. 118 (July 4, 2019): 538–57, https://doi.org/10.1080/10670564.2018.1557945.

[4] David C. Logan, "Career Paths in the PLA Rocket Force: What They Tell Us," *Asian Security* 15, no. 2 (May 4, 2019): 103–21, https://doi.org/10.1080/14799855.2017.1422089.

[5] Organizations want budget and autonomy the world over.

anywhere. Much lower aspirations might. The preamble language in that section smacks of hypocrisy (launch on warning, co-mingling, and developing a triad are all U.S. strategies as well).

Second, Congress should recognize that the nuclear recapitalization program will exacerbate Chinese fears about the United States using nuclear coercive leverage in the future. A careful evaluation of ways that we can minimize that are warranted. Both the low yield W76-2 and specifics of ICBM programs would seem prime candidates for added scrutiny. That said, unilateral concessions are unlikely to result in sustained progress on this issue, leading to the next point.

Third, Congress should strongly support continued efforts by the US government to engage the Chinese on this issue set. Of course, diplomacy requires a partner, and the Chinese are reluctant to engage here. But Congressional restrictions in the FY2001 NDAA complicate engagement on the U.S. side as well. Further, whole-of-government treatment of China as an adversary complicate diplomacy. While acknowledging the challenge posed by the CCP's deep talons throughout Chinese society, viewing all exchange through a security lens overstates the degree of that control.

Fourth, given the centrality of missile defense to Chinese concerns, Congress should—at the very least—avoid pushing the executive branch to promote missile defense as a response to Chinese or Russian developments. As former MDA head VADM Syring once noted, that is a losing arms race from Washington's perspective. Missile defense is costly relative to missile offense. China will win that economic contest. Instead, Congress should push the executive to emphasize the role of missile defenses for second tier threats, while finding ways to engage China (and Russia) on missile defense. The prospect of drawing China into any trilateral arms control discussion in the absence of missile defense being on the agenda is negligible.

Finally, Congress should pressure DOD and DSCA to strongly promote more survivable A2/AD abilities in arms sales for Taiwan, rather than showy (and constituent job promoting) F-16Vs. By enhancing conventional deterrence by denial capabilities, we reduce the need to rely on nuclear deterrence by punishment strategy in the main scenario this analyst can see raising significant nuclear escalatory prospects.

OPENING STATEMENT OF DAVID LOGAN, PH.D. CANDIDATE IN SECURITY STUDIES, PRINCETON UNIVERSITY

COMMISSIONER FIEDLER: Thank you. Mr. Logan?

MR. LOGAN: Thank you so much. I want to thank the two Chairs and the Members of the Commission, and especially the staff for pulling this together.

This is an increasingly important aspect of the U.S.-China relationship, but one that unfortunately remains poorly understood.

So, in my opening statement, I want to focus on three main points. My first point is that while China's public declaratory doctrine has remained consistent, there is increasing ambiguity about the conditions under which China might revise or disregard that doctrine.

So, the basic tenets of China's nuclear declaratory doctrine include an unconditional no first use policy, and negative security assurances.

These have largely remained unchanged, at least in the public with China affirming that it will not use nuclear weapons first under any circumstances, and that it will not use or threaten to use nuclear weapons against non-nuclear weapon states or nuclear weapons free zones.

And we see these policies consistently reaffirmed both by Chinese officials in public settings, but more importantly, in authoritative military texts, including sources that are not intended for a foreign audience. Which provide them more credibility.

However, despite this consistency, there does remain significant ambiguity about whether there are conditions under which these policies, and particularly the no first use policy, might not hold.

So, Dr. Twomey mentioned some of these. And I'll reiterate them, as well as highlight some additional possibilities.

One is we do see authoritative Chinese texts envision threatening nuclear use in response to conventional attacks against high value targets within China. This could include nuclear power reactors or the large-scale conventional bombing of major cities.

Similarly, Chinese experts have argued that conventional strikes against China's nuclear forces could and should justify a Chinese nuclear response.

Chinese strategists have also tried to explain how a launch on warning posture would be consistent with the no first use policy.

And there's questions about whether or not U.S. military forces in the region, nuclear strikes against them would be covered by a no first use policy.

There's relatively little evidence that China has made a fundamental decision to alter its no first use policy or its negative security assurances.

However, of course China could in the future revise its doctrine to explicitly accommodate some of these exceptions.

And, I agree with Mr. Kristensen in the first panel that, even if in peace time, Chinese officials believe that their nuclear policies will remain intact, it is entirely possible that in the midst of a crisis or a conflict, they will revise or disregard them. And I think that is true for many nuclear armed states.

My second point is that many factors, as Dr. Twomey said, likely drive Chinese nuclear strategy. And that in part because of that, the future of that strategy remains uncertain.

Many of the recent shifts in China's nuclear doctrine, force structure, and operations can be viewed as consistent with either maintaining this more limited nuclear strategy of assured retaliation, and with potentially shifting to a new and potentially more expansive nuclear

strategy with greater capabilities and greater aims.

As I note some in my written testimony, there are bureaucratic and status drivers, as Dr. Twomey highlighted.

But I also agree that the modernization changes that we're seeing and the growth in force, for the most part, appear aimed at maintaining a credible second strike nuclear capability in order to deter and respond to nuclear use against China.

Chinese concerns about the vulnerability of its nuclear deterrent have largely centered on U.S. advances in ballistic missile defense systems.

But also on precision guided conventional weapons and developments in advanced intelligence surveillance and reconnaissance capabilities, which could assist the U.S. in launching a disarming first strike.

Facing this perceived, rightly or wrongly, increased vulnerability, China is attempting to increase the size, mobility, and readiness of its nuclear forces in order to strengthen their survivability against a potential U.S. strike.

Things like the adoption of multiple independently targetable reentry vehicles increase the potential of Chinese warheads to penetrate U.S. homeland defense capabilities.

And Chinese scholars have also cited, for example, nuclear missile -- excuse me, nuclear ballistic missile submarines as providing the capability of potentially evading the coverage areas of U.S. homeland missile defense infrastructure.

Still, these modernization efforts cast doubt on elements of China's nuclear policies given the growing mismatch between China's limited stated aims and its more expansive capabilities.

They also ease the technical constraints, which in the past would have made it more difficult for the PLA to adjust its nuclear strategy.

And, at the end of the day, regardless of the limited strategic aims for which China might design its nuclear forces, that country's nuclear capabilities today can increasingly support more than merely an assured retaliation posture.

My third point is that the PLA, largely consistent with its declaratory doctrine, envisions using nuclear weapons against an adversary's strategic targets. Usually this is understood as major cities.

And doing so, in order to inflict unacceptable punishment after China itself has suffered a nuclear strike.

So, we see this in authoritative texts describing the PLA's operational nuclear doctrine, which only as far as we have seen, include a nuclear counterstrike campaign.

And there's no evidence, at least in the open source, that this operational doctrine includes a first strike campaign.

Rocket Force training largely reflects this, with training and exercises involving nuclear forces, consistently described as simulating the aftermath of a nuclear strike against China.

And Rocket Force operators spend extended periods in protected underground facilities to simulate the need to shelter from a nuclear attack before executing China's own retaliatory nuclear launches.

There is no strong evidence that China distinguishes between the roles assigned to its strategic and its theater nuclear forces. The location and ranges of its theater forces suggest they are oriented toward missions involving India, the South China Sea and the East China Sea.

And it's unclear how they might be used. Although they could serve as part of a signaling strategy or a limited nuclear counterstrike campaign, presumably involving U.S. military forces in the region.

With the time that I have left, I'd like to close by briefly highlighting recommendations for Congress. And I'd be happy to talk more in detail about these in the Q&A.

The first is that Congress should support open source collection and analysis of China's nuclear weapons programs and policies.

Open source research is incredibly valuable, especially given the dearth of information that we have about China's nuclear weapons policies.

Things like reopening the open source center, and making that and other open source resources widely available, including to non-governmental researchers, can be a significant boon to understanding Chinese nuclear weapon issues.

Second, as was highlighted in the first panel, Congress can facilitate strategic nuclear dialogue between China and the United States, whether directing appropriate executive agencies to support these dialogues, providing appropriate funding, and investigating the role of U.S. policy and facilitating or hindering those.

Third, I strongly reinforce Dr. Twomey's suggestion about considering the role of U.S. missile defense developments in driving potentially undesirable Chinese nuclear policy choices.

And finally, Congress can also lay the foundation for cooperative nuclear arms control with China, particularly focused on crisis stability mechanisms.

Thank you very much.

PREPARED STATEMENT OF DAVID LOGAN, PH.D. CANDIDATE IN SECURITY STUDIES, PRINCETON UNIVERSITY

Testimony before the U.S.-China Economic and Security Review Commission

Hearing on

"China's Nuclear Forces"

David C. Logan

Ph.D. Candidate
School of Public and International Affairs
Princeton University

June 10, 2021

Co-chair Fiedler, Co-chair Wong, members of the commission, thank you for inviting me to appear before you today to discuss the nuclear forces of the People's Liberation Army (PLA). My testimony draws on authoritative Chinese sources and recent scholarly work to examine aspects of continuity and change in China's nuclear doctrine, the features and drivers of China's nuclear strategy, and the way China might use nuclear weapons. I conclude with recommendations for Congress.

Continuity and Change in China's Nuclear Forces

China's nuclear doctrine may be understood through its declaratory policy, force structure, and operational practices.

Declaratory Policy

The basic tenets of China's public declaratory nuclear policy, including a No-First-Use policy and negative security assurances, have remain unchanged. After conducting its first successful nuclear test in 1964, China publicly declared that "The Chinese Government hereby solemnly declares that China will never at any time and under any circumstances be the first to use nuclear weapons."[1] China has reiterated the policy ever since. As an extension of its NFU policy, China also declares negative security assurances, undertaking "not to use or threaten to use nuclear weapons against non-nuclear-weapon States or nuclear-weapon-free zones at any time or under any circumstances."[2] In addition to its NFU policy and negative security assurances, China's declaratory nuclear policies include commitments not to engage in arms races and to eventual complete disarmament and the prohibition of nuclear weapons.[3] These policies have been reiterated in authoritative texts, including China's most recent defense white paper,[4] and Chinese officials continue to publicly reaffirm the NFU policy.[5]

[1] 中华人民共和国政府声明 [Declaration of the government of the People's Republic of China], 人民日报 [*Renmin Ribao*], 17 October 1964, p. 1. For English translation, see "Statement by Peking on Nuclear Test," *The New York Times*, 17 October 1964, p. 10, available at https://www.nytimes.com/1964/10/17/archives/statement-by-peking-on-nuclear-test.html.
[2] A/50/155-S/1995/265, Letter dated 6 April 1995 from the Permanent Representative of China to the United Nations addressed to the Secretary-General, Annex, Paragraph 2, available at https://undocs.org/pdf?symbol=en/A/50/155. For the initial formulation, see A/S-10/AC.1/17, Letter dated 7 June 1978 from the Permanent Representative of China to the United Nations addressed to the Secretary-General, Annex, Paragraph 7, available at https://unoda-web.s3-accelerate.amazonaws.com/documents/library/A-S10-AC1-17.pdf.
[3] Statement by Vice Foreign Minister Li Baodong, Head of the Chinese Delegation at The General Debate in 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, 27 April 2015, p. 4.
[4] *China's National Defense in the New Era* (Beijing, State Information Council, 2019).
[5] See, for example, "Foreign Ministry Spokesperson Zhao Lijian's Regular Press Conference on April 14, 2021," Embassy of the People's Republic of China in the United States of America, 14 April 2021, http://www.china-embassy.org/eng/fyrth/t1868920.htm; "Foreign Ministry Spokesperson Hua

Despite consistency in official public statements and documents describing the unconditional nature of the NFU policy, there remains ambiguity about whether there are conditions under which both the NFU policy and negative security assurance might not hold. Chinese experts and officials and American researchers have suggested that China might use nuclear weapons first in certain situations.[6] For instance, authoritative Chinese texts envision threatening nuclear use in response to conventional attacks against high-value targets within China, such as major cities, nuclear power reactors, or the Three Gorges Dams; however, these sections do not describe China actually launching a nuclear strike.[7] Chinese experts and retired officials have publicly argued that conventional strikes against China's nuclear forces could (or should) justify a Chinese nuclear response.[8] Some Chinese interlocutors have further suggested that this ambiguity is a deliberate attempt to confuse China's adversaries and enhance deterrence, reflecting China's emphasis on concealment and deception in the nuclear realm.[9] There are also questions about whether or not China's NFU policy and negative security assurances would apply to non-nuclear states hosting U.S. military facilities such as Japan.[10]

Much of this ambiguity and debate about the NFU policy existed prior to Xi Jinping's tenure as General Secretary.[11] However, increasing Chinese concerns about U.S. capabilities in the nuclear domain, including ballistic missile defense systems and

Chunying's Regular Press Conference on January 22, 2021," Ministry of Foreign Affairs of the People's Republic of China, 22 January 2021, https://www.fmprc.gov.cn/mfa_eng/xwfw_665399/s2510_665401/t1847956.shtml; and "Statement by Director-General FU Cong at the EU Non-proliferation and Disarmament Conference," Ministry of Foreign Affairs of the People's Republic of China, 13 November 2020, https://www.fmprc.gov.cn/mfa_eng/wjbxw/t1832223.shtml.

[6] Office of the Secretary of Defense, *Annual Report to Congress, 2020: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2020), p. 86.

[7] 于际训 [Yu Xijun], ed., 第二炮兵战役学 [*The Science of Second Artillery Campaigns*] (Beijing: 解放军出版社 [Liberation Army Publishing House], 2004), pp. 294-296.

[8] David Santoro and Robert Gromoll, "On the Value of Nuclear Dialogue with China," *Issues & Insights*, Vol. 20, No. 1 (November 2020), pp. 12-14; 王大可 [Wang Dake], 中国核政策与核心利益 [China's Nuclear Policy and Core Interests], 东方早报 [*Oriental Morning Post*], 17 January 2013, http://news.sina.com.cn/c/2013-01-17/064926054455.shtml; and 王洪光: 如何应对美在亚太部署中导 [Wang Hongguang: How to Respond to U.S. Deployments of Intermediate-Range Missiles in the Asia-Pacific], 环球时报 [*Global Times*], 9 August 2019, https://opinion.huanqiu.com/article/9CaKrnKm4SW.

[9] Interviews with Chinese experts cited in Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and U.S.-China Strategic Stability," *International Security*, Vol. 40, No. 2 (Fall 2015), p. 21.

[10] Tong Zhao, "Conventional long-range strike weapons of US allies and China's concerns of strategic instability," *The Nonproliferation Review*, (2020), p. 8.

[11] Alastair Iain Johnston, "China's New "Old Thinking": The Concept of Limited Deterrence," *International Security*, Vol. Vol. 20, No. 3 (Winter, 1995-1996), pp. 5-42; and Eric Heginbotham et al., eds., *China's Evolving Nuclear Deterrent: Major Drivers and Issues for the United States* (Santa Monica, CA: RAND Corporation, 2017), pp. 129-133.

advanced conventional precision-strike weapons appear, to have intensified these debates in recent years.[12]

Force Structure

The nuclear force structure of the PLA has experienced moderate quantitative and significant qualitative change over time and, in particular, over Xi's tenure as General Secretary.

China has steadily increased the size of its nuclear forces. In 2011, the year prior to Xi's ascension to the office of General Secretary, the Defense Department estimated that China deployed roughly 60 ICBMs, including the relatively shorter-range DF-3 systems.[13] In 2020, roughly a decade later, the Defense Department estimated China deployed 100 ICBMs.[14] Over the same period, credible public estimates of China's warhead stockpile grew from 178 to 272.[15]

In addition to this moderate growth in the size of its nuclear forces, China has made significant qualitative enhancements to its nuclear arsenal. For several decades after China's first nuclear test, the country deployed only a small and rudimentary nuclear force consisting of immobile, liquid-fueled, and highly vulnerable missiles. Today, China's nuclear forces increasingly consist of advanced solid-fueled and road-mobile missiles.[16] Some of these systems, such as the DF-31AG and the DF-41 are believed to have off-road capability and the ability to fire without pre-prepared launch sites,

[12] Rong Yu and Peng Guangqian, "Nuclear No-First-Use Revisited," China Security, Vol. 5, No. 1, 2009, pp. 85-87; 龙兴春 [Long Xingchun], "中国核政策, 不妨讲清楚 [There Is No Harm in Speaking Clearly About Chinese Nuclear Policy]," 环球时报[*Global Times*], 15 January 2013, https://opinion.huanqiu.com/article/9CaKrnJyEYd; and Zhenqiang Pan, "A Study of China's No-First-Use Policy on Nuclear Weapons," *Journal for Peace and Nuclear Disarmament*, Vol. 1, No. 1 (2018), pp. 130-132.
[13] Office of the Secretary of Defense, *Annual Report to Congress, 2011: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2011), p. 34.
[14] Office of the Secretary of Defense, *Annual Report to Congress, 2020: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2020), p. 86.
[15] In 2011, the Bulletin of Atomic Scientists estimated China's arsenal at 178 operational and 240 total warheads. Hans M. Kristensen and Robert S. Norris, "Chinese Nuclear Forces, 2011," *Bulletin of the Atomic Scientists*, Vo. 67, No. 6 (2011), p. 85. In 2020, the Bulletin of Atomic Scientists estimated China's arsenal at 272 operational and 350 total warheads. Hans M. Kristensen and Matt Korda, "Chinese Nuclear Forces, 2020," *Bulletin of the Atomic Scientists*, Vo. 76, No. 6 (2020), p. 444.
[16] David C. Logan, "Making Sense of China's Missile Forces," in Phillip C. Saunders, Arthur S. Ding, Andrew Scobell, Andrew N. D. Yang, and Joel Wuthnow, eds., *Chairman Xi Remakes the PLA: Assessing Chinese Military Reforms* (Washington, D.C.: National Defense University Press, 2019), pp. 393-435.

greatly increasing their mobility, concealment, and, therefore, survivability.[17] China has equipped some of its ICBMs with multiple independent reentry vehicle (MIRV) capability, which enhances their potential to penetrate missile defenses.[18] China's nuclear-armed theater missile systems possess enhanced accuracy, potentially providing nuclear precision-strike capabilities.[19] It has also deployed new missile systems capable of being armed with either conventional or nuclear warheads.[20] There is limited evidence of Chinese interest in tactical nuclear weapons, though there is no indication that China ever fully developed or deployed these capabilities.[21]

In addition to the growth and modernization of its land-based nuclear forces, the PLA is also developing sea and air legs of a nuclear triad with the fielding of a fleet of nuclear ballistic missile submarines (SSBNs) and the development of both a new nuclear-capable strategic bomber and an air-launched nuclear-capable ballistic missile.[22]

Operational Practices

China has historically maintained relatively restrained operational practices for its nuclear forces. China has emphasized strict centralized control of its nuclear weapons

[17] 王卫东 [Wang Weidong], "东风-31 甲改核导弹方队: 倚天长剑裹雷挟风 [DF-AG Nuclear Missile Unit: The Long Sword Envelopes the Thunder and Carries the Wind]," 解放军报 [*PLA Daily*], 2 October 2019.
[18] 李彬 [Li Bin], "分导式多弹头: 自己够用就好 [MIRVs: Just Enough]," 澎湃 [*The Paper*], 8 October 2019, https://www.thepaper.cn/newsDetail_forward_4619177; and Jeffrey Lewis, "China's Belated Embrace of MIRVs," in Michael Krepon, Travis Wheeler, and Shane Mason, eds., *The Lure & Pitfalls of MIRVs: From the First to the Second Nuclear Age* (Washington, D.C.: Stimson Center, May 2016), pp. 95-117.
[19] "阅兵首次公开: 新型东风 26 导弹具备反舰能力 [Revealed Publicly at the Military Review: The New DF-26 has Anti-ship Capability]," 新浪军事 [*Sina Military*], 5 September 2015 http://mil.news.sina.com.cn/2015-09-03/1411838409.html; and Office of the Secretary of Defense, *Annual Report to Congress, 2016: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2016), p. 25.
[20] Joshua H. Pollack and Scott LaFoy, "China's DF-26: A Hot-Swappable Missile," *Arms Control Wonk*, 17 May 2020, https://www.armscontrolwonk.com/archive/1209405/chinas-df-26-a-hot-swappable-missile/.
[21] Jonathan Ray, "Red China's 'Capitalist Bomb': Inside the Chinese Neutron Bomb Program," China Strategic Perspectives No. 8 (Washington, D.C.: Institute for National Strategic Studies, National Defense University, January 2015); and Phillip C. Saunders and David C. Logan, "China's Regional Nuclear Capability, Nonnuclear Strategic Systems, and Integration of Concepts and Operations," in James M. Smith and Paul J. Bolt, eds., *China's Strategic Arsenal: Worldview, Doctrine, and Systems* (Washington, D.C.: Georgetown University Press, 2021), pp. 127-129.
[22] Office of the Secretary of Defense, *Annual Report to Congress, 2020: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2020), pp. 85-87.

and generally kept them at very low alert levels, with warheads and delivery systems stored separately.[23]

Recently, however, there is evidence that China might be adjusting some of these practices in ways which make its nuclear forces more capable. With help from Russia, China is reportedly planning to develop an early warning system, potentially consisting of ground-based radars and space-based platforms, which could help support a launch-on-warning nuclear posture.[24] U.S. government reports suggest China may be moving to a launch-on-warning posture and increasing peacetime readiness, though these developments remain to be seen.[25] The PLA has set goals, according to a defense white paper, "to improve strategic early warning, command and control … [and] rapid reaction,"[26] and a retired Rocket Force researcher has alleged that the reaction time of the missile forces has been reduced "from days and hours to minutes."[27] The U.S. government has cited a Chinese defense industry publication and signs of activity at China's nuclear testing site as evidence of possible interest in developing new warheads, including low-yield ones, though this evidence is not definitive.[28]

Future Trajectory

The future of China's nuclear forces remains uncertain. As is explained later in this testimony, many of the recent shifts in China's doctrine, structure, and operations

[23] On China's nuclear command and control, see Fiona Cunningham, "Nuclear Command, Control, and Communications Systems of the People's Republic of China," NAPSNet Special Reports, 18 July 2019, https://nautilus.org/napsnet/napsnet-special-reports/nuclear-command-control-and-communications-systems-of-the-peoples-republic-of-china/. On China's nuclear warhead handling practices, see For more on the former Second Artillery's base organization, see Mark Stokes, "China's Nuclear Warhead Storage and Handling System," *Project 2049 Institute*, 12 March 2010, https://project2049.net/documents/chinas_nuclear_warhead_storage_and_handling_system.pdf.

[24] Dmitry Stefanovich, "Russia to Help China Develop an Early Warning System," *The Diplomat*, 25 October 2019, https://thediplomat.com/2019/10/russia-to-help-china-develop-an-early-warning-system/.

[25] Office of the Secretary of Defense, *Annual Report to Congress, 2020: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2020), p. 88.

[26] *China's Military Strategy* (Beijing: State Information Council, 2015).

[27] 杨承军 [Yang Chengjun], "核战略专家杨承军：不宜在网络上炒作涉核问题 [Nuclear strategy expert Yang Chengjun: It Is Not Appropriate to Hype Nuclear-Related Issues on the Internet]," 祖国 [*Motherland*], 13 May 2020.

[28] Office of the Secretary of Defense, *Annual Report to Congress, 2020: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2020), pp. 87-88; Bureau of Arms Control, Verification, and Compliance, *2021 Adherence to and Compliance With Arms Control, Nonproliferation, and Disarmament Agreements and Commitments* (Washington, D.C.: U.S. Department of State, 2021), pp. 40-41; and Stephen Chen, "China Steps Up Pace in New Nuclear Arms Race with US and Russia as Experts Warn of Rising Risk of Conflict," *South China Morning Post*, 28 May 2018, https://www.scmp.com/news/china/society/article/2147304/china-steps-pace-new-nuclear-arms-race-us-and-russia-experts-warn.

are consistent with both a continued nuclear strategy of assured retaliation and with the adoption of a shift to a new and more expansive nuclear strategy.[29] However, together, these changes cast doubt on elements of China's nuclear doctrine and ease the technical constraints which, in the past, would have made it more difficult for the PLA to adjust its nuclear doctrine.[30] Regardless of the limited strategic aims for which China might design its nuclear doctrine, forces, and operations, Chinese capabilities today can increasingly support more than merely an assured retaliation posture.

China's nuclear forces are likely to continue to grow and become more capable. The Defense Intelligence Agency estimates that over the next decade China is likely to double its nuclear stockpile.[31] The number of missile brigades has increased from 29 to 40 in just three years (though this growth includes conventional missile brigades as well).[32] The addition of credible sea and air legs of the nuclear deterrent will further expand China's nuclear forces.

Ongoing trends within China's nuclear forces will likely increase pressures for raising their alert status. The fielding of a SSBN fleet may motivate China to adopt peacetime mating and may encourage pre-delegation of launch authority.[33] The continued vulnerability of silo-based ICBMs and nuclear aircraft also increase pressures for peacetime mating and higher alert status, lest China confront a use-or-lose scenario.[34] The growing entanglement of conventional and nuclear forces may lead nuclear units to adopt practices and policies previously isolated to the

[29] Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and U.S.-China Strategic Stability," *International Security*, Vol. 40, No. 2 (Fall 2015), pp. 7-50.
[30] David C. Logan, "The Dangerous Myths About China's Nuclear Weapons," *War On the Rocks*, 18 September 2020, https://warontherocks.com/2020/09/the-dangerous-myths-about-chinas-nuclear-weapons/; and Austin Long, "Myths or Moving Targets? Continuity and Change in China's Nuclear Forces," *War On the Rocks*, 4 December 2020, https://warontherocks.com/2020/12/myths-or-moving-targets-continuity-and-change-in-chinas-nuclear-forces/.
[31] Lt. Gen. Robert P. Ashley, Jr., "Russian and Chinese Nuclear Modernization Trends," Remarks at the Hudson Institute, 29 May 2019, https://www.dia.mil/News/Speeches-and-Testimonies/Article-View/Article/1859890/russian-and-chinese-nuclear-modernization-trends/.
[32] P. W. Singer and Ma Xiu, "China's Missile Force Is Growing at an Unprecedented Rate," *Popular Science*, 25 February 2020, https://www.popsci.com/story/blog-eastern-arsenal/china-missile-force-growing/; and Hans Kristensen, "China's Expanding Missile Training Area: More Silos, Tunnels, and Support Facilities," *Strategic Security* (blog), *Federation of American Scientists*, 24 February 2021, https://fas.org/blogs/security/2021/02/plarf-jilantai-expansion/.
[33] Tong Zhao, *Tides of Change: Nuclear Ballistic Missile Submarines and Strategic Stability* (Washington, D.C.: Carnegie Endowment for International Peace, 2018), pp. 16-18; and David C. Logan, "China's Future SSBN Command and Control Structure," Strategic Forum No. 299 (Washington, D.C.: Institute for National Strategic Studies, National Defense University, November 2016).
[34] Office of the Secretary of Defense, *Annual Report to Congress, 2020: Military and Security Developments Involving the People's Republic of China* (Washington, D.C.: Office of the Secretary of Defense, 2020), pp. 87-89.

conventional forces which could also lead to increased readiness among nuclear units.[35]

However, there would be technological and organizational challenges to some of these changes. For instance, adopting a launch-on-warning posture would require the development of a sophisticated early warning system consisting of space-based sensors, ground-based radars, intelligence fusion capabilities, and a command and control structure to quickly disseminate launch orders. To permit the rapid response necessary for a launch-on-warning posture, China would also have to place its forces on continuous alert and either pre-delegate launch authority or exclude some members of the CMC or the Politburo Standing Committee from nuclear launch decisions.[36] Given China's traditionally strong centralized civilian control over nuclear weapons, these would constitute significant changes.

Drivers of China's Nuclear Strategy

China's nuclear strategy is best characterized as one of "assured retaliation."[37] Under this strategy, the PLA would use nuclear weapons against an adversary's strategic targets, typically understood to be major cities, in order to inflict unacceptable punishment and only after China has suffered a nuclear strike (though, as discussed earlier, there remains some ambiguity about whether the NFU policy might not hold under certain conditions).[38] China claims to have the goals of maintaining a "lean and effective" nuclear force and to "keep[] its nuclear capabilities at the minimum level required for national security."[39] In authoritative texts describing the PLA's operational nuclear doctrine, the only campaign involving the use of nuclear weapons is the nuclear counterstrike.[40]

[35] Eric Heginbotham et al., eds., *China's Evolving Nuclear Deterrent: Major Drivers and Issues for the United States* (Santa Monica, CA: RAND Corporation, 2017), pp. 114-117.
[36] I thank Phillip C. Saunders for this point.
[37] Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and U.S.-China Strategic Stability," *International Security*, Vol. 40, No. 2 (Fall 2015), pp. 7-50; and Vipin Narang, *Nuclear Strategy in the Modern Era: Regional Powers and International Conflict* (Princeton, N.J.: Princeton University Press, 2014), pp. 121-152.
[38] 孙向丽 [Sun Xiangli], 核时代的战略选择: 中国核战略问题研究 [*Strategic Choices in the Nuclear Age: Research On Questions of China's Nuclear Strategy*] (Beijing: 中国工程物理研究院 [China Academy of Engineering Physics Research Center], 2013), pp. 137-139.
[39] *China's National Defense in the New Era* (Beijing, State Information Council, 2019).
[40] Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and U.S.-China Strategic Stability," *International Security*, Vol. 40, No. 2 (Fall 2015), p. 13. For a description of such a campaign, see 于际训 [Yu Xijun], ed., 第二炮兵战役学 [*The Science of Second Artillery Campaigns*] (Beijing: 解放军出版社 [Liberation Army Publishing House], 2004, pp. 297-316; and 寿晓松 [Shou Xiaosong], 战略学 [*The Science of Military Strategy*], 3rd ed., (Beijing: Military Science Press [军事科学出版社], 2013), pp. 172-176.

As discussed, signs of (potential) change in China's approach to nuclear weapons, including the pursuit of a nuclear triad, enhanced readiness, and a potential move to a launch-on-warning posture might be understood as efforts to maintain its assured retaliation strategy in the face of perceived threats to its nuclear deterrent, though they nonetheless ease long-standing technical constraints. China's nuclear doctrine and strategy, including changes to them, are shaped by strategic, bureaucratic, and status drivers.

Strategic Drivers

Strategic drivers are primarily responsible for China's ongoing modernization efforts, which largely aim at maintaining a credible secure second-strike nuclear capability to deter and respond to nuclear use against China. However, the size and type of nuclear forces necessary to maintain a secure second-strike capability depend on the perceived threat to China. Concerns about the vulnerability of its nuclear deterrent and U.S. pursuit of absolute security have centered on U.S. advances in ballistic missile defense, precision-guided conventional weapons, and intelligence, surveillance, and reconnaissance (ISR) capabilities.[41] By increasing the size, mobility, and readiness of its nuclear forces, China likely hopes to increase their survivability to a potential U.S. strike. MIRV capabilities increase the ability of Chinese warheads to penetrate U.S. ballistic defense systems.[42] Chinese scholars have cited the ability of SSBNs to potentially evade the coverage areas of U.S. homeland BMD capabilities.[43] In addition, ongoing nuclear modernization by other states, including the United States, provides additional impetus for China's own modernization.

In this respect, U.S. policy choices may shape China's nuclear trajectory. In particular, continued U.S. advancements in BMD, including the development of the SM-3 Block IIA interceptor with higher burnout velocities and the forward deployment in East Asia of systems such as Aegis Ashore and the Long-Range Discrimination Radar, might further heighten Chinese threat perceptions, providing stronger impetus for the continued expansion and modernization of China's nuclear forces.[44]

[41] 寿晓松 [Shou Xiaosong], 战略学 [*The Science of Military Strategy*], 3rd ed., (Beijing: Military Science Press [军事科学出版社], 2013), p. 172; 陈岳 [Chen Yue], "萨德入韩破坏地区战略平衡 [THAAD Deployment in South Korea Undermines the Region's Strategic Balance],"解放军报 [*PLA Daily*], 5 August 2016; and 吴日强 [Wu Riqiang], "国亚太反导系统对中国安全的影响及中国的对策 [The Impact of U.S. Missile Defense Systems in the Asia-Pacific on Chinese Security and Chinese Countermeasures]," 中国国际战略评论 [*China International Strategy Review*], (2014), pp. 331-348.
[42] Tong Zhao, *Narrowing the U.S.-China Gap on Missile Defense: How to Help Forestall a Nuclear Arms Race* (Washington, D.C.: Carnegie Endowment for International Peace, 2020), pp. 46-48.
[43] Wu Riqiang, "Survivability of China's Sea-Based Nuclear Forces," *Science & Global Security*, Vol. 19, No. 2 (2011), p. 13.
[44] Tong Zhao, *Narrowing the U.S.-China Gap on Missile Defense: How to Help Forestall a Nuclear Arms Race* (Washington, D.C.: Carnegie Endowment for International Peace, 2020).

Bureaucratic Drivers

Bureaucratic drivers are important secondary factors shaping China's nuclear forces and strategy. During Xi's tenure, nuclear constituencies have been created or elevated across the PLA, creating more domestic political actors with an interest in expanding nuclear capabilities. In 2015, the military arm that controls China's land-based nuclear weapons was renamed the Rocket Force and promoted in rank to the status of a full service, for the first time making it equal to the Army, Navy, and Air Force.[45] The addition of sea and air components of a nuclear triad create new communities with an interest in expanding the nuclear mission set. Interservice rivalry, particularly in the face of possible slower growth in military spending, encourages the creation of new operational requirements and forces in the nuclear domain. For instance, the development of a new nuclear-capable strategic bomber and air-launched ballistic missile for the PLA Air Force, which make little sense strategically, may be better understood as a result of bureaucratic dynamics.[46] The potential "bleeding" of operational practices from conventional to nuclear communities provides opportunities and pressures for adjusting nuclear forces and practices, including through greater accuracy, dynamic retargeting, realistic battlefield training, and higher readiness levels.[47]

Status Drivers

Status drivers are less important in shaping China's nuclear forces and strategy but there is some evidence to suggest they reinforce strategic and bureaucratic drivers.[48] Chinese officials frequently highlight the international prestige generated by China's nuclear forces and Xi Jinping has referred to the Rocket Force as "the strategic pillar of China's great power status."[49] Developments like MIRV capability and the SSBN fleet are seen as important technological achievements.[50] To the extent that Chinese officials believe that advances in the nuclear domain demonstrate China's technological superiority to domestic and international audiences, they will be more

[45] David C. Logan, "Making Sense of China's Missile Forces," in Phillip C. Saunders, Arthur S. Ding, Andrew Scobell, Andrew N. D. Yang, and Joel Wuthnow, eds., *Chairman Xi Remakes the PLA: Assessing Chinese Military Reforms* (Washington, D.C.: National Defense University Press, 2019), pp. 393-435.
[46] Eric Heginbotham et al., eds., *China's Evolving Nuclear Deterrent: Major Drivers and Issues for the United States* (Santa Monica, CA: RAND Corporation, 2017), p. 110.
[47] *Ibid*., pp. 114-117.
[48] Susan Turner Haynes, "The Power of Prestige: Explaining China's Nuclear Weapons Decisions," *Asian Security*, Vol. 16, No. 1 (2020), pp. 35-52.
[49] "火箭军方队：首次以战略军种名义亮相国庆阅兵 [Rocket Force Units: First Appearance in the National Day Parade with the Status of a Strategic Service]," 新华社 [*Xinhua News*], 11 October 2019, http://www.gov.cn/xinwen/2019-10/01/content_5435643.htm.
[50] Tong Zhao, *Narrowing the U.S.-China Gap on Missile Defense: How to Help Forestall a Nuclear Arms Race* (Washington, D.C.: Carnegie Endowment for International Peace, 2020), pp. 13-14.

likely to push for further growing and advancing the nuclear force, including potentially in ways which make less sense from a purely strategic perspective.

Chinese Use of Nuclear Weapons

The Central Military Commission tightly controls China's nuclear weapons and any decision to use them would be made by the CMC and the Politburo Standing Committee.[51] This tight control is reflected in the separation of the PLA's warhead handling infrastructure from the missile bases which command the Rocket Force's brigades, the comparatively restrained operational practices of China's nuclear forces, and the PLA's strong emphasis on political reliability of military personnel assigned to nuclear units.[52]

China emphasizes the ability to retain a survivable second-strike capability as the cornerstone of nuclear deterrence.[53] However, beyond simply maintaining the *capability* to deter, Chinese writings emphasize "displaying the *will* and capability to use force as the key means of deterring an enemy" [italics added].[54] PLA doctrinal and curricular texts envision several types of missile signaling operations to enhance deterrence.[55] These include raising the alert level of missile forces, dispersing mobile systems from their garrisons, test launches of strategic missiles, and publicly suggesting a willingness to lower the nuclear threshold.[56] Some of the more escalatory deterrence signaling measures include launching ICBMs without nuclear warheads toward maritime areas and launching ICBMs armed with conventional

[51] Fiona Cunningham, "Nuclear Command, Control, and Communications Systems of the People's Republic of China," NAPSNet Special Reports, 18 July 2019, https://nautilus.org/napsnet/napsnet-special-reports/nuclear-command-control-and-communications-systems-of-the-peoples-republic-of-china/.

[52] On warhead handling practices and infrastructure, see Mark Stokes, "China's Nuclear Warhead Storage and Handling System," *Project 2049 Institute*, 12 March 2010, https://project2049.net/documents/chinas_nuclear_warhead_storage_and_handling_system.pdf. On personnel reliability, see David C. Logan, "Rocket Force Personnel in the Age of Xi Jinping," in Roy Kamphausen, ed., *The People in the PLA 2.0* (Carlisle, PA: U.S. Army War College Press, 2021).

[53] Eric Heginbotham et al., eds., *China's Evolving Nuclear Deterrent: Major Drivers and Issues for the United States* (Santa Monica, CA: RAND Corporation, 2017), pp. 23-24.

[54] *Ibid*., p. 23.

[55] For a general discussion of Chinese deterrence signaling practices, see Nathan Beauchamp-Mustafaga, et al., *Deciphering Chinese Deterrence Signaling in the New Era: An Analytic Framework and Seven Case Studies* (Santa Monica, CA: RAND Corporation, 2021).

[56] 于际训 [Yu Xijun], ed., 第二炮兵战役学 [*The Science of Second Artillery Campaigns*] (Beijing: 解放军出版社 [Liberation Army Publishing House], 2004), pp. 282-296; 肖天亮 [Xiao Tianliang], ed., 战略学 [*Science of Military Strategy*] (Beijing: 国防大学出版社 [National Defence University Press], 2015), pp. 129-131; and 曹正荣 [Cao Zhengrong], 吴润波 [Wu Runbo], and 孙建军 [Sun Jianjun], 信息化联合作战 [*Informationized Joint Operations*] (Beijing: 解放军出版社 [PLA Press], 2008), p. 260.

warheads against key targets on the adversary's homeland.[57] These measures could easily be misinterpreted as preparations for an actual nuclear launch, potentially escalating a crisis or conflict and leading to nuclear use.

China's nuclear forces are intended primarily to prevent nuclear coercion and deter nuclear attack; Rocket Force training largely reflects these purposes and indicates that the PLA envisions using nuclear weapons in retaliation for a nuclear strike.[58] Public military reporting of Rocket Force training involving nuclear units consistently describes the simulated launches occurring after China has already suffered a nuclear strike.[59] Rocket Force training has operators spend several days (or longer) in protected underground facilities to simulate the need to shelter from the aftermath of a nuclear strike before executing China's own retaliatory nuclear launches.[60] Rocket Force units are frequently described as operating under conditions of nuclear attack or in a post-attack environment.[61] There is little to no information about nuclear training involving either the Navy or the Air Force, though flushing of

[57] 于际训 [Yu Xijun], ed., 第二炮兵战役学 [*The Science of Second Artillery Campaigns*] (Beijing: 解放军出版社 [Liberation Army Publishing House], 2004), pp. 291 and 402.
[58] Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and U.S.-China Strategic Stability," *International Security*, Vol. 40, No. 2 (Fall 2015), pp. 7-50.
[59] See, for example, 宗世航 [Zong Shihang], "火箭军某旅细化完善合成训练考评体系 [A Rocket Force Brigade Refines and Improves the Training Evaluation System]," 解放军报 [*PLA Daily*], 14 April 2019, p. 2; 刘王虎 [Liu Wanghu], 宋波 [Song Bo], and 冯金源 [Feng Jinyuan], "战斗在子夜打响 [The Battle Begins at Midnight]," 火箭兵报 [*Rocket Force News*], 6 September 2018, p. 4; 中国军队 核常兼备导弹部队 [China's Military: Nuclear-Conventional Dual-Capable Missile Unit], 中视网 [*CCTV*], 22 July 2017, http://military.cctv.com/2017/07/22/ARTISRZrXEl1cztsrXJ9rZSw170722.shtml; and Minnie Chan, "Chinese Military: Rocket Force Drills Prepare for Possible US Nuclear Weapons Attack," *South China Morning Post*, 25 August 2020, https://www.scmp.com/news/china/military/article/3098727/chinese-military-rocket-force-drills-prepare-possible-us.
[60] 刘王虎 [Liu Wanghu], "二炮士兵隐蔽在地下洞库 8 天生吃韭菜甜椒 [Second Artillery Soldiers Hidden in Underground Caverns for 8-Day Exercise Eat Leeks and Sweet Peppers]," 解放军报 [*PLA Daily*], 6 May 2013, http://mil.news.sina.com.cn/2013-05-06/0420723740.html; "二炮部队 58 名女兵进驻大山隐蔽洞库发射导弹 [58 Female Soldiers of the Second Artillery Stationed in Dashan Concealed Cavern to Launch Missiles]," 新浪军事 [*Sinica Military*], 17 May 2013, http://mil.news.sina.com.cn/2013-05-17/1509724974.html; and Larry M. Wortzel, *China's Nuclear Forces: Operations, Training, Doctrine, Command, Control, and Campaign Planning* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, 2007), p. 21.
[61] 李忠 [Li Zhong] and 张帆 [Zhang Fan], "雪域战场演兵忙：某旅冬训场营营对抗演练目击记 [Snowy Battlefield Military Exercises Are Busy: Account of a Brigade's Winter Training Camp Confrontation Exercise]," 火箭兵报 [*Rocket Force News*], 7 January 2017, p. 1; 牛小立 [Niu Xiaoli], 肖云舰 [Xiao Yunjian], and 田亮 [Tian Liang], "艰难一夜 [One Difficult Night]," 火箭兵报 [*Rocket Force News*], 14 January 2017, p. 2; and 毛建彬 [Mao Jianbin], et al., "Bravely Charge the Contaminated Zone," 解放军报 [*PLA Daily*], 19 January 2021, http://www.81.cn/bz/2021-01/19/content_9970056.htm.

SSBNs from home ports or scrambling nuclear bombers could both be important deterrence signals.[62]

No Clear Distinction between Strategic and Theater Forces

China's land-based nuclear forces consist of both strategic and theater systems. China does not deploy tactical nuclear weapons of the kind typically conceptualized in the United States with very small yields and very short ranges.[63] China's strategic and theater systems are distinguished by their basing, ranges, locations, and, to a lesser extent, yields. The strategic systems consist of primarily silo-based and some road-mobile intercontinental-range systems garrisoned in the heart of the country and armed with warheads of a few hundred to a few thousand kilotons. The theater systems consist of road-mobile systems with ranges of a few thousand kilometers, garrisoned largely near China's borders and armed with warheads of a few hundred kilotons.[64] The available evidence does not indicate that China distinguishes between the roles assigned to these strategic and theater nuclear forces.[65]

It is unclear precisely how China envisions using its theater nuclear forces, though they might be used in several ways.[66] First, China might use them as part of a limited nuclear counterstrike campaign, presumably against U.S. military forces in the region. Although China does not appear to plan for limited nuclear strikes, some language from doctrinal materials suggests the PLA envisions at least two waves of nuclear counterstrikes and that they might involve one or more than one missile base, implying that Chinese nuclear strikes might have some flexibility in how they are conducted.[67] Chinese decision-makers could always attempt to order a tailored nuclear strike in a contingency. Second, China might use its theater nuclear forces to threaten a nuclear strike or engage in nuclear signaling operations to reestablish deterrence during a conflict, though this might violate China's NFU policy. The

[62] Tong Zhao, *Tides of Change: Nuclear Ballistic Missile Submarines and Strategic Stability* (Washington, D.C.: Carnegie Endowment for International Peace, 2018), p. 80.
[63] Phillip C. Saunders and David C. Logan, "China's Regional Nuclear Capability, Nonnuclear Strategic Systems, and Integration of Concepts and Operations," in James M. Smith and Paul J. Bolt, eds., *China's Strategic Arsenal: Worldview, Doctrine, and Systems* (Washington, D.C.: Georgetown University Press, 2021), pp. 126-129.
[64] For some discussion on distinguishing these systems, see David C. Logan, "Are They Reading Schelling in Beijing? The Dimensions, Drivers, and Risks of Nuclear-Conventional Entanglement in China," *Journal of Strategic Studies* (2020), pp. 27-30.
[65] Tong Zhao, "Conventional long-range strike weapons of US allies and China's concerns of strategic instability," *The Nonproliferation Review*, (2020), p. 8; and Fiona S. Cunningham, *Managing U.S.-China Nuclear Risks: A Guide for Australia* (Sydney: United States Studies Centre, 2020), p. 6.
[66] For some discussion, see Fiona S. Cunningham, *Managing U.S.-China Nuclear Risks: A Guide for Australia* (Sydney: United States Studies Centre, 2020), pp. 3-6.
[67] 于际训 [Yu Xijun], ed., 第二炮兵战役学 [*The Science of Second Artillery Campaigns*] (Beijing: 解放军出版社 [Liberation Army Publishing House], 2004), p. 145. For some discussion, see Fiona S. Cunningham and M. Taylor Fravel, "Dangerous Confidence? Chinese Views on Nuclear Escalation," *International Security*, Vol. 44, No. 2 (Fall 2019), pp. 84-85.

location of China's theater nuclear forces suggests they are oriented toward missions involving India, the South China Sea, and the East China Sea.[68]

Recommendations for Congress

Based on the above analysis, I make the following recommendations for Congress.

First, Congress should support open-source collection and analysis on China's nuclear weapons. Research on any state's nuclear weapons policies and practices is difficult. This is especially true of China, which is remarkably opaque about its nuclear forces. Open-source research, including from military reporting, news media, PLA doctrinal and curricular materials, public-facing government documents, and academic reports, is incredibly valuable to better understanding China's nuclear weapons programs, including the roles China assigns to its theater nuclear weapons systems, the drivers and future trajectory of China's nuclear forces, and the role of the emerging air and sea legs of China's nuclear triad. However, the U.S. government has erected obstacles to open-source research. In June 2019, the Open Source Enterprise (OSE) was decommissioned and its contents transferred to restricted networks.[69] The OSE had previously provided valuable access to open source information about the Chinese military and its nuclear forces. This access is particularly valuable given the increasing challenges of conducting fieldwork in China. In its 2019 annual report to Congress, the Commission recommended "direct[ing] the Office of the Director of National Intelligence to restore the unclassified Open Source Enterprise website to all of its original functions for U.S. government employees. Access to the Open Source Enterprise should also be expanded by making appropriate materials available to U.S. academic and research institutions."[70] However, the Commission's 2020 annual report omitted this recommendation and there has been no indication of movement in restoring OSE or a replacement service. Congress should direct the Director of National Intelligence to restore the unclassified OSE, make it available to U.S. academic and research institutes, and ensure appropriate funding for the secure collection, translation, and dissemination of open sources.

[68] Phillip C. Saunders and David C. Logan, "China's Regional Nuclear Capability, Nonnuclear Strategic Systems, and Integration of Concepts and Operations," in James M. Smith and Paul J. Bolt, eds., *China's Strategic Arsenal: Worldview, Doctrine, and Systems* (Washington, D.C.: Georgetown University Press, 2021), pp. 129-131; and David C. Logan, "Are They Reading Schelling in Beijing? The Dimensions, Drivers, and Risks of Nuclear-Conventional Entanglement in China," *Journal of Strategic Studies* (2020), p. 20.
[69] Steven Aftergood, "Improved Access to Open Source Intelligence Urged," *Secrecy News* (blog), *Federation of American Scientists*, 2 December 2019, https://fas.org/blogs/secrecy/2019/12/osint-access/.
[70] *2019 Annual Report to Congress* (Washington, D.C.: U.S.-China Economic and Security Review Commission, 2019), p. 541.

Second, Congress should facilitate strategic nuclear dialogue between China and the United States. Dialogues, whether official or at the Track-1.5 and Track-2 levels, can be incredibly valuable in gaining insights into Chinese nuclear weapons issues and communicating the policies and views of the U.S. government.[71] The United States can use dialogues to seek clarity about the role of China's theater nuclear forces, the drivers and extent of Chinese conventional-nuclear entanglement, Chinese views of escalation and signaling dynamics, and China's requirements and goals for nuclear forces. In the past, the Defense Threat Reduction Agency (DTRA) played an important role in funding and supporting U.S.-China dialogues on nuclear issues. In 2019, however, DTRA ended its support amid frustration with inconsistent Chinese participation and the Chinese government's continued refusal to commit to an official dialogue.[72] Congress can support dialogue in several ways. First, Congress can direct the Secretary of Defense, through DTRA, to fund and support unofficial and official dialogues between the United States and China on nuclear weapons issues. Second, Congress should provide the appropriate funding necessary to realize this goal. Third, Congress can investigate the role of U.S. policy in facilitating or hindering official dialogues, including, for instance, the costs and benefits of the United States acknowledging nuclear mutual vulnerability with China, which has been a key Chinese prerequisite for initiating official dialogue.

Third, Congress should investigate the role of U.S. BMD developments in driving undesirable Chinese nuclear policy choices and consider options to appropriately adjust U.S. BMD policy. As discussed, Chinese concerns about U.S. BMD capabilities are a key driver of China's nuclear insecurity. While these concerns may be misplaced or disputable, they appear sincerely held.[73] Recent U.S. actions on BMD have only exacerbated those concerns. For instance, the 2017 National Defense Authorization Act (NDAA) revised the 1999 National Missile Defense Act by removing the word "limited" from descriptions of planned U.S. BMD deployments. This deletion, along with analogous statements from administration officials, signaled a more expansive BMD goal, one which might potentially impact China's nuclear forces and further drive China's nuclear expansion.[74] The 2018 NDAA reinforced this move by

[71] David Santoro and Robert Gromoll, "On the Value of Nuclear Dialogue with China," *Issues & Insights*, Vol. 20, No. 1 (November 2020); Brad Roberts, ed., *Taking Stock: U.S.-China Track 1.5 Nuclear Dialogue* (Livermore, CA: Center for Global Security Research Lawrence Livermore National Laboratory, 2020); and author's own experiences.
[72] Brad Roberts, "A Review and Assessment from an American Perspective," in Brad Roberts, ed., *Taking Stock: U.S.-China Track 1.5 Nuclear Dialogue* (Livermore, CA: Center for Global Security Research Lawrence Livermore National Laboratory, 2020), p. 26; and Responses of Hon. Andrea L. Thompson to Questions Submitted by Senator Jeff Merkley, hearing before the Senate Foreign Relations Committee on the Intermediate Range Nuclear Forces Treaty, 15 May 2019, https://www.congress.gov/event/116th-congress/senate-event/LC65208/text?s=1&r=5.
[73] Tong Zhao, *Narrowing the U.S.-China Gap on Missile Defense: How to Help Forestall a Nuclear Arms Race* (Washington, D.C.: Carnegie Endowment for International Peace, 2020).
[74] Kingston Reif, "Trump Seeks Missile Defense Buildup," *Arms Control Today*, Vol. 49, No. 2 (March 2019), pp. 30-32.

significantly expanding the work of the Missile Defense Agency (MDA).[75] Congress can direct appropriate U.S. government agencies to study issues such as the role of U.S. BMD capabilities in driving Chinese nuclear programs, the potential threat U.S. BMD capabilities might present to China's nuclear deterrent, the technical feasibility of distinguishing between theater and strategic BMD capabilities, and the potential strategic costs and benefits of specific BMD programs. This may help the U.S. government better balance the benefits of BMD developments with their potential costs.

Finally, Congress can lay the foundation for cooperative nuclear arms control with China, focused on crisis stability mechanisms. The United States government has expressed an interest in enlisting China's participation in nuclear arms control, which could address many U.S. concerns. The near-term likelihood of any formal U.S.-China arms control agreements is very low, but the United States can work now to lay the groundwork for future initiatives. Areas of possible cooperation include crisis-communications and crisis-management capabilities such as through the National and Nuclear Risk Reduction Center, joint technical assessments of BMD systems, Chinese observer participation in (mock) New START inspections, and advanced notification agreements covering major exercises and launches. Congress could eventually support the development of relationships between the National Nuclear Security Administration (NNSA) and the U.S. National Laboratories and Chinese counterparts.[76] Some of these efforts might be hampered by current legal restrictions on U.S.-China military-to-military exchanges. Section 1201 of the 2000 NDAA states that "The Secretary of Defense may not authorize any military-to-military exchange or contact … if that exchange or contact would create a national security risk due to an inappropriate exposure," including in the areas of nuclear operations, advanced combined-arms and joint combat operations, surveillance and reconnaissance operations, military space operations, release of classified or restricted information, and access to a Department of Defense laboratory. Although the current level of military-to-military contacts does not come close to violating the restrictions, the U.S. government might desire future contacts which might be restricted. For instance, in 2014, the Chairman of the Joint Chiefs of Staff suggested that, depending on Chinese participation in the RIMPAC exercises, Congress might reconsider the 1201 restrictions.[77] Congress could direct the Congressional Research Service or the Secretary of Defense to investigate whether and to what extent the

[75] Eric Gomez, "Missile Defense in the 2018 NDAA," *Cato at Liberty* (blog), *Cato Institute*, 20 November 2017, https://www.cato.org/blog/missile-defense-2018-ndaa.
[76] Frank A. Rose, "Bringing China into the Fold on Arms Control and Strategic Stability Issues," *Order from Chaos* (blog), *The Brookings Institution*, 25 September 2019, https://www.brookings.edu/blog/order-from-chaos/2019/09/25/bringing-china-into-the-fold-on-arms-control-and-strategic-stability-issues/; and Sarah Bidgood, "Risky Business: Four Ways to Ease U.S.-Russian Nuclear Tension," *Arms Control Today*, Vol. 49, No. 7 (September 2019), pp. 6-11.
[77] Jeanette Steele, "Historic Moment for Naval War Games," *San Diego Union-Tribune*, 6 July 2014, https://www.sandiegouniontribune.com/military/sdut-rimpac-china-japan-naval-exercises-harry-harris-2014jul06-story.html.

Section 1201 restrictions would hamper potentially beneficial cooperation and consider revising the restrictions as necessary.[78]

[78] For some more suggestions about reexamining U.S.-China military-to-military contacts, see Joel Wuthnow, "Projecting Strength in a Time of Uncertainty: China's Military in 2020," Testimony before the U.S.-China Economic and Security Review Commission, 9 September 2020, pp. 22-23.

OPENING STATEMENT OF CAITLIN TALMADGE, ASSOCIATE PROFESSOR OF SECURITY STUDIES, GEORGETOWN UNIVERSITY SCHOOL OF FOREIGN SERVICE

COMMISSIONER FIEDLER: Thank you. Dr. Talmadge?

DR. TALMADGE: Good morning. Thank you very much for the opportunity to speak with you all today on this important topic.

The main point that I want to get across in my brief prepared remarks today, is that the U.S.-China nuclear relationship is growing increasingly competitive in ways that raise risks of actual nuclear use.

Leaders on both sides in the future might enter a conflict with the expectation that it will be controlled, limited, and purely conventional. But, there are increasing reasons to question this sanguine view.

The risk of Chinese nuclear use, while low in absolute terms, is rising relative to where it has been in the past.

Furthermore, even short of an actual war or actual nuclear use, a more competitive U.S.-China nuclear relationship will likely have important consequences even in peacetime or in a crisis short of war, because nuclear weapons, as have already been discussed this morning, cast a long shadow.

Overall, as the first panel, I think, nicely illustrated, it's very clear that China's nuclear arsenal is improving both qualitatively and quantitatively.

Many of China's nuclear activities seem clearly oriented toward improving survivability.

That is, towards strengthening China's secure second strike capabilities for retaliatory purposes.

And they do not necessarily by themselves clearly or definitively signal any departure from China's longstanding no first use pledge.

Some aspects of China's nuclear modernization are more ambiguous, however. And suggest that China might be considering new and more ambitious nuclear missions, such as being able to hit with nuclear weapons U.S. or allied military targets in the western Pacific theater.

China's deployment of the intermediate range DF26 missile, which we talked about a little bit this morning, a missile that apparently has a hot swapping capability, enabling it to rapidly switch between launching conventional or nuclear warheads, as well as having a high degree of accuracy against moving targets like aircraft carriers, is an example of something China is doing today that really does look different from what it's done in the past.

In this context, potential Chinese nuclear escalation, for example, in a high stakes war over Taiwan, is a concern.

Given the island's political importance, it's not inconceivable to me at least, to think that Chinese leaders losing a war over Taiwan, if that were to happen, could turn to the limited use of nuclear weapons to try to get the United States to back down, or simply to halt the U.S. conventional campaign.

Additionally, even if China were not losing a conventional war over Taiwan, it's quite possible, as the discussion of entanglement suggested this morning, that such a war might damage, degrade, or even destroy important components of China's nuclear arsenal.

This is primarily because, as was discussed, there are a series of interlinkages between China's conventional and nuclear forces.

If the United States wants to attack China's conventional theater ballistic missile forces, like the DF26 for example, it's almost inevitable that the United States will also erode some of

China's nuclear tipped theater ballistic missiles.

The sea-based leg of China's nuclear forces has significant interlinkages with conventional forces too. I'd be happy to discuss those.

And it's also important to remember that in any major war, the United States is very likely to go after military assets on the Chinese mainland as part of that conventional war, that are nevertheless very important for protecting China's nuclear forces, such as air defenses that would protect China's silo-based nuclear forces.

The overall picture then in a major conventional war, would not probably be one that would be very comforting to Chinese leaders.

And assessing a pattern of conventional damage against their nuclear forces, Chinese leaders might come to think that Washington had aims beyond winning the conventional war.

That the United States might be seeking to disable or destroy China's nuclear arsenal outright, maybe even as a prelude to regime change.

Amidst the fog of war and worst-case thinking, Chinese leaders might see limited nuclear escalation as a way to force an end to the conflict either by halting the U.S. military campaign, or simply as a means of signaling to the United States that it had crossed what China considered to be a vital escalation threshold.

China's own little-studied 1969 nuclear crisis with the Soviet Union, points to some of these potentially escalatory dynamics in the wartime environment.

So, there are real reasons to be concerned that a conventional war might not stay conventional.

But even short of the possibility of actual Chinese nuclear use, China's improving arsenal will likely have some significant consequences during peacetime and in any future crisis short of war.

And the main reason is that a more robust Chinese nuclear arsenal will entrench the United States in China -- and China, in a deeper state of mutual nuclear vulnerability, or mutually assured destruction, MAD, as it's sometimes called.

In MAD, there is no meaningful way for either side to avoid suffering unacceptable damage in an all-out nuclear war, no matter who goes first.

And I think it was very instructive, Commissioner Wessel, your comment earlier when you were asking a panelist to grade China's nuclear forces.

No one said China -- I give China an A plus. China probably is not there. But, what you also heard in the grading was that there's movement toward, toward that A plus.

Which I would sort of characterize as the condition of mutual vulnerability. And that's a change.

From this perspective, China's nuclear improvements are worrisome to many U.S. policymakers, not because of a fear that China is going to launch a bolt from the blue nuclear attack against Los Angeles or something.

Rather, the concern is that if the United States enters an undisputed state of nuclear vulnerability with China, meaning that China can inflict unacceptable damage on U.S. cities, even in the aftermath of a U.S. first strike, which is the thing people were questioning today, then the United States may be less able to deter China from engaging even in conventional or subconventional aggression, especially against U.S. partners or allies.

In other words, the United States may no longer be able to credibly leverage threats of nuclear escalation against China, because such escalation would now be as dangerous for the United States as it would be for China.

Another way to think of this, is that if the two sides are stalemated at the nuclear level, the conventional balance then becomes much more important for deterrence and for crisis bargaining.

And as is well known by the members of this Commission, the conventional balance is also not moving in a very favorable direction for the United States and its allies.

So, it's that context in which these concerns about the nuclear arsenal are emerging. I highlight briefly for your consideration two recommendations, given these concerns. First, I would note that even in a more competitive nuclear relationship, the United States can work with China to build de-escalatory off-ramps in the event that a crisis or a war happens.

Fostering robust, direct, and regularly used crisis communication channels between high level policy makers and military officers should be pursued.

There are some steps that it looks like the Biden administration is already taking in this direction. We should keep pushing on this door which was a method that we used even in the Cold War with the Soviet Union very effectively.

Second, the United States should consider engaging in arms control with China, bearing in mind that arms control can mean a lot of different things.

And it's probably going to mean something different in the future then how it looked in the Cold War.

An arms control process for example, might be conceived more broadly as strategic stability talks that could address not only nuclear weapons, but other emerging technologies and domains that are likely to affect nuclear escalation risks.

China, thus far, has resisted efforts to join U.S.-Russian strategic arms control. But, the United States, I think, should emphasize to China that it benefits from verifiable constraints and caps on the U.S. and Russian arsenals.

And that over the medium term, some type of Chinese participation in this regime will likely be required in order to sustain the strategic arms control framework politically.

And without that framework, China would potentially have to worry about basically being a latecomer to a three-way unconstrained arms race between the U.S., Russia, and China, which is not something that should be very appealing to Chinese leaders.

So ultimately, this is something that I think, China can see as being in its interest too.

Although this won't be easy to pursue, I do think that there are a variety of credible and creative ways that the United States might begin to integrate China into an arms control framework.

It will be a process and not simple. But, I'd be happy to discuss those further and in more specificity in the Q&A.

Thank you again for the opportunity to testify.

PREPARED STATEMENT OF CAITLIN TALMADGE, ASSOCIATE PROFESSOR OF SECURITY STUDIES, GEORGETOWN UNIVERSITY SCHOOL OF FOREIGN SERVICE

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THE U.S.-CHINA NUCLEAR RELATIONSHIP: GROWING ESCALATION RISKS AND IMPLICATIONS FOR THE FUTURE

Testimony before the U.S.-China Economic and Security Review Commission

Hearing on China's Nuclear Forces

June 7, 2021

Commissioner Fiedler, Commissioner Wong, other distinguished members of the Commission, fellow panelists, thank you for the opportunity to speak with you today. I have been asked to address the topic of China's nuclear arsenal, possible scenarios for Chinese nuclear use, and the implications for the United States. My testimony today comes from my perspective as an analyst of military affairs and nuclear strategy whose research has focused heavily on the U.S.-China nuclear relationship in recent years.

The main point I want to get across today is that the U.S.-China nuclear relationship is becoming more competitive in ways that raise risks of nuclear use.[1] Leaders on both sides might enter a future conflict with the expectation that it will remain controlled, limited, and purely conventional, but there are persuasive reasons to doubt this sanguine view. Specifically, the risk of Chinese nuclear use, while still very low in absolute terms, is growing relative to where it once was, in part because the overall risk of conflict between the two nations is also growing. For decades, nuclear weapons have been largely peripheral to U.S.-China relations, but that is no longer the case. Unfortunately, a future U.S.-China conventional conflict may not remain easily controlled and limited, and there are some real dangers of nuclear escalation. Furthermore, as I will discuss, a more competitive U.S.-China nuclear relationship will likely have important consequences even in peacetime or a crisis, short of war, because nuclear weapons cast a long shadow.

In my remarks today, I will first give an overview of the important changes underway in China's nuclear arsenal, before turning to some possible scenarios for Chinese use. I will then discuss some of the broader potential implications of a more competitive U.S.-China nuclear relationship and conclude with some recommendations for Congress.

China's Nuclear Modernization

[1] My testimony draws throughout on my previous publications. These include Caitlin Talmadge, "Would China Go Nuclear? Assessing the Risk of Chinese Nuclear Escalation in a Conventional War with the United States," *International Security* 40, no. 4 (Spring 206): 50-92; Caitlin Talmadge, "Beijing's Nuclear Option," *Foreign Affairs* 97, no. 6 (November/December 2018): 44-50; and Caitlin Talmadge, "The U.S.-China Nuclear Relationship: Why Competition Is Likely to Intensify," Brookings Global China Series, September 2019.

Only a decade or two ago, China's nuclear arsenal was small, vulnerable, and maintained at a very low state of peacetime readiness. China's no-first-use pledge was thus credible simply because its forces were minimal and not poised for use.[2] Like the United States and Russia, however, China is now undergoing a significant period of nuclear modernization. Much of the public discussion of changes in China's nuclear arsenal has focused on growth in arsenal size, but it is important to remember that China is beginning from a very low baseline.[3] China's arsenal remains dramatically smaller than that of the United States and Russia, in the low hundreds rather than thousands, and the United States for decades has consistently over-predicted increases in the size of China's nuclear forces.[4] Thus, when we hear concerns that China's nuclear arsenal may soon double, we should pause to remember that even a doubled Chinese arsenal would be only a fraction of the U.S. and Russian arsenals. That said, China's arsenal is clearly on a steady upward trajectory, and China has the resources to support a significantly larger nuclear arsenal that it currently possesses. It seems prudent to assume that growth in Chinese forces will continue, although to what ultimate level remains unclear.

Equally important are the qualitative characteristics of China's nuclear weapons and what clues they offer as to China's nuclear strategy, beyond simply the quantitative size of the arsenal. Many of China's recent changes seem clearly oriented toward improving survivability. In other words, they do not necessarily by themselves signal any departure from China's long-standing no-first-use pledge. Instead, they appear oriented toward ensuring that if China suffered a nuclear attack, it would still have enough surviving forces to inflict a retaliatory second strike on its opponent. They are about creating a condition of mutual vulnerability with the United States—a situation in which there is no meaningful way for either side to avoid suffering unacceptable damage in a nuclear war, no matter who strikes first.

For example, China has taken steps to improve the mobility of its nuclear forces, investing in road-mobile ICBMs that would be significantly more difficult for an adversary to locate and destroy prior to launch, compared to silo-based ICBMs in fixed locations.[5] China is also investing in a sea-based nuclear deterrent, which although currently rudimentary and vulnerable to U.S. anti-submarine warfare capabilities, provides a foundation for a future ballistic missile

[2] Taylor Fravel and Evan Medeiros, "China's Search for Assured Retaliation: The Evolution of Chinese Nuclear Strategy and Force Structure," *International Security* 35, no. 2 (Fall 2010): 48-87; Avery Goldstein, *Deterrence and Security in the 21st Century: China, Britain, France, and the Enduring Legacy of the Nuclear Revolution* (Stanford, CA: Stanford University Press, 2000); Vipin Narang, *Nuclear Strategy in the Modern Era*, chapter 5; and Taylor Fravel, *Active Defense: China's Military Strategy Since 1949* (Princeton: Princeton University Press, 2019), chapter 8.

[3] For example, Robert Ashley, "Russian and Chinese Nuclear Modernization Trends," (remarks at the Hudson Institute, Washington, DC May 29, 2019), https://www.dia.mil/News/Speeches-and-Testimonies/Article-View/Article/1859890/russian-and-chinese-nuclear-modernization-trends/; Bill Gertz, "China Engaged in 'Breathtaking' Nuclear Expansion,' STRATCOM commander warns," *Washington Times*, April 21, 2021; and Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China*, Annual Report to Congress, 2020, 85.

[4] On arsenal size, see *Military and Security Developments*, 85; Hans Kristensen and Matt Korda, "Chinese Nuclear Forces, 2020," Bulletin of the Atomic Scientists, vol. 76, no. 6: 444. On estimates, see Hans Kristensen, "DIA Estimates for Chinese Nuclear Warheads," *Federation of American Scientists*, May 31, 2019, https://fas.org/blogs/security/2019/05/chinese-nuclear-stockpile/.

[5] *Military and Security Developments*, 86.

submarine force.[6] This force could someday strengthen China's secure second strike capabilities, especially versus U.S. missile defenses, given submarines' less predictable launch locations and depressed launch trajectories.[7] Likewise, China has worked to extend the range of its nuclear forces so that they can credibly threaten targets in the continental United States. It is adding multiple independent re-entry vehicles (MIRVs) to much of its intercontinental land-based nuclear missile force, even the silo-based force, likely with the goal of improving the ability to penetrate U.S. missile defenses.[8]

Other aspects of China's nuclear modernization are more ambiguous, however, and suggest that China might be considering new and more ambitious nuclear missions, such as tactical nuclear use or nuclear warfighting.[9] These roles would potentially go well beyond the secure second strike retaliatory capability we typically associate with China's nuclear forces.

Notably, for example, China deploys two intermediate-range, land-based ballistic missiles, the DF-21 and more recently the DF-26, which can carry both nuclear and conventional warheads. In particular, the DF-26 reportedly has a "hot swapping" capability, meaning that China can rapidly shift between launching the nuclear and conventional variants. The missile is also said to be highly accurate, potentially enabling it to attack moving targets such as aircraft carriers. In addition, the DF-26 is very long range, able to reach targets as far as Guam.[10]

These purported characteristics—nuclear-conventional flexibility, precision, and range—suggest that the DF-26 is designed to be used for something other than a countervalue second strike against an enemy city, which was the standard role of Chinese nuclear weapons in the past. Indeed, the DF-26 appears to be well suited to limited nuclear use against U.S. military targets in the Pacific.

Of course, there are scenarios in which even this type of nuclear use would not necessarily be first use; China could be envisioning the use of a theater nuclear capability only in response to similar U.S. use, and it is important not to try to render a definitive verdict about shifts in Chinese nuclear intentions based on one or two new missiles. But certainly this is a clue to the possibility of impending changes and should be watched closely.

In addition, China is apparently taking steps to improve its command and control of nuclear forces and conducting exercises to improve the readiness of its nuclear forces. Some of these exercises may involve mating warheads to missiles, possibly on a widespread scale and with regularity. Again, this marks a change from China's arsenal in the past, which was widely characterized as having warheads stored separately from missiles in peacetime. In the context of

[6] *Military and Security Developments*, 86. On the limits of China's current SSBN force, see Owen Cote, "Invisible nuclear-armed submarines, or transparent oceans? Are ballistic missile submarines still the best deterrent for the United States?" *Bulletin of the Atomic Scientists* 75, no. 1 (January 7, 2019): 30-35.
[7] Andrew Erickson and Lyle Goldstein, "China's Future Nuclear Submarine Force: Insights from Chinese Writings," *Naval War College Review* 60, no. 1 (Winter 2007): 56, 65; and Cunningham and Fravel, "Assuring Assured Retaliation," 28-29.
[8] *Military and Security Developments*, 56.
[9] This analysis draws heavily on Austin Long, "Myths or Moving Targets? Continuity and Change in China's Nuclear Forces," War on the Rocks blogpost, December 4, 2020, available online.
[10] *Military and Security Developments*, 56.

China's deployment of theater nuclear forces, such developments again suggest more of a possible emphasis on tactical nuclear use.[11]

Overall, it is very clear that China's arsenal is undergoing a period of change, both quantitatively and qualitatively.[12] The full strategic implications of that change are as yet unclear but merit close attention, as they could presage a shift away from China's no-first-use pledge, which I will discuss more below. Yet even if the changes are intended only to improve the survivability of Chinese forces for purposes of ensuring second strike retaliation, this would also potentially be a consequential change for reasons I will discuss below as well.

Risks of Chinese Nuclear Escalation

There is good news and bad news regarding the potential for actual Chinese nuclear use given the developments just mentioned. The good news is that many of the mechanisms analysts typically believe could lead to nuclear use probably are still unlikely to be relevant in the U.S.-China context.

For example, analysts sometimes have worried about the possibility of unauthorized nuclear use by countries such as Pakistan, but that is very unlikely in China, where for political reasons there is strong centralized party control of nuclear weapons. This seems unlikely to change any time soon. Similarly, during the Cold War both sides were deeply concerned about the potential for an all-out nuclear first strike by the other side, either for purposes of outright aggression or for pre-emption because it thought the other side was about to launch. But China's arsenal is still far too limited in its size and capabilities to conduct this sort of strike against the United States and is likely to remain so for the foreseeable future. There is simply no prospect of a bolt-from-the-blue Chinese nuclear attack of the sort that the United States once feared the Soviets might launch, unless Chinese leaders are utterly insensitive to costs. (However, China likely is fearful that the United States might launch a nuclear first strike on China, an important concern whose implications I discuss below.)

So that is the good news. The bad news is that there are still two other plausible pathways to Chinese nuclear use, each of which I discuss in more detail below.

Chinese Asymmetric Nuclear Escalation

One pathway to potential Chinese nuclear use is what MIT professor Vipin Narang calls *asymmetric escalation*: when a state turns to nuclear weapons because it is losing a high-stakes conventional conflict.[13] The idea is to engage in rapid nuclear escalation, likely against military targets, in an effort to get an opponent to back down from a conventional war the state is losing, or simply to halt the opponent's military campaign through crippling nuclear strikes.

[11] *Military and Security Developments*, 88.
[12] China also appears to be pursuing a nuclear-capable air-launched ballistic missile, which could eventually endow China with a true nuclear triad. However, China's nuclear bomber capability is currently much less developed than the air- and sea-based legs of China's arsenal, so I do not focus on it here. *Military and Security Developments*, 51, 85, 87.
[13] Vipin Narang, *Nuclear Strategy in the Modern Era*.

This is, in essence, what NATO threatened to do to the Warsaw Pact during the Cold War. It is what led Israel to consider nuclear weapons use during the 1973 war with Egypt. It is what Pakistan promises to do if India invades today; what many suspect North Korea would do if it was losing a war with Coalition forces on the peninsula; and what Russia's nuclear forces have been postured to do since the end of the Cold War left it conventionally inferior to NATO.[14]

Notably, however, these are all scenarios in which a state is or was at risk of losing important territory in a major land war—usually homeland territory that was in imminent danger of being conquered by an adversary's fast-moving ground forces. It is hard to see China facing such a situation. Despite recent border skirmishes, China is never going to be overrun by India, so it is hard to imagine China turning to nuclear weapons to coerce its way out of a border conflict. And, of course, the Pacific Ocean separates the United States and China, so there is no Fulda Gap bringing their armies eyeball to eyeball the way the superpowers found themselves in the Cold War.

The one possible exception might be a Taiwan scenario, though. Given the island's political importance, it is not inconceivable to think that Chinese leaders losing a war over Taiwan could engage in asymmetric nuclear escalation to try to get the United States to back down or simply to halt the U.S. conventional campaign. Again, the idea would be to engage in limited nuclear use, likely against military targets, for purposes of coercion or military denial or both. This would, obviously, constitute a violation of China's no-first-use pledge, but it is comparable to the sort of scenario that historically has led countries to threaten asymmetric nuclear escalation. It would also be the sort of situation in which theater nuclear capabilities of the sort described above could be relevant.

Chinese Nuclear Escalation in Response to Conventional Counterforce

A second pathway to Chinese nuclear use—which is distinct from but also could co-occur with the one I just described—could arise in response to what I have called *conventional counterforce*. Conventional counterforce happens when an adversary uses conventional weapons to degrade, destroy, or endanger components of a state's nuclear arsenal.[15] Conventional counterforce is most likely to occur in conventional wars between adversaries where one or both sides' militaries exhibit a high degree of entanglement between nuclear and conventional forces.[16] China's nuclear arsenal contains a number of such interlinkages, which I will discuss below, but the basic danger is that in fighting a major conventional war versus China, the United States is very likely to degrade, destroy, or endanger components of China's nuclear arsenal in ways that could precipitate limited Chinese nuclear escalation.

[14] On the common logic in these examples, see Keir Lieber and Daryl Press, *The Myth of the Nuclear Revolution: Power Politics in the Atomic Age* (Ithaca: Cornell University Press, 2020), chapter 4.
[15] I develop this concept in more detail in Caitlin Talmadge, "Would China Go Nuclear?" This article references the other important scholarship done on this topic, particularly Barry Posen, *Inadvertent Escalation: Conventional War and Nuclear Risks* (Ithaca, NY: Cornell University Press, 1991).
[16] James M. Acton, "Escalation through Entanglement: How the Vulnerability of Command-and-Control Systems Raises the Risks of an Inadvertent Nuclear War," *International Security* 43, no. 1 (Summer 2018): 56-99.

For example, I mentioned earlier that two of China's intermediate-range missiles, the DF-21 and DF-26, have both nuclear and conventional variants. For the DF-21 at least, it appears that the nuclear and conventional variants are in distinct launch brigades that operate in distinct locations, but they are still attached to the same bases.[17] Because of this, it is possible that the nuclear and conventional brigades utilize overlapping transportation networks and supply depots, and they might even share some command-and-control networks. Even if they don't, however, the United States might not be able to distinguish between the conventional and nuclear networks so as to avoid the nuclear-relevant systems while targeting only the conventional ones. The nuclear and conventional launch sites would also look the same (though the warhead storage sites would probably be distinct). What this means is that even if the United States wants to target only China's conventionally tipped DF-21 force in a conventional war over Taiwan, it may conduct strikes that also infringe on China's nuclear tipped DF-21 force—at least indirectly, and possibly directly if the United States lacks very accurate intelligence about the locations, operations, and command-and-control systems of the conventional versus nuclear brigades.

With the DF-26, the nuclear-conventional interlinkages are even more significant if the missile has the aforementioned "hot swapping" capability. Functionally, this means that there is no meaningful distinction between the conventional and nuclear variants of the missile, except perhaps distinct warhead storage sites. All of the missile launchers have the ability to lob conventional ordnance at U.S. forces and friendly territory, making all of them likely to be targeted by U.S. conventional campaign planners. But strikes on DF-26 bases, launch sites, and transporter-erector launchers will, by definition, also degrade China's nuclear capabilities even if the missiles are not mated to nuclear warheads at the time of the conventional attack—because all of them are nuclear-capable. In fact, this may be intentional on China's part, reflecting a possible belief that the missile's dual capability will deter U.S. attacks on it.[18]

The sea-based leg of China's nuclear forces has significant linkages with conventional forces too. For example, China uses the same shore-based, very low frequency transmitters to communicate with both its attack submarines and its ballistic missile submarines (SSBNs). It is very likely in the event of a war that the United States would want to disable this communications system as part of the conventional naval battle, which would not be hard to do given that it is a large, fixed, emitting target. The problem is that doing so would also prevent the ability of Chinese leaders to communicate with their SSBN force, essentially decapitating the sea leg of China's nuclear deterrent unless China were to make the very unlikely decision to totally devolve launch authority to SSBN commanders.[19]

[17] Fiona Cunningham and Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Strategy and U.S.-China Strategic Stability," *International Security* 40, no. 2 (Fall 2015), 43.
[18] Ankit Panda, "China's Dual-Capable Missiles: A Dangerous Feature, Not a Bug," *The Diplomat*, May 13, 2020, available online. For alternative perspectives suggesting that the entanglement is not part of a deliberate strategy by China, see Tong Zhao and Li Bin, "The Underappreciated Risks of Entanglement: A Chinese Perspective," in *Entanglement: Russian and Chinese Perspectives on Non-Nuclear Weapons and Nuclear Risks*, ed. James Acton (Washington, DC: Carnegie Endowment for International Peace, 2017), 53; and David Logan, "Are They Reading Schelling in Beijing? The Dimensions, Drivers, and Risks of Nuclear-Conventional Entanglement in China," *Journal of Strategic Studies*, forthcoming, available online.
[19] Again, please see my previously published works cited in footnote 1 for further details, especially Caitlin Talmadge, "Would China Go Nuclear?"

Other likely components of a U.S. conventional campaign would also leave China's nuclear arsenal vulnerable, even if the nuclear forces were not attacked directly. To continue with the discussion of the naval realm, for example, the United States is very likely to pursue and sink Chinese attack submarines in a war over Taiwan because these submarines will threaten U.S. surface forces. But China's attack submarines also protect its ballistic missile submarines, which would become exceptionally vulnerable if their escort force is sunk.

Similarly, in any conventional air campaign against mainland targets, the United States is likely to try to degrade, disable, or destroy the ground-based radars and air defenses protecting Chinese conventional forces, especially the missile forces relevant to a Taiwan campaign. But doing so will also create corridors through which the United States could potentially conduct a surprise attack on China's nuclear forces—including, in the future, its apparently re-emerging nuclear bomber force. Again, attacks on legitimate conventional targets could leave components of China's nuclear arsenal more vulnerable to further attack.

Of course, each aspect of this potential infringement on China's nuclear forces would be subject to the contingencies of any particular scenario, and it is possible that taken in isolation, each component would not necessarily be alarming to Chinese leaders. For example, even if the United States severely degraded China's intermediate range ballistic missile force and the air defenses protecting it, China would still have several brigades of intercontinental nuclear ballistic missiles located far from any fight over Taiwan in far western China.

Nevertheless, the overall picture would probably not be a comforting one to Chinese leaders: attacks on their theater nuclear forces and supporting bases, launch sites, infrastructure, and possibly command and control networks; a degradation of the early warning radars and air defense systems protecting other components of China's land-based nuclear arsenal; the loss of communication with its ballistic missile submarine forces; the degradation of the escort submarines needed to protect those boomers.

Assessing this pattern of damage to their nuclear forces, Chinese leaders might come to think that Washington had aims beyond winning the conventional war—that the United States might be seeking to disable or destroy China's nuclear arsenal outright, even the intercontinental ballistic missiles located deep in the country's interior, perhaps as a prelude to regime change. For years, observers have pointed to the U.S. military's failed attempts to locate and destroy Iraqi Scud missiles during the 1990-91 Gulf War as evidence that mobile missiles are virtually impervious to attack. Therefore, the thinking goes, China could retain a nuclear deterrent no matter what harm U.S. forces inflicted on its coastal areas. Yet recent research suggests otherwise.[20] Chinese intercontinental ballistic missiles are larger and less mobile than the Iraqi Scuds were, and they are harder to move without detection. The United States is also likely to have been tracking them much more closely in peacetime. As a result, China is unlikely to view a failed Scud hunt in Iraq nearly 30 years ago as reassurance that its residual nuclear force is safe today, especially during an ongoing, high-intensity conventional war.

[20] Austin Long and Brendan Rittenhouse Green, "Stalking the Secure Second Strike: Intelligence, Counterforce, and Nuclear Strategy," *Journal of Strategic Studies*, vol. 38, nos. 1-2 (2015), 56-64.

China's vehement criticism of a U.S. regional missile defense system designed to guard against a potential North Korean attack already reflects these latent fears.[21] Beijing's worry is that this system could help Washington block the handful of missiles China might launch in the aftermath of a U.S. attack on its arsenal. That sort of campaign might seem much more plausible in Beijing's eyes if a conventional war had already begun to seriously undermine other parts of China's nuclear deterrent. It does not help that China's real-time awareness of the state of its forces would probably be limited, since blinding the adversary and deliberately imposing the "fog of war" on opponents are standard parts of the U.S. military playbook.

At that point, the question becomes, how will China react? Will it practice restraint and uphold its no-first-use pledge once its nuclear forces appear to be under attack? Or will it use those weapons while it still can, gambling that limited escalation will either halt the U.S. campaign or intimidate Washington into backing down?

Beijing's answers to these questions have grown somewhat ambiguous in recent years. Although officially China continues to adhere categorically to its no-first-use pledge, some PLA officers have written publicly that China should signal that it might use nuclear weapons in the event that a conventional war threatened China's nuclear arsenal or the survival of the regime.[22] However, this is not an official stance, and even so, which exact set of capabilities China would consider part of its core nuclear deterrent and which it considers less crucial remains unclear. For example, if China already recognizes that its sea-based nuclear deterrent is relatively small and vulnerable, then seeing it become even more vulnerable in a war might not prompt any radical discontinuity in Beijing's calculus.

The danger lies in wartime developments that could shift China's assumptions about U.S. intentions. If Beijing interprets the erosion of its sea- and land-based nuclear forces as a deliberate effort to destroy its nuclear deterrent through conventional counterforce, or perhaps even as a prelude to a nuclear counterforce, it might see limited nuclear escalation as a way to force an end to the conflict.[23] For example, China could use nuclear weapons to instantaneously destroy the U.S. air bases that posed the biggest conventional threat to its arsenal. It could also launch a nuclear strike with no direct military purpose on an unpopulated area or at sea as a means of signaling to the United States. Nothing says "you've crossed my red line" quite like a mushroom cloud.

China's own history of nuclear decision-making points to how these wartime perceptual dynamics could prompt escalatory behavior. In 1969, a border crisis brought China to the brink of nuclear war with the Soviet Union. In early March of that year, Chinese troops ambushed Soviet guards amid rising tensions over a disputed area. Less than two weeks later, the two countries were fighting an undeclared conflict with heavy artillery and aircraft. The dispute

[21] Elizabeth Shim, "Kim Jong Un Is Willing to Denuclearize, Xi Jinping Says," *UPI*, June 27, 2019; and Fiona Cunningham and Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Strategy and U.S.-China Strategic Stability," *International Security* 40, no. 2 (Fall 2015): 7-50.
[22] *Military and Security Developments*, 86.
[23] To be clear, this is my deduction. Chinese nuclear experts frequently claim that China will not engage in this type of controlled nuclear bargaining. The key question is whether these sorts of reassuring peacetime claims will actually hold up under the pressure of a crisis or war. Fiona Cunningham and Taylor Fravel, "Dangerous Confidence? Chinese Views on Nuclear Escalation," *International Security*, vol. 44, no. 2 (Fall 2019): 61-109.

quickly escalated beyond what Chinese leaders had expected, and before the end of March, Moscow was making thinly veiled nuclear threats to pressure China to back down.

Chinese leaders initially dismissed these warnings, only to radically upgrade their threat assessment once they learned that the Soviets had privately discussed nuclear attack plans with other countries. Moscow never intended to follow through on its nuclear threat, archives would later reveal, but Chinese leaders believed otherwise. On three separate occasions, they were convinced that a Soviet nuclear attack was imminent. Once, when Moscow sent representatives to talks in Beijing, China suspected that the plane transporting the delegation was in fact carrying nuclear weapons. Increasingly fearful, China test-fired a thermonuclear weapon in the Lop Nur desert and put its rudimentary nuclear forces on alert—a dangerous step in itself, as its liquid-fueled missiles posed a serious danger of unauthorized or accidental launch.[24] Only after numerous preparations for Soviet nuclear attacks that never came did Beijing finally agree to negotiations.[25]

China is a different country today than it was in the time of Mao Zedong, but the 1969 conflict offers important lessons. To recap: China started a skirmish that risked war and initially believed that nuclear weapons would be irrelevant, even though the Soviet arsenal was several orders of magnitude larger than China's, just as the U.S. arsenal dwarfs China's today. Once the dispute escalated in ways they did not expect, however, the Chinese reversed their assessment of the possibility of a nuclear attack to a degree bordering on paranoia. Most worrying, China appears to have actually considered using its nuclear weapons, even though it had to expect devastating retaliation.[26] Ambiguous wartime information and worst-case thinking led it to take nuclear risks it would have considered unthinkable only months earlier. This pattern could unfold again today, with a conventional deterrence failure—which by definition would have occurred if the United States and China were fighting a major war—giving way to a nuclear deterrence failure.

Broader Implications of China's Improving Nuclear Arsenal

Even short of the possibility of actual Chinese nuclear use in a war, China's improving arsenal will likely have some significant consequences during peacetime and in any future crises. The main reason is that a more robust Chinese arsenal will entrench the United States and China in a deeper state of mutual nuclear vulnerability, or mutually assured destruction (MAD). As I mentioned earlier, in MAD there is no meaningful way for either side to avoid suffering unacceptable damage in a nuclear war, no matter who strikes first.

[24] It is unclear if the test was in response to the crisis or already preplanned, but at a minimum China did not delay the test due to the crisis.
[25] For more on the 1969 episode, see M. Taylor Fravel, *Strong Borders, Secure Nation: Cooperation and Conflict in China's Territorial Disputes* (Princeton, N.J.: Princeton University Press, 2008), 211–217; and Lorenz M. Lüthi, "Restoring Chaos to History: Sino-Soviet-American Relations, 1969," *China Quarterly*, June 2012, 378–397; Michael Gerson et al., *The Sino-Soviet Border Conoict: Deterrence, Escalation, and the Threat of Nuclear War in 1969* (Washington, D.C.: Center for Naval Analyses, November 2010); John Wilson Lewis and Litai Xue, *Imagined Enemies: China Prepares for Uncertain War* (Stanford, Calif.: Stanford University Press, 2006), 45-72.
[26] Much remains unclear about this episode, in part due to the chaotic nature of Chinese command and control at this time.

Historically, the United States has been highly resistant to acknowledging the condition of MAD with China.[27] Instead of accepting MAD with China—a country that possesses intercontinental ballistic missiles (ICBMs) that can reach the continental United States—the United States has sought capabilities that could be used for damage limitation. The most recent U.S. Nuclear Posture Review in fact explicitly highlights the long-standing U.S. pursuit of damage limitation, which is a nuclear mission distinct from deterrence.[28] Deterrence tries to convince an adversary not to launch a nuclear attack by threatening him with nuclear retaliation if he does so. Damage limitation, by contrast, is not about imposing costs on the adversary; it is about meaningfully reducing the costs to oneself in an all-out nuclear war.[29] The United States pursues damage limitation through counterforce capabilities, which can enable the United States to find, destroy, or disable adversary nuclear forces; missile defenses, which can intercept adversary nuclear launches; and civil defense measures.

It is important to note that the pursuit of damage limitation does not mean that the United States intends to start a nuclear war or that it believes it could emerge from a nuclear war unscathed. Rather, the likely U.S. objective is to make China to worry that if *China* starts a crisis or conflict that raises risks of nuclear escalation, the United States will have a higher tolerance for bearing these risks than China will, because of the United States' relatively greater ability to limit the damage the United States would suffer in a nuclear exchange.[30] Were this effort successful, U.S. nuclear capabilities could theoretically deter China from initiating any conflict in the first place, or could endow the United States with bargaining advantages in any effort to coerce China if a crisis or war did break out. Again, the idea is not that the United States would relish fighting a nuclear war. It is that when nuclear weapons began to cast their inevitable shadow over any tense U.S.-China interaction—even well below the nuclear threshold—the United States probably would be less likely to back down over escalation fears than China. China's awareness of this fact could thus give the United States an important advantage in what strategist Thomas Schelling famously characterized as a "competition in risk-taking."[31]

From this perspective, China's nuclear improvements are worrisome to many U.S. policymakers not because of a fear that China will suddenly launch a nuclear attack. Rather, China's improvements to survivability are perceived as threatening even if China maintains its no-first-use policy because they erode the U.S. ability to limit damage. If the United States enters an undisputed state of mutual nuclear vulnerability with China—meaning that China can inflict unacceptable damage on U.S. cities, even in the aftermath of a U.S. first strike—then U.S. policymakers may worry that U.S. nuclear weapons will be much less likely to deter China from

[27] "Nuclear Posture Review Report, April 2010," U.S. Department of Defense, April 6, 2010, https://www.hsdl.org/?view&did=777468. For background on the issue see Vince Manzo, *Nuclear Arms Control Without a Treaty? Risks and Options After New START* (Center for Naval Analyses, 2019), Part IV.
[28] "Nuclear Posture Review Report 2018," U.S. Department of Defense, February 5, 2018, https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF, VIII, 23.
[29] Charles Glaser and Steve Fetter, "Should the United States Reject MAD? Damage Limitation and U.S. Nuclear Strategy toward China," *International Security* 41, no. 1 (Summer 2016): 49-50.
[30] This logic is explained well in Austin Long, "U.S. Nuclear Strategy toward China: Damage Limitation and Extended Deterrence," in *America's Nuclear Crossroads: A Forward-Looking Anthology*, ed. Caroline Dorminey and Eric Gomez (Washington, DC: Cato Institute, 2019), 47-55. For a critical view, see Glaser and Fetter, "Should the United States Reject MAD?," 49-98.
[31] Thomas Schelling, *Arms and Influence* (New Haven: Yale University, 2008), 91.

engaging in conventional or sub-conventional aggression, especially against U.S. allies or partners. The United States would also be less able to leverage nuclear threats against China in the event of a crisis or war.[32]

Classic deterrence theory of course would suggest that the mutual presence of second-strike forces would stabilize the U.S.-China relationship and reduce the likelihood of conflict due to the fear of escalation.[33] But U.S. policymakers may reasonably worry that if China turns out to be a highly revisionist actor with growing local conventional military advantages, improvements in its nuclear arsenal could embolden rather than inhibit Chinese aggression, in line with the so-called Stability-Instability Paradox.[34] It was precisely this sort of fear that led to U.S. pursuit of a damage limitation capability versus the Soviets during the Cold War, even though MAD seemed much more entrenched then than it is today between the United States and China.[35]

The basic concern is that if the two sides are stalemated at the nuclear level, the conventional balance becomes much more important for deterrence and bargaining, and as is well known, the conventional balance also is not moving in a favorable direction for the United States and its allies. The key issue is one's assessment of how China might behave under the condition of mutually acknowledged, mutual vulnerability versus how it behaves now.[36] Would China's behavior be different in a world where its leaders believed it had a robust, secure second-strike force that U.S. policymakers knew was capable of inflicting unacceptable damage on U.S. cities, even in the aftermath of a U.S. first strike?

Again, the traditional view is that precisely because nuclear war would be so devastating under this condition of mutual vulnerability, conventional conflict would become very unlikely.[37] The two sides might still follow the U.S. and Soviet course and engage in a costly arms race, but they would probably be much less likely to end up in a hot war deliberately initiated by either side.

The alternative, more pessimistic view is that the loss of any U.S. relative nuclear advantage, combined with an eroding U.S. conventional position, could actually invite aggression from a highly revisionist China. Again, this view assumes both that U.S. nuclear weapons play some role in constraining China conventionally now, and also that Chinese aims would be expansive if this constraint were loosened, in combination with a conventional balance more favorable to China. From this perspective, China might be especially tempted to expand its "gray-zone" challenges below the threshold of full-on conventional war, if it knew that the United States might fear that a robust conventional response to such challenges could risk nuclear escalation. Or, China might follow the logic of the Stability-Instability Paradox just mentioned and simply assume that it was "safe" to fight a conventional war, or even a limited nuclear war, under the

[32] For more on this logic see Green and Long, "Correspondence."
[33] Robert Jervis, *The Meaning of the Nuclear Revolution: Statecraft and the Prospect of Armageddon* (Ithaca: Cornell University Press, 1989).
[34] The term comes from Glenn Snyder, "The Balance of Power and the Balance of Terror," in *The Balance of Power*, ed. Paul Seabury (San Francisco: Chandler, 1965), 184-201.
[35] Austin Long and Brendan Green, "Stalking the Secure Second Strike: Intelligence, Counterforce, and Nuclear Strategy," *Journal of Strategic Studies* 38, no. 1 (2015): 38-73; and Brendan Green, *The Revolution That Failed: Nuclear Competition, Arms Control, and the Cold War* (Cambridge: Cambridge University Press, 2020).
[36] Long, "U.S. Nuclear Strategy toward China."
[37] Jervis, *The Meaning of the Nuclear Revolution.*

shadow of mutually assured destruction, because it would be irrational for either side to escalate to all-out nuclear use. The key point is that depending on the perceptions of key decisionmakers on both sides, more entrenched mutual vulnerability could generate crises and challenges, not stalemate and stability.

Unfortunately, although nuclear competition with China is far from totally inevitable, the United States also is unlikely to do much to forestall such competition, for two reasons. First, some in the United States may (with varying degrees of reluctance or enthusiasm) accept the prospect of nuclear competition with China, given that this is a contest in which the United States is currently far ahead. If U.S. policymakers believe that U.S. nuclear advantages generate deterrent power or coercive leverage, especially in the face of a less and less favorable conventional balance, they are very unlikely to cede this position. In fact, they may choose to ramp up competition further, assuming domestic politics permit them to do so.[38]

Second, China is not the only nuclear-armed state of concern to the United States. Even if the United States wanted to eschew nuclear competition with China, U.S. nuclear policy choices with respect to other nuclear states would make it difficult to signal this choice credibly to China. For example, the United States might reasonably decide that damage limitation capabilities are an important part of preparation for worst-case scenarios vis-à-vis Russia and North Korea—states that clearly do reserve the right to use nuclear weapons first. But these capabilities are likely to appear highly threatening to China even if they are aimed elsewhere, and they may propel a more competitive dynamic even if this is not the intent.[39]

Recommendations for Congress

Several recommendations come out of this analysis. First, U.S. policymakers should acknowledge, at least to themselves, the trade-offs inherent in a more competitive nuclear relationship with China. U.S. refusal to acknowledge mutual vulnerability, when combined with continued development of capabilities relevant to damage limitation and a worsening bilateral relationship, makes China relatively more likely to adopt an ambitious nuclear strategy than would otherwise be the case. It could create rational incentives for China to potentially move away from no-first-use, for example. If and when China does so, the United States should then recognize the role that its own policy choices may have played in that decision, rather than interpret such change as entirely a function of aggressive Chinese intentions.[40] Of course, this is not an all-or-nothing equation, and is not meant to downplay China's own motives and behavior, but the key point is simply to recognize that China will react to U.S. choices.

Furthermore, U.S. pursuit of damage limitation could also be destabilizing, not to mention costly. It will almost certainly lead to policies that heighten Chinese fears of U.S. nuclear attack,

[38] This belief has a long lineage in American strategic thought. For a recent exposition, see Matthew Kroenig, *The Logic of American Nuclear Strategic: Why Strategic Superiority Matters* (Oxford: Oxford University Press, 2018). For critiques, see Robert Jervis, *The Illogic of American Nuclear Strategy* (Ithaca: Cornell University Press, 1984); Charles Glaser, *Analyzing Strategic Nuclear Policy* (Princeton: Princeton University Press, 1990); and Todd Sechser and Matthew Fuhrmann, *Nuclear Weapons and Coercive Diplomacy* (Cambridge: Cambridge University Press, 2017).
[39] Glaser and Fetter, "Should the United States Reject MAD?."
[40] For a full discussion of these dangers, see Glaser and Fetter, "Should the United States Reject MAD?."

because most of the capabilities relevant to damage limitation—such as counterforce—are also useful in launching a first strike. A healthy Chinese fear of U.S. capabilities could of course be useful in deterring China from deliberately initiating a war, but if the two countries stumble into a conflict through something other than a rational calculation on China's part—such as a misperception or a crisis with a third party—Chinese concerns about the survivability of their nuclear forces could lead to escalatory pressures on Beijing.

Second, even in a more competitive nuclear relationship, the United States can work to reduce the danger of nuclear escalation. Even if the United States believes that there are some deterrent or coercive advantages to be gained in a competitive nuclear relationship with China—advantages that depend on credible threats of escalation—the United States can still work with China to build off-ramps in the event of a crisis or war. The United States might seek to develop what RAND analysts in the Cold War once called "an optimal amount of instability": "enough to deter the [adversary] from precipitating a crisis, but not enough to cause a crisis to spiral out of control should it occur."[41] Fostering robust, direct crisis communication channels between high-level policymakers, and especially high-ranking military officers, is important in this regard, despite the challenges that such efforts face.[42] It is encouraging to see that the Biden administration is working in this direction.

Finally, the United States should consider engaging in arms control with China, bearing in mind that arms control in the future will probably look different from how it evolved in the Cold War. Because of that experience, Americans tend to define arms control narrowly—as legally binding, bilateral treaties that produce symmetrical reductions in nuclear forces. But as Thomas Schelling and Morton Halperin noted decades ago, arms control can be conceptualized much more broadly, "to include all the forms of military cooperation between potential enemies in the interest of reducing the likelihood of a war, its scope and violence if it occurs, and the political and economic costs of being prepared for it." It requires only "the recognition that our military relation with potential enemies is not one of pure conflict and opposition, but involves strong elements of mutual interest."[43]

With respect to China, an arms control process might be conceived of as strategic stability talks that could seek to address not only nuclear weapons but also emerging technologies in the cyber and space domains that are likely to affect nuclear escalation risks.[44] China has thus far resisted efforts to join U.S.-Russian strategic arms control given its dramatically smaller nuclear arsenal.[45] This position is somewhat understandable, but the United States should emphasize to China that it benefits from verifiable constraints on the U.S.-Russian arsenal, and that over the medium term, some type of Chinese participation in this regime will likely be required in order to sustain the strategic arms control framework. Without it, China would potentially have to

[41] Glenn Kent and David Thaler, *First-Strike Stability: A Methodology for Evaluating Strategic Forces* (Santa Monica, CA: RAND, 1989), 5.
[42] Scott Harold, "Optimizing the U.S.-China Military-to-Military Relationship," *Asia Policy* 14, no. 3 (July 2019): 145-168.
[43] Thomas Schelling and Morton Halperin, *Strategy and Arms Control* (Washington: Pergamon Press, 1985), 1-2.
[44] Frank Rose, "The end of an era? The INF Treaty, New START, and the Future of Strategic Stability," *The Brookings Institution*, February 12, 2019, https://www.brookings.edu/blog/order-from-chaos/2019/02/12/the-end-of-an-era-the-inf-treaty-new-start-and-the-future-of-strategic-stability/.
[45] Tom O'Connor, "China 'Will Never' Join Arms Control Deal with U.S. and Russia," *Newsweek*, May 20, 2019.

worry about much larger U.S. and Russian arsenals and would, in essence, be entering a three-way arms race as the latecomer.

Though it will not be easy, there are a variety of credible and creative means by which the United States might begin to integrate China into an arms control framework: convening bilateral strategic stability talks with China, expanding talks with Russia to include China, developing a bilateral pre-launch missile notification regime with China, inviting China to observe a New START inspection, establishing a link between the U.S. Nuclear Risk Reduction Center and a Chinese counterpart, and even building on Obama administration progress with China to develop norms for outer space.[46]

Arms control is not an end in itself, of course. It has to serve U.S. strategic objectives.[47] In the Cold War, the United States used arms control both to cap the arms race and, at times, to channel it into areas of competition more favorable to the United States. Although current prospects for arms control with China are dim, the U.S. relationship with the Soviets was adversarial, too. The two sides still found common ground in making some of their forces more transparent to the other in ways that would reduce the likelihood of dangerous misperceptions in a crisis. Despite China's long-standing resistance to greater transparency, the United States should continue trying to engage China in both government-to-government and non-governmental dialogue on nuclear issues, with an eye toward developing an arms control framework over the longer term.[48]

[46] Frank Rose, "The Future of Global Strategic Stability," (Remarks at the Sasakawa Peace Foundation Book Launch, Tokyo, Japan, July 19, 2019), 5, available from the author.
[47] Robert Joseph and Eric Edelman, "New Directions in Arms Control," *The National Review*, April 29, 2016.
[48] Oriana Mastro, "The Vulnerability of Rising Powers: The Logic Behind China's Low Military Transparency," *Asian Security* 12, no. 2 (2016): 63-81; and Wu Riqiang, "How China Practices and Thinks About Nuclear Transparency," in in *Understanding Chinese Nuclear Thinking*, ed. Li Bin and Tong Zhao (Washington, DC: Carnegie Endowment for International Peace, 2016), 219-250. On the mixed record of success of past efforts to engage China in dialogue on nuclear issues, see *Taking Stock: U.S.-China Track 1.5 Nuclear Dialogue*, ed. Brad Roberts (Center for Global Security Research, December 2020), especially 15-32.

PANEL II QUESTION AND ANSWER

COMMISSIONER FIEDLER: Thank you very much. The first panel and this panel to some -- I haven't heard mention of hypersonics in the context of Chinese nuclear weapons yet from anybody.

And it is well known that they are way ahead of us in the development of hypersonics. Am I wrong about that?

And could somebody explain to us the nuclear implications of their hypersonic development program?

DR. TWOMEY: Let me jump in. I commend work by James Acton on this issue set. I mentioned it briefly in the written testimony that I belatedly submitted to you all.

You know, I think the way to think of hypersonics kind of are twofold. One, despite their name, they're actually slow relative to traditional ballistic missiles.

They trade off maneuverability, the advantages of maneuverability for a loss of speed. But, that maneuverability does provide some utility in penetrating missile defense capabilities.

And so again, as, I think, both David and I talked about, that's a real key driver for the Chinese, is finding ways to overcome U.S. missile defense systems so that they're not subject to being on the receiving end of nuclear coercion as Professor Talmadge was just talking about. They don't want to be, you know, put in a position where they have no credible response.

So, overcoming U.S. missile defense systems then becomes critical for them.

COMMISSIONER FIEDLER: Thank you.

MR. LOGAN: If I could add to that very quickly.

COMMISSIONER FIEDLER: Okay. Sure.

MR. LOGAN: I agree with Dr. Twomey's assessment. I think ballistic missile defense concerns are significantly driving some of those developments.

We also see throughout history evidence of what some researchers have called the technology reserve model driving Chinese development.

So, this concern about falling behind in advanced cutting-edge technologies, regardless of whether or not the strategic implications of those technologies are immediately obvious.

And we've seen this with the development in the 1980s of the neutron bomb. Some evidence that China could have deployed MIRV capabilities earlier, much earlier perhaps than even 2015.

And so, I think this is an additional, what you might call strategic hedging, in the development of hypersonics.

And then one other distinction I think is important to make, and I would also refer the Commissioners to James Acton's work, is whether those systems are being deployed at the strategic level with the aim of targeting homeland assets, or whether they're being used at the theater level. And I think that the implications of those matter. They vary significantly depending on how they're -- they're being conditioned.

COMMISSIONER FIEDLER: Does the maneuverability issue give them further advantage in a Guam attack scenario within the Taiwan?

DR. TWOMEY: Yes, I mean it certainly gives them the increased confidence that they'd get a missile through whether it's conventional or nuclear through the THAAD systems that are deployed there now and an AEGIS ashore or an AEGIS system that might be deployed there at sea.

Again, you can conceive of these as being a way to get a nuclear warhead through

although a higher speed ballistic missile might also have a pretty good shot at getting through depending on which missile defense system it is and how much warning and so on we get through. I'm not overly confident in the quality of our missile defense system in general. But this increases their ability to penetrate those missile defenses.

COMMISSIONER FIEDLER: Yes, I wasn't actually just referring to nuclear in the Guam scenario. I mean Guam is going to be a first target of any Taiwan conflict. That's why I'm concerned about it.

DR. TWOMEY: The only reason to differentiate between the nuclear and the conventional -- well, not the only -- an important reason is, you know, the conventional arsenal, as was discussed earlier with the DF-26s or the arsenal of DF-26s, is sort of large. And so the way to solve the missile defense problem there is just to overwhelm the missile defense, to Winchester the THAAD system there. And so that doesn't require hypersonics necessarily. It just requires the large arsenal of conventional that they're building.

COMMISSIONER FIEDLER: I don't have any more questions.

COMMISSIONER WONG: Thank you. My question is for Dr. Twomey. You know, looking at your recommendations, I think three of them can be at least in brief described as number one, the U.S. should scale back and tailor our modernization of our forces, our nuclear forces. The U.S. should scale back and tailor our ballistic missile defense development. And the U.S. should scale back and tone down what is, I think, becoming a consensus in Washington of a full spectrum competitive stance toward China. All of these actions you recommend would perhaps take away the drivers of Chinese nuclear arsenal expansion.

I want to summarize that for you because I have also listened to your description of certain new elements or new drivers in Chinese thinking on their nuclear arsenal. You describe concerns about U.S. conventional strikes on their strategic assets. And I look at that and I think to myself well, that's not about U.S. nuclear capabilities or BMD. That's about U.S. conventional capabilities.

You talk about the need for -- or the prefiguring of nuclear weapons in the great power status of China which is more of a political issue, again, not really connected to our modernization, our ballistic missile defense.

And you talk about trans-war deterrence which perhaps has a connection, but I think is more -- if you're talking about certain scenarios, the Taiwan scenario and China is only talking about what you refer to trans-war deterrence with the use of nuclear weapons in war fighting because they have the conventional capabilities now perhaps to start thinking about invasion of Taiwan. So the driver there is more Chinese conventional capability than U.S. nuclear capability.

So I lay this out because I see a disconnect between your description of the new elements or new drivers in Chinese nuclear thinking capabilities and then your policy recommendations. I hand it over to you to maybe talk just a little bit about that.

DR. TWOMEY: So I tried -- that's a great point and thank you for the question and the careful attention that it shows.

I tried to lay out what I see as kind of the newest aspects in Chinese thinking, while still highlighting some of the continuities and the broader developments. I think although the quantitative increase in Chinese warheads and deliverable warheads in the United States is not putting it at the Cold War level, it's nevertheless quite disconcerting to me. And I think finding ways to reduce pressure in that regard should be a high priority.

The destabilizing deployment of MIRVS which is not really a -- fundamentally a

doctrinal question, it's a hardware question that the first panel addressed well. But it's worrisome. I scratch my head about the DF-41s in silos.

I guess that seems more amenable to addressing in terms of the U.S. ability to influence it. And then more broadly and this is a point Professor Talmadge raised, right, the kind of reification of strategic nuclear competition in the relationship gives power to the Rocket Force's leadership who want to find a way to contribute to the defense of their nation and their national interests.

And I want to reduce those folks' ability to shape the debate and to push back against the political leadership as Dr. Saunders talked about in the previous panel. And so I think taking away important drivers from them to explain why they need to have the new hypersonic system or a new SSBN to target U.S. assets from a diverse direction, a different azimuth, reduces their ability to kind of promote those aspects.

Yes, if we could have a conventional arms control discussion with the Chinese, that would be great. Having spent a lot of time trying to get the Chinese to talk seriously about the nuclear front, I'm pretty pessimistic that we're going to make much progress there, let alone in other areas.

COMMISSIONER WONG: Just a follow-up question to that, the underlying idea to some of your recommendations is if the U.S. shows restraint, it could set an example and take away at least the rationale or the internal political arguments made by the Rocket Force for their need to expand.

My question is have we seen in our recent history that U.S. restraint has resulted in Chinese restraint? And I point to the past ten or so years of New START where we have limited our strategic deployed warheads. Have we seen a response to that from the Chinese as commensurate with that restraint or have we seen an increase?

DR. TWOMEY: So Mr. Logan just flagged the belated deployment of MIRVS where they probably had the capability to put those into the force several decades ago and the non-deployment of a neutron warhead, neutron bomb warhead. So there have been some examples where the Chinese haven't done as much as they could.

The other way I would kind of answer the question is China has an economy that's 70 percent the size of the United States' economy. It's got a population that's four times the size of ours. And it's got a nuclear arsenal that's five percent of ours. And so yes, it's growing, but what's the baseline of expectation that we should have?

Why should a country that is, if you want to make that PPP adjustment in exchange rates for the economy, it's a larger economy than ours. Why should they have such a smaller arsenal than us? Isn't that a form of restraint? I have recommendations for the Chinese side, as well, that would include a number of different signs of restraint for them, but that's not something that any of us in this virtual room can directly communicate. Thus, I gave you mine for our side.

COMMISSIONER WONG: And we appreciate it. Thank you, Doctor.

COMMISSIONER FIEDLER: Commissioner Kamphausen.

COMMISSIONER KAMPHAUSEN: Thank you. Dr. Twomey, Chris, I share Commissioner Wong's concerns. I think about how likely the reciprocal response to reassurance on the part of the U.S. might be.

So I have a -- I guess my first question is if I'm reading Dr. Talmadge's testimony correctly, I read this statement to mean -- I'll read the statement first. A likely U.S. objective to make China -- to worry that if China starts a conflict that raises risks for nuclear escalation, the U.S. will have a higher tolerance for bearing these risks than China will because of U.S.

relatively greater ability to limit the damage the United States would suffer in a nuclear exchange.

I read that to mean some efficacy of our ballistic missile defense. Dr. Talmadge, is that fair to say that was part of your intent there?

DR. TALMADGE: It could be, yes. Ballistic missile defense would be a component of a damage limitation policy, so yes, as would counter-force capabilities, civil defense measures. They're all things that limit the damage you suffer in an all-out nuclear war.

COMMISSIONER KAMPHAUSEN: So if that's the case then, if the Chinese perceive our missile defense for whatever its limitations, Chris, as limiting their own options or giving us more options, I'm wrestling with how reassuring them will increase our own security. So that's, I guess, the first question. And Mr. Logan, since you also made the argument about some reassurance on missile defense, maybe you could answer as well.

DR. TWOMEY: Thanks very much for the question. Again, I think if we rely on missile defense as a primary component to how we are going to address the growing Chinese threat, we're going to be in a losing game with an economy that has continued to outgrow our own and has the ability to spend considerably more on military priorities than they are currently doing. And so as a starting point, to me, that seems worthy of avoiding.

My recommendation would certainly be to have discussions with the Chinese about the potential for U.S. restraint on missile defense or other areas. Our withdrawal from the missile defense commitments that we had made to the Soviets raises some questions about our credibility, so I think it's an uphill climb for us. But that would be certainly something I would say we should have a discussion with the Chinese about, is that part of strategic stability comes from the existence of offensive capabilities, but especially at lower numbers like the Chinese lower numbers of low 200s, especially at lower numbers, even mid-size missile defense capabilities like our own play a role.

COMMISSIONER FIEDLER: Roy?

COMMISSIONER KAMPHAUSEN: I have a follow-up. Maybe, Mr. Logan, I'll ask for a response for the record. Dr. Twomey, you've led for almost 15 years, I think, the most significant Track 1.5 exchange on these issues with Chinese counterparts and I was privileged to take part in a couple over the years.

Off the top of your mind, what are the two or three key takeaways from that nearly 15 years of engagement on these sets of issues? Is there either in terms of changes on the Chinese part or consistency over the years, opportunity to share some of the key takeaways from that since those dialogues have been suspended for the last year and a half or so.

DR. TWOMEY: Thank you. You know, I think several important takeaways, right? A deeper understanding of how the Chinese see their environment to include the point about missile defense systems being an important part of their threat perception down into the nitty-gritty of seeing some of the models that they've shared of nuclear exchanges and U.S. missile defense assets. That would be one.

Second would be an evolving discussion of how the Chinese talk about their nuclear neighborhood, returning to the question raised in the previous panel of how they perceive the North Korean nuclear arsenal, how they perceive the growing Indian arsenal, talking about the potential role for arms control in both the bilateral context, but beyond that, right?

Would a trilateral arms control be viable for the Chinese, given that they have a contested border with the Indians and have had casualties in the last 12 months there, right? So that's another area that we have been able to discuss with them.

COMMISSIONER KAMPHAUSEN: Thanks very much.

COMMISSIONER FIEDLER: Commissioner Wessel.

COMMISSIONER WESSEL: Thank you all for all your work and the testimony. It's deeply appreciated. And Dr. Logan, let me make clear and I think all of my colleagues share your view on the importance of open source, enhancing open source collection and dissemination. It is a critical area that is in need of more resources.

Dr. Talmadge, thank you for your comments. When my kids were young, in addition to letter grades, they got a question of whether they played well with others. So when we ask for grading in that area, and I say this, Dr. Logan, your testimony, you know, which talked about strategic ambiguity and raised for me questions about confidence that we should have in what we perceive China's commitment to no first use, et cetera, is.

What I heard is there's no first use as long as there's no first use. And that we shouldn't have confidence in it. With China's or the CCP's reluctance or unwillingness to abide by many international norms and agreements, what confidence should we have in Chinese leadership and CCP statements around their commitments to no first use and other doctrinal, publicly expressed doctrinal comments? How would you grade that on plays well with others and confidence that we should have? Dr. Talmadge, do you want to start?

DR. TALMADGE: Sure. So a grade for both sides on how well they play with others or just China?

COMMISSIONER WESSEL: No, we're just looking at China now.

DR. TALMADGE: Sure.

COMMISSIONER WESSEL: Again, that is part of the equation, how they perceive us and what our response is. So I think that's fair.

DR. TALMADGE: Sure. And I ask that because I think almost all of the discussion to this point has really highlighted how interactive the two sides' threat perceptions and capabilities are and the hypersonic question and the missile defense question. These are all -- there are motives and there's intentions of behavior on both sides, but they are reacting to each other in some important ways.

And as the India discussion points out, the North Korea discussion points out, they both have other actors to worry about besides each other. That being said, I would probably give the Chinese a C or worse on the question of playing well with others. Not so much because of their specific nuclear actions which is the topic of our hearing today, although as I said, there are some steps that they're taking that point in the direction of changes and we've talked about those, the MIRVs, the DF-26, dual-capable stuff.

But as I tried to highlight, it's the taking of those steps in the context of other things they are doing, right? And some of those are in the security realm, but at the conventional level, so things like constant incursions into Taiwanese airspace. That sort of stuff is concerning. Their behavior in Hong Kong. Those are kind of painting a picture that suggests Chinese intentions that are concerning that might be revisionist or might be aggressive, that they might not keep promises. And it's in that context that I think people start to look down the pathway of their nuclear behavior and get concerned. Not even again that they're going to engage in a nuclear attack or something, but just that again, as the two sides get to more of a nuclear stalemate, the conventional balance or even the sub-conventional balance becomes a lot more important.

You know, but that being said and I think my fellow panelists have highlighted this as well, I don't think the U.S. gets a full pass on everything either. It's true that the United States might be pursing missile defenses purely for what seem like defensive purposes of damage

limitation, wanting to protect the homeland, troops, and allies and so forth. But it's undeniable, I think, and can be true at the same time that those capabilities are threatening to China given how small their arsenal is.

They are definitely worried that they could be part of a U.S. effort to protect itself, not in the aftermath of a Chinese first strike, but in the aftermath of a U.S. first strike, right? That the U.S. would go first and missile defense would mop up China's ragged retaliation. And with the size and fragility of China's arsenal which again, when we did the grading of China's arsenal nobody said A+, I think lends some legitimacy to their concerns.

So there's missile defenses, the U.S. refusal to acknowledge mutual vulnerability with China which I think is an issue that should be studied, and in general, the U.S. tendency to pursue, I think, nuclear modernization and conventional capabilities with maybe less than frank attention to how those might be threatening to other countries. So I think the U.S. has a role to play here, too.

COMMISSIONER WESSEL: I appreciate it. I see my time has expired. Love an answer for the record or up to you whether to extend the time.

COMMISSIONER FIEDLER: We can extend. We have time.

COMMISSIONER WESSEL: Dr. Logan, did you have a view?

MR. LOGAN: Yes, I'll try to be quick. And I should clarify that I'm not quite a doctor, but hopefully will be there soon.

COMMISSIONER WESSEL: I'm sorry, Ph.D. candidate.

MR. LOGAN: I'll take it as a compliment.

COMMISSIONER WESSEL: Yes.

MR. LOGAN: So on the question of play well with others, I don't know that I can assign a specific letter grade, but there is widespread and I think longstanding frustration with the failure to move some of the Track 1.5 dialogues to the official level. That's due to several reasons, some of which could be attributed to U.S. actions, some of which is going to be unsolvable by U.S. policy.

There's just a lack of experience on the Chinese side in participating in official dialogues. There's skepticism that China could participate as an equal player and not be taken advantage of. There are internal divisions within the Chinese bureaucracy between on the one hand, the military operators, who design force structure and doctrine and on the other hand, the strategists and civilian academics who are more engaged with their U.S. counterparts. And then there's the Chinese tendency to hold some of these dialogues hostage to other issues that they view as a higher priority.

When it comes to -- you also asked about confidence in no first use. So I would put very little confidence in public statements. And I think, as I mentioned in my opening statement, it's unlikely even if Chinese officials sincerely believe at the moment that the no first use will survive a crisis or a conflict. I still would not put tremendous faith in that. But what we can put faith in to an extent is looking at things that are not just public statements. So this includes how Rocket Force units train and exercise, and authoritative military texts that are not intended for a public audience and that are even classified within China itself.

And the available evidence we have from that is that China still envisions using nuclear weapons only after it has been struck by a nuclear strike itself. Now if we were to see changes I think in either of those areas that would be a significant sign of a revision or reconsideration of no first use, but at least in the open source, I have not seen any evidence that that has taken place yet.

Now again, there are limits to open source and that could change going forward, but I think those are more credible signals of China's views about its own no first use policy.

COMMISSIONER WESSEL: Thank you.

COMMISSIONER FIEDLER: Thank you. Commissioner Scissors, before Senator Talent. You're next.

COMMISSIONER SCISSORS: When I don't know anything about a topic which is like this, one, I usually try to be humble and I don't want to be humble in this case. I want to say you all are missing something. The first panel missed it. Nobody is saying this and you're wrong and you need to just explain to me how you're wrong because you're wrong.

Has anyone said the word Xi Jinping in any of this discussion? Are we really going to claim that Xi Jinping's cult of personality leadership does not matter to these issues?

And I understand if this were 2014, 2015 when I had jumped on Xi Jinping is a really bad guy train already, you could say, come on, nuclear changes take 10, 15 years. He's going to be around for 10, 15 years. He may be around for 20 years, 25 years. So I'm going to take this rant at Professor Talmadge because she sort of got closest to what I wanted to hear. Congratulations.

Look, Xi Jinping has personalized CCP political control over lots of really important to China stuff. Not just important to us stuff. Not just peripheral stuff, really important to China stuff. Hey, you guys, who are my potential enemies, guess what's happening to you? So does that -- his leadership, his control of the CCP which is indefinite at this point, in particular, more him likely to accept or reject, whichever you think, nuclear warfare because -- it's his personal position, if he feels his personal position is threatened.

And I tried to think of the Chinese translation of apres moi le deluge which is French for after me, I don't give a crap. But that's my fear. And I am taken aback that we could get to this point in the discussion and Xi Jinping's name has never been uttered. So please tell me why I am over reacting?

DR. TALMADGE: I'll jump in here if I may, sir. So one thing I would just preface my remarks in saying is I think actually both of my co-panelists know a lot more about Chinese domestic politics than I do. And I hope that we'll hear from them.

The way that I think about Xi Jinping's role though has less to do with nuclear decision making specifically than with the propensity for the U.S. and China to just get in a conflict of any type, or a crisis. And I think Dr. Saunders made this point this morning that many of the risks of increasing nuclear use by either side just come from the fact that the risk of conflict overall, while still low in absolute terms, are clearly rising.

And I think Xi's statement's about Taiwan, pursuit of military modernization, and changes to succession rules within China to lengthen and try to further legitimize his tenure as leader, all kind of point to maybe a new set of Chinese intentions. And that may be too strong, but a more assertive China regionally for sure, and more of a desire to challenge the United States.

So that's actually what I worry about from the perspective of the issues that we're talking about today, especially when you combine it with the fact that overall, studies that have been done looking at the Chinese strategic community and it's thinking, seem to indicate that there's a view that nuclear weapons, you know, they just won't get used -- everybody is afraid of them, so escalation is not something that we have to worry about because it would just get out of control. And they're sort of off the table in an odd way which makes me worry a bit about getting into a war that confounds the expectations of Chinese leaders. And you know, they may go into a war

thinking nuclear weapons are irrelevant, and that could change pretty rapidly in a crisis, depending on how it goes.

So that's kind of how I think about that issue which is not actually getting that much at him, but just at the general problem of conflict being increasingly likely.

COMMISSIONER SCISSORS: Thank you. I want to make the question more pointed for either of the other two panelists. By the way, I agree with you. But I wanted to make it more pointed. If possible, can you say anything about nuclear conflict and Chinese nuclear posture, generally, tied to Xi Jinping?

In other words, I don't -- let me rephrase. I don't believe it didn't change. When we play this game of U.S. and China and we don't label them any further than that, Xi Jinping's China is different than Hu Jintao's China in incredibly important ways. Now if you want to convince me it's not different on the nuclear side, it's just an evolution of Chinese capabilities, we can just call it China, we don't have to call it Xi Jinping's China, take a shot. But I really want to try to -- to get your understanding because I don't know anything about this issue about nuclear posture particularly.

DR. TWOMEY: David, go ahead.

(Laughter.)

MR. LOGAN: So I think I largely agree with Dr. Talmadge.

VICE CHAIRMAN CLEVELAND: Spoken like the Doctor.

COMMISSIONER FIEDLER: You're clearly the Ph.D. candidate.

(Laughter.)

MR. LOGAN: Doing the dirty work. I largely agree with Dr. Talmadge's assessment. I think that Xi Jinping's role is seen more heavily --- one, in decisions about whether and when to enter a conflict with the United States and sort of the scope of that conflict. And then also, two, about the potential use of nuclear weapons within that conflict.

I don't think that there's very good evidence that I've seen that Xi Jinping has driven the modernization program itself or driven the increase in the arsenal size. In the last -- and I'd have to double check, but I believe that since he has assumed power, the increase in the arsenal size, over that roughly eight-year period, is roughly equal to the arsenal increase that took place in the preceding eight years before he took power. And that applies to both warheads and ICBMs. So I don't think we're seeing -- we are seeing an increase, but it's sort of in a steady state increase in that respect.

One thing that I think is significant is we do see strong evidence of promoting PLA senior leaders who have personal ties to Xi Jinping, especially from the Nanjing military region where he served as a CCP official earlier in his career. And so that provides more potential control over some of these issues. And if a political decision is made to change China's nuclear doctrine that would probably make it a whole lot easier to either implement that decision or to maintain the status quo.

But as to Xi's beliefs or views about nuclear weapons, I don't think that we have any good insight about that. It's sort of the individual level, unfortunately.

DR. TWOMEY: I'm happy to weigh in, but I see we're over time.

(Laughter.)

COMMISSIONER FIEDLER: We'll come back to you in the second round. Senator Talent.

COMMISSIONER TALENT: Yes, thank you, Mr. Chairman. I thank the witnesses. Again, wish I could be there. So I'm kind of two minds of this because I'm inclined to credit what

you all were saying and I think almost all the witnesses and all the panels are saying about what the primary policy driver is for China, although I think I might put it a little differently maybe because of my own experience.

I tend to believe that stakeholders within the Rocket Force and other parts of the nuclear community within the PLA are searching for ways to get more resources and more attention and are putting this case to the higher level civilian authorities who as a witness in a previous panel said probably don't know that much about the nuclear -- or the strategic arsenal.

When I was in the Congress, even those of us who served on the Armed Services Committee didn't normally deal with that set of issues and they're getting more money out of them. Now where I think I disagree with you all is in terms of where I see the thrust of your recommendations and here I think I'm going to have a question at the end of this. I think what Commissioner Wong said bears some repeating and Dr. Talmadge just referred to it.

Context is very important here. I mean Beijing started a border, vicious border incident with India last year, occupied Hong Kong in violation of their obligations. They militarized the South China Sea in violation of their promises to us. They're consistently encroaching not just on Taiwanese airspace and territorial waters, but Japanese airspace and territorial waters.

They're following a policy of resource extraction and corruption which our Commission has documented out the kazoo in Southeast Asia, in Africa, and now they're moving to Latin America. And as we said in our report from last year, the ultimate goal seems to be to overturn the international order and replace it with a hierarchical one with them at the top.

You know, in light of all that, if I was in face-to-face discussions with them, I would tell them I'm not inclined either to give you the benefit of the doubt or to expect that we're going to cater to your concerns that we're going to launch a first strike.

In other words, we're modernizing our arsenal and we're building missile defense not because of them, but because of North Korea, the possibility of other rogue states getting nuclear weapons. We've got to defend our people from that and also because the nuclear alternative is a much bigger component of Russian thinking than it is of Chinese.

I don't see why we can't say to them look, you need to understand why we're doing what we're doing, instead of in light of your actions around the rest of the world, demanding that we understand why you're doing what you're doing. Now particularly, Dr. Twomey, in lieu of the fact that you've had a lot of personal experience, how do you think that would go over if we said that to them? And I would put it much more nicely than I just put it to you all. I mean -- and after a few drinks, probably. What do you think?

DR. TWOMEY: We put it to them like that, as bluntly as we can. And after drinks, it's that blunt and at the conference table it's somewhat more subdued although we would name tick I think all the points that you just raised, although if the meetings get going again, we'd welcome your participation to make them directly.

COMMISSIONER TALENT: What are they drinking?

DR. TWOMEY: Well it's that Mao Tai stuff sitting over there. It's horrible when you're in Beijing.

You know, and their response is to flag the concerns that they have that are driving many of those behaviors. It's dangerous to get -- it's a time sink to get into the Taiwan discussion with them. And I would rather talk about things like the potential destabilizing in conflict deployment of a boomer for flushing the boomers. That's a more productive discussion with nuclear experts than please change your Taiwan policy.

COMMISSIONER TALENT: Right. I mentioned Taiwan, but I would recognize why

that is a much more highly-sensitive subject for them.

DR. TWOMEY: We certainly flag the difference in national interests over many of the issues that you raised. That's not the way to move the conversation forward on this issue set. Now that may be what should drive our policy behind closed doors, or in the open deliberations of American decision making over foreign policy. I would agree with that. Why don't I just stop there.

COMMISSIONER TALENT: See, my concern and then I want the other two witnesses to address this. My concern is -- oh, and by the way, I don't think any of you actually recommended that we stop doing A, B, or C. You just said we should look at it. That was my reading of what you were saying which I think is fair, okay?

But my concern is in this context, if we stop doing something that we need to do for our other security purposes, they may draw the opposite conclusion that you want them to draw. They may say oh, we got the Americans to stop building missile defense, to stop modern -- and what did it? Well, when we started building our own arsenal. Xi Jinping might call up the Rocket Force commander and say this is working out better than I thought it would.

See, I'm afraid we may send the opposite message, and I guess I'm running out of time, but maybe Commissioner Fiedler will give me another minute, but that's for you other two to address it, if you'd like to.

DR. TWOMEY: I'd certainly say it should be as part of a bilateral discussion, right, that we shouldn't take unilateral steps. The problem is it's hard for us to credibly say we'd like to have an arms control discussion with you, China, but oh, by the way, missile defense is off the table. That's not something that's interesting to them. So we need to publicly kind of put it on the table, again, recognizing that we have both extended deterrence commitments and other adversaries to worry about.

COMMISSIONER TALENT: Okay, and if I'm out of time, one question, maybe in a second round if you want to address it or I'll put it for the record is would you enter discussions with them without the Russians? Because I'm concerned with something like that. I just think, and this is apart from our other discussion, it's time to get the Chinese in the real world. This is not a bipolar type of issue. And I think we've got to have all three at the table. But I'm probably way over my five minutes.

COMMISSIONER FIEDLER: You can answer, please.

DR. TWOMEY: I won't lie. The French arsenal is bigger than the Chinese.

COMMISSIONER TALENT: Right.

DR. TWOMEY: And the Indians probably need to be there, too. But I should let others chime in, too.

DR. TALMADGE: Sure. I would just jump in briefly to say that I think there's actually some productive ways that China could be brought into U.S.-Russian in conversations on arms control and strategic stability for all the reasons that have been listed. I think there's a lot of obstacles, a lot of resistance on China's part to doing that.

But you know, I think even some basic things like what about including China in a New START inspection so they could actually see how that mechanism works in a way that's non-threatening to them, show them what the two largest nuclear arsenals have done in terms of arms control and give them an opening to have some transparency. So yes, I think Russia has to be at the table, but it's not just being at the table. I think there's actually ways to show China what the U.S. and the Russians have done.

The other point, if I may just briefly make it in response to your comment, Senator, on

the arms control question. While I agree with you that we should be keeping U.S. interests front and center and have a very hard-nosed look at our interests vis-a-vis China, I would just note that even at the height of the Cold War when the Soviets were most definitely not friends with the United States and the relations were not warm and friendly by any means, we did still have much more robust crisis communication channels so that in the event that there was a war, you could at least have some off ramps.

And also, even short of a crisis, you know, the U.S. came to a conclusion that a totally unconstrained arms race with this other super power just was not in U.S. interests. And it actually used arms control as a tool to channel that competition in directions that were actually favorable to U.S. strengths, right, to cap the quantitative level of force competition and emphasize U.S. technological qualitative strengths in that area.

And so we have interests, I think, in engaging with China in this process. And while on the one hand, as you said, we don't want to trade away capabilities we need, on the other hand, I don't think it's in our interest to just have a totally unconstrained arms race with China or with Russia. And so we've got to think about this problem very much from the perspective of our interests.

COMMISSIONER TALENT: Thank you.

MR. LOGAN: I do have some comments, but I'm happy to defer, the time is significantly over.

COMMISSIONER FIEDLER: We have time. And we're going to come back to Commissioner Cleveland.

MR. LOGAN: So I guess I'll start first with the notion of U.S. priorities and I think there's sort of a disconnect between U.S. intentions regarding some of these capabilities and the Chinese perceptions about U.S. intentions and then even the capabilities themselves. And I think Senator Talent is absolutely correct that these capabilities are not designed or deployed specifically to neutralize the Chinese nuclear deterrence. But I think in sort of -- there's a little bit of mirroring going on in that from the Chinese perspective those sort of statements are viewed as insufficient.

And so I think there are sort of some discrete steps that can be taken either to review certain programs and just -- to give a couple of examples. One is -- and I think Dr. Twomey mentioned this -- the SM-3 Block IIA which is this a ballistic missile defense interceptor that has a burnout velocity that is much higher than other interceptors that the U.S. has deployed. And there's this concern that even though it may be deployed with the purpose of providing feeder missile defense and extended deterrence commitments in the region that it could still provide a strategic capability against Chinese ICBMs.

And that's sort of a technical question, like how capable are some of these radars and interceptors against Chinese ICBMs?

And so one thing that some experts have proposed, and I think there could be tremendous value in, is a joint technical assessment of course done with tremendous sensitivity to safeguarding U.S. sensitive and classified information to determine how much these capabilities actually could affect China's nuclear systems. And I think most U.S. experts have concluded that they won't. But as far as I'm aware there is no publicly-available information for China to reach that conclusion on its own.

Chinese experts regularly point to, for example, congressional directives to STRATCOM to explore the ability of the United States to neutralize Chinese tunnels that might control or house Chinese nuclear systems, the U.S. refusal to accept mutual vulnerability. These are all

things that, at least on the Chinese side, are used as examples and evidence of U.S. intentions within the nuclear domain.

And finally very quickly on the arms control front, I think there's tremendous value in engaging China bilaterally or in a multilateral setting. I actually think there's probably more promise in a bilateral setting, but whatever you can get I would take. And I think that anything that focuses on actual doctrinal change or restrictions on deployments is significantly off in the future. I think that at the moment crisis mechanisms, as Dr. Talmadge said, are most significant and are most likely to be achieved.

COMMISSIONER FIEDLER: Thank you very much. Commissioner Cleveland.

VICE CHAIRMAN CLEVELAND: Yes, that was a good -- I appreciate that conversation. I want to strongly align myself with Commissioner Wong's summary. I think it was extraordinarily effective. Appreciating, Dr. Twomey that you do not want to talk about Taiwan, sitting where I'm sitting, I want to talk about Taiwan.

But let me first ask, Dr. Talmadge, you say in your written testimony that if China turns out to be a highly revisionist actor with growing local conventional military advantages, improvement in its nuclear arsenal could embolden rather than inhibit aggression. So I think that somewhat addresses Dr. Scissors' comments. But then you also say it might use nuclear weapons in the event that a conventional war threatened China's nuclear arsenal or the survival of the regime.

I'd like you to give a little more context or definition to what regime survival looks like and, in particular, does the loss of Taiwan -- is that included in what would be defined as regime survival? And then I'd also like to speculate and it is speculation, what would happen in a Taiwan scenario if Taiwan struck a co-located conventional and nuclear base in some way, whether it was command and control capabilities or if there was some targeting that Taiwan was responsible for rather than the United States, how would that affect China's thinking and reaction?

So the first question is for you, Dr. Talmadge, and the second question is more broadly. And I could speculate in a similar way if it's unlikely South Korea or another one of our partners took action that we were not directly responsible for, how would that affect Chinese thinking?

DR. TALMADGE: Sure, so on this question of what counts as regime survival or what would be threatening enough, I mean I think we are really in the realm of speculation here. I don't have one specific answer.

You know, fortunately, there is not a big database of wars that have been fought between nuclear powers where this question can be answered empirically. But I do think this gets back to the point that Dr. Scissors raised which is, you know, we know regime security has always been very important to Beijing and we know that Xi Jinping has made an increasing emphasis on unification as part of his political agenda. And so does that link the status of Taiwan or the outcome of a Taiwan war or the way that that war seems to be going with his personal political fortunes in a way that might make escalation more likely? And I could see that being possible, but I don't think that's a question we can answer empirically.

My point would be that I think from the U.S. perspective, it's something we should keep in mind as we do conventional campaign planning for this sort of conflict. And then that relates directly, I think, to your second question about what if it were a partner or an ally, if I understood you, that hit one of these targets.

I mean, to be honest, I don't think any one particular strike against entangled military, you know, nuclear conventional assets, by itself would be dispositive, right? Whether it was by Taiwan, by an ally, by the United States, whether it was part of China's land based force, it's sea

based leg, or some other aspect of its military forces that was non-nuclear, but relevant to nuclear forces.

My concern is with the overall pattern of damage that China might be experiencing, so I don't think there's any one thing. But if you're China, and the war has been going on, and all of a sudden you lose communication with a few of your SSBNs because your very low frequency transmitters have been taken out because they're also relevant to directing your attack submarines. And your attack submarines have gotten sunk and those are what protect your SSBNs. And your air defenses have been peeled back and there are corridors in which the U.S. could come attack your silo base forces and also some of your dual capable brigades start disappearing. It's not any one of those things by itself, but the overall context and pattern would start to make you think what is the U.S. up to in this conflict, right?

And this again gets back to who's making the decision? Who's threatened by the outcome politically? And so whether it being launched from an ally's territory or whatever would matter, I don't think we can say, but I would note that I think in any of the scenarios I've talked about for limited Chinese nuclear escalation, I mean allies are partners. You know, military bases on their territory or at sea could be targets. So they're sort of in this regardless of whatever the provenance of a particular attack is.

VICE CHAIRMAN CLEVELAND: Well, I'll let the others answer and then I want to come back to your comment about the political considerations. Dr. Twomey and Dr. To-Be Logan.

DR. TWOMEY: I think Professor Talmadge's response is right that the context matters, right? That it's not a single strike, it's this broader pattern that would lead to escalation. And just to be clear, it's not that I don't want to talk about Taiwan. I think that's the only scenario where the topic of today's hearing is relevant. It's hard for me to get from a South China Sea fishing dispute to nuclear war, but much less difficult -- and I think Professor Talmadge and I see it slightly differently -- the potential for escalation in a Taiwan scenario I think is very high.

And so -- but I just don't think that's a productive conversation to have with Chinese nuclear experts. That was the point I was making earlier.

So yes, I would worry about the kinds of scenarios that were just listed and because the conventional military balance has shifted so far in China's favor, we're going to have to for force preservation and to advance our interests in the conflict, we're going to have to -- we're going to be faced with taking some of those escalatory steps, I think, relatively early in a conflict and we should think through those options. And we do, of course. INDOPACOM certainly spends time on that.

On the regime survival point, and I would love another bite at Commissioner Scissors' question, time permitting, but I won't use that here --

VICE CHAIRMAN CLEVELAND: No, no. Go ahead. We have plenty of time. So whatever --

DR. TWOMEY: On regime survival, I think one point to add to the vast uncertainty that was the center point of Professor Talmadge's response is what does losing mean, right? That's going to be defined in a way the regime is going to be careful to not put themselves in a position where they ever lose Taiwan. They just are waiting to fight another day, right? The civil war has been going on for 70 or 90 years depending on when you start counting, probably 1926, so I guess it's closer to 95 years. And it will just continue on.

But the question of kind of casualty sensitivity on their side and the loss of naval fleets, they're going to have ways to spin that domestically. But certainly, that would be the real

danger is that at some point they think they need to have a way to show their population, their very nationalist enraged population, that they are winning and making progress. And so that's the concern.

Just briefly on Commissioner Scissors' question, and Phil Saunders, I think, did mention Voldemort's name, did mention Xi Jinping by name, two other things to add. You know, the article that I drew on for my written testimony does talk a little bit more about providing some quotes from Xi Jinping on the issue that I raised earlier on China talking about its strategic forces contributing to its great power status. That's a very new and Xi Jinping-like point.

Second, he's instituted the chairman responsibility system within the CMC to really centralize control for him personally. And I think there is an element to solidifying his control over the nuclear C2 that comes out about that.

But then I would add two other points. One, the point that I think David Logan made earlier that there is this steady, consistent growth in the Chinese arsenal across time, the point Hans Kristensen made earlier. He's got a nice chart, at Federation of American Scientists that shows that. And so there's not a real point of inflection on the arsenal size itself under Xi Jinping.

And then some of the issues I was talking about kind of the war-fighting stuff, the trans-war deterrence that I find most disturbing is coming out of a grass roots, low-level discussion from within the Rocket Forces and so I think that's separable, but also disturbing, right? So it's all of the above lead me to be quite worried.

MR. LOGAN: If I could add a few comments on the Taiwan scenario? I agree with the two panelists that this is by far the most relevant when we're concerned about nuclear escalation and nuclear use. I think it's highly speculative. It depends a lot on the domestic political conditions that are operating in China in the midst of that crisis or conflict and those are essentially unknowable at this point. And then, of course, the leadership's view of those conditions.

But there's two things that could help reduce that. One, I think, has been mentioned is the creation of at least some escalation control mechanisms which could be valuable even in the midst of conflicts, attempts to try to communicate limits about the scope of U.S. intentions within a conflict to not target perhaps China's nuclear deterrent.

And then the second is are there political off ramps that provide the Chinese leadership, assuming that it will not take Taiwan. an opportunity for saving face domestically. I think that there's been very good recent academic research showing that Chinese citizens are more likely to accept certain military outcomes depending on the political context in which they're couched and I think that U.S. communication and political negotiation will have a significant role in creating some of those off ramps.

Going back to the question about allied strikes against potentially entangled, conventional and nuclear assets, I think that this is a great point. This is something that has not received a lot of attention and we do have evidence, South Korea and Japan are developing some of these long range strike capabilities which could be relevant in a scenario like that.

And from the Chinese perspective, I don't think that it's going to matter which actor initiates the strike, one, because it may not be entirely clear who has actually initiated that strike. And two, I think on the Chinese side there is this tendency to exaggerate the extent to which the U.S. and its regional allies are coordinating and integrating significantly so often.

So I think that I agree with Dr. Talmadge, she's done excellent work on this, that it is sort of the overall pattern and contours of the conflict. It's not specific strikes against

individual systems. Part of that is because the regional systems, like the DF-21As and the DF-26s, are relatively segregated geographically, operationally from the ICBMs.

Now strikes against conventional assets that are used to defend against both the feeder and the strategic nuclear systems would be highly escalatory and then I think what would be potentially most escalatory is strikes against entangled command and control. But that may be something that is difficult to avoid in the form of war.

COMMISSIONER FIEDLER: I'm going to give Commissioner Scissors the last word here or the last interchange with you.

COMMISSIONER SCISSORS: Thanks. This may just be a comment and a question for the record. I don't want to take up too much time. But we've all, I think, just agreed that Taiwan is the key scenario. It is undeniable that overall Xi Jinping's ascension to power and there's a key political development in the last ten years in a way, for example, that Hu Jintao's ascension to power was not.

Xi has said and this is probably the weakest point of this build up, some more aggressive things about Taiwan than previous Chinese leaders. And that's fair. I don't know how meaningful it is.

But if you put these three things together, Taiwan is the most likely scenario. Xi Jinping has extended his political control to all aspects of Chinese society. He's been more aggressive, seemingly more aggressive about Taiwan. It seems really weird to me that he wouldn't have done anything to change Chinese's nuclear force posture, right? He can't see the outcomes of his own behavior?

We're most likely to have a nuclear war over Taiwan. I control everything. That's been my goal and I care a lot about Taiwan, more than previous Chinese leaders seem to have. So it's just odd that you guys would -- that to the extent that people are saying it really hasn't made that much difference, it doesn't seem to fit the other points.

COMMISSIONER FIEDLER: Do you want one more time?

COMMISSIONER SCISSORS: Sorry, did you not understand what I'm saying? All right, point one, we all agree Taiwan is the most likely place we're going to have a nuclear war. Point two, Xi Jinping has his fingers in everything. We all should agree on that. Point three, he's been more aggressive on Taiwan.

How do we get from those three points to he's not really involved in their nuclear posture that much? I mean that doesn't make sense for him. Maybe it's true. Maybe he's distracted by other things, but I don't think that's something we can rely on in the long term if we all think, and probably the Chinese think, if we're going to have a nuclear war, it's going to be over Taiwan. Xi is deliberately raising the stakes over Taiwan. He has his fingers in every pie. Why wouldn't he have his fingers deeper in the nuclear pie as time goes on?

I know that's too big a question to ask, but I would love a response for the record and I would love a response, honestly, where you said you don't know this because there are a billion things I don't know on this issue and bam, this is why your build up is flawed. But I pose that for the record because we don't have time to get into it.

COMMISSIONER FIEDLER: We have a quick second for a response.

(Laughter.)

Anybody want to respond?

DR. TWOMEY: I would just say, you know, I actually agree with all three points in the set up. But there's an additional element which is the goal for China is not a nuclear war over Taiwan. The goal is to entice or compel peaceful reunification because then they get the benefits

of the advanced society and the technology basis, the silicon chip manufacturing firms, and so on that Taiwan possesses today. That's the attraction, right?

And so that receives the bulk of, I'm sure, Xi Jinping's attentions when he thinks about the Taiwan issue, is how do I through economic coercive leverage and political enticements make it look attractive to the Taiwanese population to over time move closer to Beijing rather than moving further away?

And I think you do see it as a fairly long-term goal, not a short-term goal, right? It's not explicitly linked to the 2049 anniversary because they don't want to tie their hands. Because even Xi Jinping with, I agree, there's kind of a more assertive perspective on Taiwan than some of his predecessors and all of his predecessors, except Mao. Even he doesn't want to tie his hands in a way that could come back to bite him, that could be used by domestic other leaders to show that Xi Jinping is weak.

COMMISSIONER FIEDLER: Anyone else? We have just -- we're slightly over time, but if you have a comment, go ahead.

DR. TALMADGE: Excuse me. I would just add that I don't think you heard anyone disagreeing with you. I think there is just caution because it's hard to definitively know what's the cause of certain changes in China's nuclear arsenal and how Xi Jinping might be thinking about them. And so you're making a set of inferences and I think, you know, we're just kind of having some analytical humility about that. What did you say?

COMMISSIONER SCISSORS: Which I totally lack.

DR. TALMADGE: Right, but on the other hand, like this is the business they've chosen. This entire topic is kind of fraught with data gaps and the need to make reasonable inferences, and so I think that's what you're hearing from us.

VICE CHAIRMAN CLEVELAND: Can I say one thing? Dr. Twomey, I did not mean to -- and if I said this in some way, I did not mean to suggest that you were not interested in Taiwan. I appreciated the fact that you were saying the Chinese weren't necessarily interested in talking about it, but I didn't want to mischaracterize your --

COMMISSIONER FIEDLER: And I would point out that Xi Jinping is chairman of the Military Commission and I'm certain he spends a fair amount of time on nuclear posture. Okay, thank you. We are going to adjourn for now and resume after lunch at 1:35 with Panel 3.

(Whereupon, the above-entitled matter went off the record at 12:53 p.m. and resumed at 1:36 p.m.)

PANEL III INTRODUCTION BY COMMISSIONER ALEX WONG

COMMISSIONER WONG: Well, it's good to be back from our lunch break. I hope everyone had their fill.

We are now moving on to Panel III for the day. It's our final panel today, and it will assess the U.S. and regional perspectives on China's nuclear buildup, as well as implications for the global non-proliferation regime.

We will kick off the discussion with Dr. Brad Roberts, the Director of the Center for Global Security Research at the Lawrence Livermore National Laboratory.

Good to have you here, Dr. Roberts.

Next, we'll be hearing from Abe Denmark, Director of the Asia Program at the Wilson Center and former Deputy Assistant Secretary of Defense.

Good to see you, Abe. Thanks for joining us in person.

And last, but certainly not least, we will hear from Ms. Valerie Lincy, Executive Director of the Wisconsin Project on Nuclear Arms Control.

Thank you for being here, Ms. Lincy.

Well, without further ado, let's start with you, Dr. Roberts.

OPENING STATEMENT OF BRAD ROBERTS, DIRECTOR OF THE CENTER FOR GLOBAL SECURITY RESEARCH, LAWRENCE LIVERMORE NATIONAL LABORATORY

DR. ROBERTS: Thanks so much for the opportunity to join you today and contribute to the discussion.

Let me also begin by noting that the views I'm presenting are my personal views and should not be attributed to my employer or its sponsors.

My statement for the record, which you have in front of you, examines how China's nuclear modernization will, or should, affect the Biden administration's review of the nuclear policy and posture and the broader defense strategy review. My core argument is that there are many touchpoints, many ways in which China's nuclear policy and posture are consequential for U.S. decisions on nuclear policy, deterrent strategy, and force planning.

But let me turn to the five specific questions that were put to me and give you a brief answer on each.

The first, "What are the implications of China's nuclear modernization for U.S. interests?" Well, we've already had a lot of discussion of that topic today. So, let me just drill down in a couple of ways that might be useful at this point.

It's important to unpack the word "modernization". China is not just modernizing its nuclear forces; it's also diversifying them and building them up. The modernization in itself isn't particularly consequential for the United States. Yes, some consequences, but not particularly consequential.

The diversification of China's force, that's another matter. Its move from a monad to a dyad to a triad adds great resiliency and flexibility to the force, and its steps to develop a regional nuclear capability has an important impact on our extended deterrence posture in the region.

What about the buildup? Well, we've spoken a lot about that already. What about the combination of these three factors modernization, diversification, buildup? The result will be a China that's more confident in running risks, military and political, and more risk for the United States in defending its interests in a conflict over Taiwan or elsewhere in the region with China.

The answer to this first question, fundamentally, is, it depends. It depends, in part, on China's answer to the question, how much is enough? China has given us no answer. It may not have an answer. It may be a mystery, not a secret.

Available evidence permits multiple interpretations. We've debated already multiple perspectives, in part, in response to Commissioner Borochoff's question about intent. My perspective on this is that the available evidence permits two interpretations, and that's the fact we have to live with.

One is that the accelerated growth of China's nuclear forces is consistent with "no first use" and its longstanding desire to stay ahead of developments in the U.S. strategic posture and goes to the logic it accelerated because the Trump administration foreshadowed great acceleration in U.S. BMD and conventional strike.

The other interpretation this takes us to Commissioner Scissors' question the other interpretation is that President Xi has put his stamp on this; that there is now a political requirement, as opposed to a military requirement, and the political requirement is to have a nuclear force that is consistent with being in the, quote, "dominant position at the center of the world stage".

So, second question, "What changes in U.S. force posture might be necessary?" The short answer is, as yet, none. The longer answer is that, in time and depending on the shape and character and size of China's nuclear force, the United States may need to deploy additional strategic weapons and may need to adapt its extended deterrent posture for the improved protection of its allies in Northeast Asia.

But the difficult force posture questions are essentially outside the nuclear realm. They relate to things we've spent some time talking about today: where do we go on missile defense? How do we account for China's interest or the interest in strategic stability as we go the next steps on missile defense?

The discussion so far has something of the quality of we're starting from scratch and thinking about how to design a missile defense that balances all of these competing interests. In fact, we've been at it a long time.

We face similar questions about our conventional prompt strike capability. How many of what kind of hypersonic weapons do we deploy armed with what kinds of warheads? How do we tailor the emerging strategic toolkit that's not just nuclear to the multiple problems in a multi-polar security environment, including in Northeast Asia both China and North Korea and, oh, by the way, also Russia?

The third question, "What are the practical implications of the fact that China refuses to join the arms control process?" I think there are four.

One, its refusal inhibits deeper reductions by the United States and Russia.

Two, it increases the anxiety of U.S. allies who wonder really where China is headed with all of this, and at what expense to their security.

Three, it increases uncertainty for the United States and Russia and India and Japan, and thus, the need to hedge.

And fourth, it increases our interest in P5 cooperation on nuclear security at the Security Council.

The fourth question, "Is there any potential for the U.S. and Russia to work together to bring China to the table?" I see none. China's opposition to arms control is deep and abiding. That said, we have so far done a better job of arguing why it's in our U.S. interest for China to come to the table than in arguing why it's in China's interest. Our arguments have focused on the value to us of reducing shared nuclear risks. China's interest is in raising nuclear risk for the United States.

The final question, and very briefly, "What might future dialog look like?" Today, as for the last 25 years, we've imagined many possibilities for dialogue, many things we would like to talk about, many values of dialogue. China hasn't been interested at the official level. Unofficially, yes, Track 1.5 has been quite productive, as others have described. But official dialogue in the near term seems highly unlikely and highly unpromising, if it were to occur. We're interested in substantive, sustained, high-level dialogue; they're not.

Thank you for the opportunity to join the discussion. I look forward to your questions.

PREPARED STATEMENT OF BRAD ROBERTS, DIRECTOR OF THE CENTER FOR GLOBAL SECURITY RESEARCH, LAWRENCE LIVERMORE NATIONAL LABORATORY

China and the 2021 US Nuclear Posture Review
Brad Roberts
Testimony Before the U.S.-China Economic and Security Review Commission
June 10, 2021

Secretary of Defense Lloyd Austin's February 2021 designation of China as the "pacing threat" invites important questions about how US nuclear policy and posture might have to adapt. These questions are given added salience by recent revelations about the accelerating growth of China's nuclear arsenal. What impact should China's nuclear policy and posture, and their modernization, have on US nuclear policy, deterrence strategy, and force planning?

To frame brief answers to these questions, my remarks will survey key issues in the Nuclear Posture Review (NPR) process, now just getting started by the Biden administration. But some context is needed to inform that survey, as provided here with three brief observations about the past, present, and future.

Setting the Context

First, since the end of the Cold War, there has been a great deal of continuity in US nuclear policy toward China. That continuity reflected some shared judgments across the Clinton, Bush, and. Obama administrations. Some of these carried into the Trump administration; some did not. To be sure, there were some other important discontinuities through this period. With some over-simplification, the shared judgments were that:

- the US-China relationship was not fundamentally adversarial and thus the two could benefit by putting their nuclear focus on strategic stability rather than deterrence
- significant problems in the strategic military relationship sat somewhere in the future, not in the present
- China's nuclear modernization was troubling largely for China's lack of transparency and uncertainty about its end-goal and not because new capabilities were reaching the field
- the two could keep nuclear weapons in the background of the political relationship and thereby avoid having to contend with them as an irritant in the political relationship, in contrast to the US-Russian relationship
- toward that end, high-level, substantive, and sustained dialogue focused on nuclear issues and/or strategic stability would be of interest and benefit to both sides
- the US and Russia could take another modest step or two in reducing nuclear arsenals without worrying too much about a Chinese "sprint to parity"
- the extended nuclear deterrent in Northeast Asia could be shaped with an eye primarily on deterring North Korea and assuring South Korea and Japan

All four administrations also praised the virtues of "tailored deterrence," meaning they rejected the idea that "one size fits all" in a world in which multiple potential adversaries must be deterred. During this period, policymakers hedged against a potential military flashpoint over

Taiwan and determined that the US should be ready to deter China in crisis and to attempt to restore deterrence if it were to fail.

Conspicuously today, few experts in the defense community adhere to these long-standing tenets. We stand at a potentially major turning point in US nuclear policy. The political and military relationships have shifted onto a new ground that is much more competitive and confrontational, at the same time that new information is emerging about China's modernization of its nuclear forces.

Second, China is not today the "pacing threat" for the U.S. nuclear posture—Russia is. Russia's nuclear force is significantly larger than China's. It is also significantly more diverse in the types of weapons and delivery systems it includes. Russia's nuclear weapons complex has a unique capacity for large-scale output. Moreover, Russia has gone much further than China in integrating nuclear weapons into all of its general-purpose military forces and has a capacity far superior to China's to dominate nuclear escalation at all levels of war. For decades the US has committed to maintain a nuclear deterrent that is "second to none." China's force does not drive that requirement the way Russia's does. With time, China's growing forces may change this calculus.

Third, China is not only modernizing its nuclear forces, it is diversifying them and increasing their numbers. Its envisioned end-state is unclear; perhaps it doesn't have one. In our thinking about China's nuclear future, it is important to clearly distinguish what we know from what we don't know. We know that China will be more capable, with a modern triad, modern warheads, and modern command and control. We know that China will be more competitive, with a modern design and production infrastructure for both warheads and delivery systems. We also know that it will be more confident in its ability to accept military risk. What we don't know is whether a more capable, competitive, and confident China will also be more assertive and aggressive. China's assertiveness in its maritime environs and use of force in "gray zone" strategies to try to settle territorial claims, in combination with its economic coercion of its trading and financial partners are troubling indicators of what may lie ahead.

We also know that China is building up its nuclear force; but we don't know whether the strategic balance with the United States will shift, as that depends in part on what the United States does in response. We know that China's no-first-use policy has been under pressure of various kinds; we don't know whether the traditions of nuclear minimalism will be overtaken by contemporary concerns. We don't know what President Xi meant when in 2016 he promised "a great rise in strategic capabilities" and in 2017 "breakthroughs…in strategic deterrence capability." Nor do we know what he meant when in 2020 he promised that by 2049 China would become "a leader in terms of composite national strength and national influence…at the center of the world stage" where it will have "the dominant position."

We can make many predictions about China's nuclear future but we must also recognize that the future is littered with uncertainties. We must also recognize the possibility that the United States may have little or no influence over the next choices China might make about its

strategic future. The Biden administration's review of defense strategy, and the associated integrated strategic review, will have to frame responses to these "knowns" and "unknowns" and to the general challenges of coping with uncertainties.

China in US Nuclear Policy

China in US nuclear declaratory policy. Each new president publicly declares the conditions under which he or she might consider employing nuclear weapons. Over the decades, there have been very few changes in first principles. But President Biden has introduced the possibility of one, which will be considered in the review process. Every prior president of the nuclear era has declared that the fundamental purpose of US nuclear weapons is to deter nuclear attack on the US or its allies. No president has been willing to take the extra step to declare that this is the sole purpose. In the case of President Obama, for example, he judged that there was a narrow range of plausible contingencies in which the vital interests of an ally or even the US could be put in jeopardy by non-nuclear means. So he rejected "sole purpose" while vowing to work to create the conditions that would enable it to be safely adopted at a future time. On the campaign trail, Joe Biden expressed his support for "sole purpose," stating that, "as president, I will work to put that belief into practice, in consultation with the US military and US allies."

China will not be the key driver of this decision. But it would welcome such a declaration, given its own no-first-use declaratory policy and its long-standing advocacy that the US adopt "no-first-use." ["Sole purpose" and "no first use" are similar but not identical promises of nuclear restraint; the differences vary with specific definitions.]. Such a declaration would be unlikely, however, to result in significant changes to China's nuclear policy or posture. While China would welcome such a US declaration, Japan would not. Its leaders believe that its vital interests can be put at risk by non-nuclear means; they strongly hope that the country that defends it (the US) will not foreswear its most powerful tool for contending with that threat. Japan, South Korea, and Australia are all anxious on this score as the balance of conventional forces in the region shifts in China's favor, thereby weakening the preferred strategy of deterrence by denial (that is, by having the means to prevent its military success).

China will factor in the US debate about "sole purpose" in at least one other respect. There will be a debate about whether such an unverifiable declaration would be accepted by others as credible—that is, as likely to be true in time of crisis and war. The credibility of such declarations is called into question by the fact that the Soviet Union long maintained a "no-first-use" policy publicly while in secret it planned and prepared for first use. Skepticism will be reinforced by the perception of many that China's rapid expansion of its force, and development of certain capabilities that make sense primarily if used first, signals that it retains its declaratory policy for public messaging but not as a guide to actual military plans and preparations.

China in the Biden administration's "strategy to put diplomacy first." The new administration's commitment to "elevate diplomacy as our tool of first resort" will be reflected in an ambitious

agenda of nuclear diplomacy encompassing arms control and nonproliferation. In this context, the administration has repeated the calls of its predecessors for China to join it in a dialogue about strategic stability and in the arms control process. The NPR will have to account for the fact that China has rejected such calls for decades. As its response to Trump diplomacy makes clear, it is unwilling to be coerced to the table. If the Biden administration is to be successful in engaging China in substantive, sustained, high-level dialogue, it must find arguments that persuade China rather than simply pressure it. Repeating standard US calls for Chinese transparency and restraint will do little to advance meaningful diplomacy.

China in US assurance strategy. NPRs also generally offer assurances of various kinds, including to US allies of its resolve to defend them, to nonproliferation partners of its commitment to the NPT, and to Russia and China of conditional strategic restraint. Prior administrations have assured China that US homeland missile defense "is not aimed at China;" none has been particularly troubled that China rejects these assurances as not credible. Moreover, China has regularly sought an assurance it has never received: that the US accepts mutual vulnerability as the basis of the strategic military relationship. The US has not contested mutual vulnerability and thus the condition exists de facto. But that is not the same thing as making a political statement. Prior administrations have refrained from accepting the condition as a political fact for multiple reasons, including the concern that it would be read in Beijing and Tokyo as appeasement. The 2021 NPR will have to consider whether or not to offer such an assurance. It may be that such a clarification would be reassuring to China and slow its pace of nuclear modernization. Or it may be that such a clarification would be irrelevant in China's calculus. Or it may be that it would be seen as a temporary development in US nuclear policy, given the decades of US ambivalence about answering the question—essentially "too little and too late."

China in US Deterrence Strategy

China and the commitment to take steps to reduce the role of US nuclear weapons. The Biden administration has clearly articulated this commitment but has not specified which steps it might or when it might take them. It hopes that by taking steps it will provide leadership by example, thereby encouraging others to do the same. Its NPR is highly likely to call on China to do the same. But China rebuffed similar efforts by the Obama and Trump administrations. China also made it clear that it was unwilling to follow the United States in seeking to substitute non-nuclear means for nuclear means to reduce the number of nuclear weapons. Little can be gained for the US by simply repeating the calls of prior administration. Given its ongoing nuclear modernization, China is likely to be an obstruction to the Biden administration's effort to further reduce the role of US nuclear weapons.

China in tailored deterrence. NPRs also generate presidential guidance on how to operationalize deterrence. As a factor in US deterrence planning, China is changing as it becomes more capable. China is well along in becoming a nuclear peer to the United States—in qualitative, not quantitative terms, with its completion of a nuclear triad, development of a theater-range force and early warning system, integration of non-nuclear strike and defensive capabilities, and development of conventional power projection capabilities for potentially

escalatory conflicts. It is also well along in becoming a multi-domain peer to the United States—with significant new cyber, spacer, and counter-space capabilities. Its theater deterrence and defense posture is also robust and still rapidly improving. As a quasi-peer, it puts new demands on US deterrence strategy. The 2021 NPR will have to identify those demands and tailor responses. The simultaneous deterrence of Russia, China, and North Korea will demand more planning capacity at US Strategic Command and close collaboration between STRATCOM and the relevant regional combatant commands.

China and US Force Planning

China and the US 'second to none' strategy. As noted above, the US has long maintained a "second to none" approach to sizing its nuclear force, as a signal that it will neither allow itself to slip into an inferior strategic position nor compete to try to gain superiority. [Note that this applies to its strategic forces, not the non-strategic forces in Europe, where Russian forces outnumber US forces by a ratio of approximately an order of magnitude.] In the 2021 NPR, the Biden administration will have to think through whether and how "second to none" fits a world in which both Russia and China are growing their nuclear forces and deepening their strategic cooperation. Numerous hard questions will have to be answered. Does a multipolar nuclear environment create new nuclear requirements for the US? Are the reductions so far made in US nuclear forces through arms control irreversible? Should future reductions be irreversible? And what might retirement of the US ICBM force imply for the desired balance with China? At the very least, it would substantially reduce the number of targets in the US that would have to be struck in an attempted preemptive strike, perhaps leading some in China to think that such a counterforce strike might be successful in crippling the US capability to respond militarily.

China and extended nuclear deterrence in Northeast Asia. Recent US administrations have explained the role of the US nuclear umbrella over Japan and South Korea in terms of the North Korean threat. As China deploys additional nuclear weapons and/or nuclear-capable delivery systems in the region, and as it projects power more widely, questions arise about the role of the umbrella vis-à-vis China. The 2021 NPR will have to consider what changes to the extended deterrent, and to strategic communications about it, are warranted by China's nuclear modernization, if any. China will deeply oppose any explicit US statement that US weapons might be brought into the region for potential attack on China. Such a statement would also result in intensified Chinese pressure on US allies not to support that role. In this circumstance, allies would seek stronger reassurance. Moreover, the emerging North Korean nuclear threat has generated new demands for "more NATO-like" nuclear deterrence arrangements in the region, which an administration committed to reducing nuclear roles might find difficult to pursue.

China and the nuclear hedge. Each NPR since the Cold War has reflected leadership concerns about possible sudden erosion in the security environment as well as concerns of the technical community about unwelcome surprises of a technical kind, whether in an aging US nuclear weapon or in an enemy's secret toolkit. Hence each NPR has brought renewed statements of intent to ensure that the capabilities and capacity remain in the weapons design and

production complex to enable timely responses to surprise. There has also been a rising focus on how to hedge against the programmatic risk in trying to precisely sequencing the rarely attempted simultaneous modernization of multiple warheads and delivery systems. But the necessary investments have proven politically challenging. The 2021 debate over the necessary nuclear hedge is likely to be intense, given both the expense and the opposition of those who believe that nuclear reductions should be irreversible and investments should not be made to enable the future production of new nuclear weapons. The open-ended expansion of China's nuclear force is likely to make it harder to argue against such investments. China's own success in developing its weapons complex and infrastructure and endowing it with the needed capabilities and capacities offers an object-lesson in focus and resolve.

China and the Integrated Strategic Review

This survey implies that all of the important questions about the impact of China's nuclear modernization on US national security will be dealt with by the NPR. That is incorrect. The nuclear issue is not separable from broader developments in China's military strategy and improving capabilities to engage in modern strategic warfare that is multi-domain and multi-dimensional in character. A sound answer to the China nuclear problem requires a sound answer to the integration problem.

China thinks in such broader terms. It sees the bilateral US-PRC nuclear relationship in the context of the broader relationship of the strategic military capabilities of the two countries. These include missile defenses and non-nuclear strategic strike capabilities and perhaps also the associated enabling capabilities in cyber space and outer space. Especially from China's perspective, the credibility of its threat to retaliate by nuclear means if attacked by the United States is undermined by the US deployment of long-range precision non-nuclear strike capabilities, other so-called "left of launch" capabilities, and homeland missile defenses. China's military planners fear that these capabilities may be used in combination to preemptively eliminate China's assured retaliation posture. They fear also that the simple presence of these US capabilities might embolden the US to try to coerce China. Having struggled with this problem since at least the early 1990s, China's military planners long ago recognized the need to integrate the strategic military toolkit for deterrence and defense purposes.

Today, the United States is playing catch up, conceptually and organizationally. From 9/11 to 2014 or so, its military focus was elsewhere. Catching up requires more complete and effective integration of multi-domain operations. This requires getting operational concepts right. At present, they are not. As the bipartisan National Defense Strategy Commission concluded in its 2018 report, the US military "could well lose" a war against China or Russia because it has not so far developed the concepts necessary to successfully counter an adversary's escalation strategies, nuclear and otherwise. Accordingly, the Biden administration's review of nuclear policy and posture is being conducted in the context of a broader "integrated strategic review." The aim is to produce an updated defense strategy that fully integrates strategic and non-strategic dimensions of war as well as nuclear and non-nuclear aspects.

That integrated review will also likely involve decisions about the further development and deployment of homeland missile defenses and of long-range, precision, prompt, non-nuclear strike capabilities (as well as space and counter-space capabilities as well as cyber and infrastructure resilience). The last administration set a "simple goal" for missile defense: "to destroy any missile launched against the US, anywhere, anytime, anyplace." Its pursuit of hypersonic strike capabilities was driven by a vision of "over-matching" strategic forces. The Biden administration will have to chart its own course. It is likely to reject these goals. But the alternatives are not as clear as they once were, when the threats were less sophisticated and numerous and the technical choices fewer. China can be expected to compete to maintain confidence in its threat of assured nuclear retaliation and is well hedged against the need to do so. Whether promises of US restraint would be met with reciprocal restraint is an open question today. The prospects of successfully responding to China's strategies for deterrence and competition are improved with a US policy and posture review process that sees the problem whole, rather than breaking it in pieces with stove-piped capability reviews.

The integrated strategic review is a good idea. It will help frame the right big China questions for US defense strategy. But as an ambitious innovation, it is likely to fall short in some respects. Expectations should be kept modest.

What Should Congress Do?

On a bipartisan basis wherever possible, Congress should:

1. Ensure that strategic issues in the China-US military relationship receive the necessary sustained leadership focus from the Biden administration. The Congress can do so by maintaining its own focus. And by highlighting serious concerns about China's nuclear modernization without sounding alarmist.
2. Set its expectation that:
    a. The Biden National Defense Strategy will fully and effectively address the concerns raised in the 2018 report of the NDS Commission about the US lack of conceptual preparedness for regional wars against nuclear-armed adversaries.
    b. The administration's integrated strategic review will produce a coherent answer that sets out the specific contributions of different deterrence capabilities (regional and strategic, offense and defense, kinetic and non-kinetic, nuclear and non-nuclear) and the approaches needed to contain the risks of strategic escalation in multi-domain warfare.
    c. The administration's review of nuclear policy, deterrence strategy, and force planning accounts comprehensively and substantively for the China factor.
    d. In doing so, the administration will take full account of allied views.
3. Oppose the adoption by the administration of minimum deterrence or analogous strategies. These are strategies built on the premises that nuclear weapons are so destructive that very few weapons are needed and that the threat to employ them in retaliation is always credible.

4. Continue to support the Program of Record for nuclear modernization as formed by the Obama administration and adopted with minor modifications by the Trump administration. This includes needed investments in warheads, delivery systems, and the associated infrastructure and expertise.
5. Invest to encourage the needed intellectual bandwidth on these issues. Toward this end, task the administration to report on what institutional capacity has been created at DoD and in its support elements to ensure a steady flow of new insights about China's approach to modern conflict, including its strategic dimensions. The last administration was right to emphasize the need to out-compete, out-innovate, and out-think US adversaries. After three decades of sharp atrophy in the institutions that generate strategic thought for the US government, more needs to be done to generate the needed focus and excellence for the long term.

Brad Roberts is the director of the Center for Global Security Research at Lawrence Livermore National Laboratory. The views expressed here are his personal views and should not be attributed to the laboratory or its sponsors. Dr. Roberts served as deputy assistant secretary of defense for nuclear and missile defense policy from 2009 to 2013. In that capacity, he served as co-director of the Obama administration's Nuclear Posture Review and Ballistic Missile Defense Review. Dr. Roberts also helped found and lead a DoD-sponsored unofficial US-China nuclear deterrence dialogue that spanned nearly 20 years. Key insights from that process are discussed in his edited monograph *Taking Stock: US-China Track 1.5 Nuclear Dialogue* (CGSR Occasional Paper 2020). His most recent publication is "Orienting the 2021 Nuclear Posture Review" in the summer 2021 issue of *The Washington Quarterly.*

OPENING STATEMENT OF ABRAHAM DENMARK, DIRECTOR OF THE ASIA PROGRAM, WILSON CENTER

COMMISSIONER WONG: Thank you, Dr. Roberts.

Let's move to Abe.

MR. DENMARK: Thank you, Commissioners. I'm honored to testify before you today.

And like Dr. Roberts, let me begin by saying that these are my views alone, not those of the Wilson Center or the U.S. Government.

I'd like to offer a summary of my written testimony by focusing on three points: the state of the U.S.-China nuclear relationship; allied and partner views of China's nuclear modernization, and my recommendations for U.S. policy, given these assessments.

Clearly, as you've heard today, Beijing is embarking on a major initiative to develop a significantly larger and more sophisticated nuclear arsenal. Yet, while these developments are certainly worrisome, they have not fundamentally altered the ability of the United States to deter China at the strategic level.

The United States will maintain nuclear escalation dominance across all rungs of the escalation ladder, which will undermine the credibility of any effort by Beijing to imply nuclear coercion or ignore threats by the United States. With a large, survivable, and effective nuclear triad that is in the process of being modernized, there should be no doubt in the credibility of U.S. nuclear capabilities or the deterrent they convey.

The primary challenge in the U.S.-China military dynamic lies not in the nuclear dimension, but, rather, in diminishing American conventional military advantages. As the PLA continues to refine and advance its conventional military capabilities, the United States faces increasing risks and potential costs in a conventional conflict with China. Nuclear weapons may, therefore, become more salient in U.S. strategy in the Indo-Pacific if the regional balance of conventional military power were to become unfavorable to U.S. interests.

These dynamics have profound implications for U.S. allies and partners. With the exception of India, U.S. allies and partners in East Asia generally view the significance of China's nuclear modernization through the lens of how it affects the ability and will of the United States to support its extended deterrence commitments.

While China's nuclear modernization will not substantially undermine U.S. nuclear deterrence capabilities, it will potentially raise the costs and risks associated with those commitments. It is, therefore, not U.S. capabilities that concern U.S. allies and partners per se, but, rather, their concerns focus on the resolve of the United States to risk potentially devastating costs in the defense of an ally or partner.

The significant advantages the United States enjoys over China in terms of raw nuclear capability means the concerns about U.S. extended deterrence capabilities are limited, even in the face of China's nuclear modernization initiative. Absent dramatic changes to the nuclear balance or collapse in confidence in American resolve, I expect allies and partners will continue to value U.S. extended deterrence commitments.

To various degrees, East Asian allies and partners fear abandonment by the United States and entrapment into a U.S.-China conflict. Specifically, most fear that China may attack them and/or the U.S. military bases they host, or that they may be pulled into a U.S.-China conflict without their prior approval.

While concerns about the reliability of the United States have certainly intensified in recent years, this reflects a deeper apprehension among our allies and partners regarding their

perceptions of declining American power; concerns about the predictability and future direction of American domestic politics; inconsistent U.S. foreign and national security policies, especially regarding allies and partners, and persistent questions about the long-term intentions of the United States to support its allies and lead the international community.

With the exception of India, each U.S. ally and partner in the Indo-Pacific is developing limited, and for the most part, very limited, conventional counterforce and/or countervalue deterrent capabilities as a hedge against the possibility of abandonment by the United States. Each U.S. ally and partner in the Indo-Pacific possesses some degree of latent nuclear capability except, of course, India and may pursue such a capability, should confidence in U.S. extended deterrent commitments suffer an unlikely catastrophic collapse. Yet, despite ongoing debates on the subject in some countries' foreign policy communities, no U.S. ally or partner in the Indo-Pacific is seriously contemplating the development of an indigenous nuclear capability at this time, except, of course, for India, which is the outlier in this analysis.

Unlike other U.S. allies and partners in the region, New Delhi views nuclear issues with China as a direct challenge. In fact, China has become India's pacing challenge for its nuclear capabilities. Yet, India's nuclear calculations are more complex, in that they must also contend with Pakistan, which, as one scholar noted, quote, "places India in the unusual position of needing to deter a more powerful nuclear adversary while intimidating a weaker opponent." Unquote.

I'll conclude my remarks with a summary of my three policy recommendations to address ally and partner concerns.

One, maintain U.S. and allied conventional military advantages. Re-establishing expectations that the United States will maintain its conventional military advantages in the defense of its allies and partners would have a dramatic effect in improving confidence in American extended deterrent commitments. Indeed, maintaining the credibility of U.S. conventional deterrence would significantly reduce the risk of conflict in general and nuclear use in particular.

Two, increased risk tolerance. The United States has an opportunity to be tactically active in response to pressure from China, which would send a signal of resolve to U.S. allies, partners, and adversaries alike. Operating within the guidelines of their own policies, the United States and its allies and partners should preplan peaceful military operations, such as multilateral exercises or combined maritime and air patrols, that can be executed quickly in response to a Chinese provocation.

And three, enhanced allied deterrence cooperation. The United States should accelerate efforts to empower its allies and partners to contribute more to regional conventional deterrence by establishing regular multilateral engagements, examining conventional deterrents, and exploring possible revisions to joint regional force posture and distributed concepts of operations to account for emerging challenges and opportunities. This should include the deployment of U.S. conventional ground-based intermediate-range anti-ship cruise missiles.

Concurrently, the United States should consider a significant upgrade to its efforts to engage and reassure its Indo-Pacific allies on regional nuclear deterrence by broadening existing bilateral deterrence dialogues, both geographically and substantively, supplementing them with a high-level mechanism for the United States and its allies to discuss deterrence and identify ways ahead.

I'll finish there. Thank you very much for inviting me, and I look forward to your questions.

PREPARED STATEMENT OF ABRAHAM DENMARK, DIRECTOR OF THE ASIA PROGRAM, WILSON CENTER

Testimony Before the U.S.-China Economic and Security Review Commission

Hearing on China's Nuclear Forces
June 10, 2021

Dirksen Senate Office Building Room 430

Nuclear Confidence and Strategic Uncertainty:
Ally and Partner Reactions to China's Nuclear Modernization

Submitted by:

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The views expressed herein are those of the author alone, and do not necessarily represent the views of the of the Wilson Center or the United States Government.

Commissioners: I am honored to testify before you today, and I applaud your determination to understand how China's nuclear modernization is viewed by our allies and partners in the Indo-Pacific.[1] I would like to offer some initial thoughts on this topic, and I look forward to our discussion. But before I begin, please note that these are my views alone, and do not necessarily represent the views of the Wilson Center or of the U.S. government.

U.S. allies and partners in the Indo-Pacific play very close attention to the complexities of the burgeoning competition between China and the United States. Yet, while our allies and partners have certainly taken notice of China's nuclear modernization initiative, they interpret these developments quite differently than we do in Washington. As the United States seeks to revitalize its alliances and partnerships across the Indo-Pacific and maintain a credible deterrent against an increasingly ambitious and assertive China, we must provide a clear understanding of how China's nuclear modernization affects the U.S. deterrent capability, and how our allies and partners view these developments.

Toward those ends, my testimony today will touch on three issues: (1) the state of the U.S.-China nuclear relationship; (2) allied and partner views of China's nuclear modernization; and (3) my recommendations for U.S. policy given these assessments.

The State of U.S.-China Nuclear Relations

My assessment of how U.S. allies and partners view China's nuclear modernization is fundamentally rooted in my understanding of U.S.-China nuclear dynamics. Overall, describing these remarkable investments as "nuclear modernization" understates the breadth of China's activities on its nuclear capabilities. According to the Department of Defense, "China's strategic ambitions, evolving view of the security landscape, and concerns over survivability are driving significant changes to the size, capabilities, and readiness of its nuclear forces." The Pentagon has further assessed that China's nuclear forces are in the process of significant modernization and diversification, are pursuing a credible "nuclear triad," and that China's nuclear warhead stockpile – estimated to be in the low 200s – is projected to at least double in size over the next decade. Beijing is developing new ICBMs, and the Pentagon assesses that "the number of the PRC's land-based ICBMs capable of threatening the United States is expected to grow to roughly 200" by 2025. The PLA is also building more of the DF-26, a mobile, ground-launched IRBM capable of rapidly swapping between conventional and nuclear warheads.[2]

These developments seem to be aimed at fulfilling General Secretary Xi Jinping's goals to "achieve a great rise in strategic capabilities" and making "breakthroughs … in strategic deterrence capability."[3] Yet there is still a great deal we don't know about China's nuclear intentions and its desired end-states. The opacity that China has wrapped around its nuclear capabilities exacerbates these

[1] I will contain my remarks to Australia, India, Japan, the Republic of Korea, and Taiwan.

[2] Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2020,* (Washington: Office of the Secretary of Defense, 2020). https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF, p. viii-ix.

[3] Ibid., 55.

uncertainties, forcing outside observers to assess China's approach to nuclear deterrence from its investments and the statements of its leaders.

Although the strategies and doctrine driving this modernization initiative remain unclear, the Department of Defense has assessed that China may intend "to increase the peacetime readiness of its nuclear forces by moving to a launch-on-warning (LOW) posture with an expanded silo-based force."[4] While some may consider a LOW posture as consistent with Beijing's No First Use (NFU) policy, China's efforts to quantitatively and qualitatively improve its nuclear capabilities – combined with Russia's 2019 announcement of its intention to assist China in developing a missile attack warning system – strongly suggest that Beijing's approach to deterrence may in practice be edging away from NFU.[5] However, it remains unlikely that China will ever officially abrogate its NFU commitment, preferring instead to maintain a degree of ambiguity surrounding questions of when exactly Beijing would use nuclear weapons. Regardless, I have never put a great deal of weight on China's NFU policy for several reasons, but primarily because I have never believed the NFU policy would actually constrain the decisions of a Chinese leader in a crisis more than would the logic of deterrence, and I would never base the security of the United States and our allies and partners on Beijing's fealty to a pledge.

Though certainly worrisome, these developments have not fundamentally altered the ability of the United States to deter China at the strategic level. While the United States has never officially acknowledged vulnerability to a Chinese nuclear strike, it and has not attempted to deny Beijing a credible retaliatory capability since the DF-5 ICBM was first deployed in 1981.[6] In fact, successive U.S. administrations have gone out of their way to reassure Beijing that the United States does not seek to undermine China's retaliatory capability and relies upon deterrence to protect against Chinese nuclear attack.[7]

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[4] Ibid, ix.

[5] Dmitry Stefanovich, "Russia to Help China Develop an Early Warning System," *The Diplomat,* October 25, 2019. https://thediplomat.com/2019/10/russia-to-help-china-develop-an-early-warning-system/; China Power Team, "How is China Modernizing Its Nuclear Forces?" China Power, December 10, 2019. https://chinapower.csis.org/china-nuclear-weapons/.

[6] John William Lewis and Hua Di, "China's Ballistic Missile Programs: Technologies, Strategies, Goals," *International Security,* 17:2 (Fall 1992). https://www.jstor.org/stable/2539167?seq=1, p. 10.

[7] According to the Congressional Research Service in 2015, "As a matter of policy, U.S. missile defenses are not intended to alter the balance of nuclear deterrence with the major nuclear-armed states, i.e. Russia and China."[7] The Trump administration suggested a similar approach in the U.*S. Missile Defense Review 2019*, which declares "While the United States relies on deterrence to protect against large and technically sophisticated Russian and Chinese intercontinental ballistic missile threats to the U.S. homeland, U.S. active missile defense can and must outpace existing and potential rogue state offensive missile capabilities." Although President Trump stated at the release of the *Missile Defense Review* that his goal was "to ensure we can detect and destroy any missile launched against the United States, anytime, anywhere and any place," it is notable that the report itself made no such claims and the Trump administration's defense budgets did not reflect that objective. Ian E. Rinehart, Steven A. Hildreth, and Susan V. Lawrence, "Ballistic Missile Defense in the Asia-Pacific Region: Cooperation and Opposition," Congressional Research Service R43116, April 3, 2015. https://fas.org/sgp/crs/nuke/R43116.pdf, p. 3; Office of the Secretary of Defense, *U.S. Missile Defense Review 2019,* U.S. Department of Defense, 2019. https://media.defense.gov/2019/Jan/17/2002080666/-1/-1/1/2019-MISSILE-DEFENSE-REVIEW.PDF, p. v; David Vergun, "Trump Pledges to Protect America From Any Enemy Missile," U.S. Department of Defense, January 17, 2019. https://www.defense.gov/Explore/News/Article/Article/1734640/trump-pledges-to-protect-america-from-any-enemy-missile/.

To this point, China's nuclear modernization initiatives will not significantly change this underlying reality. According to the *U.S. Missile Defense Review 2019*, "China can now potentially threaten the United States with about 125 nuclear missiles, some capable of employing multiple warheads, and its nuclear forces will increase in the coming years."[8] By contrast, the United States had 3,822 nuclear weapons as of September 30, 2017 (the most recently declassified number).[9] What's important here is that China's nuclear stockpile, even if it were to double as the Pentagon assesses, will still come nowhere close to rivaling that of the United States in total numbers. With a large, survivable, and effective nuclear triad that is being modernized, there should be no doubt in the credibility of U.S. nuclear capabilities or the deterrent they convey.

Despite the dramatic improvement expected in China's nuclear capabilities, they do not appear intended to undermine the U.S. deterrent or achieve some degree of parity in order to gain a first user advantage.[10] Rather, Beijing seeks to enhance the survivability of its nuclear arsenal in order to maintain a credible retaliatory capability in response to Beijing's concerns about U.S. conventional long-range precision strike, cyber operations, and missile defenses.[11] Chinese scholars have described this as "catching up with the United States and Russia in terms of the technological development of strategic weapons," in the belief that "lagging behind [in technological development] would make [China] vulnerable to attack."[12] Moreover, as Chinese scholar Zhao Tong has noted, China's nuclear modernization program "has been developing under the assumption that China's nuclear forces should be able to ride out a first strike and maintain the ability to deliver a nuclear relation that is beyond the 'unacceptable level of damage.'"[13] Developing a more survivable and effective nuclear force will make Beijing more confident in its ability to conduct an "assured retaliation" even after absorbing a first strike – and a LOW posture will not fundamentally change these calculations.

Beyond a more survivable retaliatory capability, the primary implication of China's nuclear modernization initiative for U.S. deterrence is that, in a nuclear exchange, the United States would be more likely to absorb an "unacceptable level of damage," but not to a degree that would eliminate Washington's ability to inflict a devastating retaliatory strike. Since the ability of the United States to

[8] Office of the Secretary of Defense, *U.S. Missile Defense Review 2019,* p. v.

[9] Retired weapons awaiting dismantlement were not included in the totals. Steven Aftergood, "2017 Nuclear Stockpile Total Declassified," Federation of American Scientists, March 22, 2018. https://fas.org/blogs/secrecy/2018/03/stockpile-2017/.

[10] Stephanie Lieggi, "Going Beyond the Stir: The Strategic Realities of China's No-First-Use Policy," NTI, January 1, 2005. https://www.nti.org/analysis/articles/realities-chinas-no-first-use-policy/.

[11] See Wu Riqiang, "Living With Uncertainty: Modeling China's Nuclear Survivability," *International Security* 44:4 (2020): p. 84–118; Lora Saalman, "Prompt Global Strike: China and the Spear," Daniel K. Inouye Asia-Pacific Center for Security Studies, 2014. https://www.jstor.org/stable/resrep14019?seq=1#metadata_info_tab_contents; Sanjana Gogna, "China's Nuclear Ambiguity and Risk of Deterrence Breakdown," *CAPS in Focus*, September 5, 2020. http://capsindia.org/files/documents/db78ed2f-2f94-43d1-b41a-c88c51fd5c39.pdf.

[12] Li Bin, "Differences between Chinese and U.S. Nuclear Thinking and Their Origins," in *Understanding Chinese Nuclear Thinking,* Li Bin and Tong Zhao, eds. (Carnegie Endowment for International Peace, 2016), https://carnegieendowment.org/files/ChineseNuclearThinking_Final.pdf, p. 14.

[13] Tong Zhao, "Modernizing Without Destabilizing: China's Nuclear Posture in a New Era," Carnegie-Tsinghua Center for Global Policy, August 25, 2020. https://carnegietsinghua.org/2020/08/25/modernizing-without-destabilizing-china-s-nuclear-posture-in-new-era-pub-82454.

inflict terrible destruction on China would not be substantially changed in this case, U.S. deterrence capabilities would not be substantially diminished by China's nuclear modernization.

However, some American analysts have about the potential for nuclear escalation in a U.S.-China crisis. They fear that China's improved ability to use nuclear weapons with precision and in the theater – rather than a massive countervalue strike on the American homeland – would potentially give Beijing options to credibly threaten nuclear use in situations other than the most dire. For example, these analysts fear that Beijing may threaten nuclear use against U.S. forces and bases in theater if the PLA's conventional forces had been largely defeated, or that China may attempt to rapidly seize territory and present the United States with a *fait accompli*, threatening nuclear use in order to quickly terminate the conflict before the United States and its allies can attempt to roll back China's territorial gains. They also fear that China's nuclear modernization may undermine the credibility of U.S. threats to use nuclear weapons first.[14]

Yet, while I agree that China's new nuclear capabilities provides Beijing with more options to consider, I am less concerned about the potential for them to drive Beijing to embrace nuclear coercion as a tool of its foreign policy - primarily because doing so would ignore the fundamental logic of deterrence. Despite the significant improvements underway in China's nuclear capability, they will still be no match for those of the United States – qualitatively or quantitatively. The United States will maintain nuclear escalation dominance across all rungs of the escalation ladder, which will undermine the credibility of any effort by Beijing to employ nuclear coercion or ignore threats by the United States.

American strategists are also concerned about the prospect of unintentional escalation. These fears are exacerbated by what Western analysts believe to be the colocation of China's nuclear and conventional missile forces, meaning that U.S. attacks on conventional military assets may actually hit nuclear assets, thereby potentially causing Beijing to believe that the United States is attempting to destroy China's retaliatory capability.[15]

China's nuclear strategists are more optimistic about the risks of nuclear escalation in any future crisis with the United States, primarily because they do not believe the stakes of such a confrontation would be sufficient for either side to risk nuclear escalation. They also see China's NFU policy as robust enough to provide a clear distinction between a conventional and a nuclear conflict but ambiguous enough to deter the United States from attacking China's nuclear arsenal with conventional capabilities. Chinese nuclear strategists are also more dismissive of the potential

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[14] Stephen Fruhling, Andrew O'Neil, and David Santoro, "Escalating Cooperation: Nuclear Deterrence and the U.S.-Australia Alliance," University of Sydney United States Studies Centre, November 7, 2019. https://www.ussc.edu.au/analysis/escalating-cooperation-nuclear-deterrence-and-the-us-australia-alliance; Elbridge Colby, "If You Want Peace, Prepare for Nuclear War," *Foreign Affairs,* November/December 2018. https://www.foreignaffairs.com/articles/china/2018-10-15/if-you-want-peace-prepare-nuclear-war; Elbridge Colby, "Testimony Before the U.S.-China Economic and Security Review Commission: 'China's Offensive Missile Forces: Implications for the United States,'" U.S.-China Economic and Security Review Commission, April 1, 2015. https://www.uscc.gov/sites/default/files/Colby%20USCC%20Testimony%201%20April%202015.pdf..

[15] Fiona Cunningham and M. Taylor Fravel, "Why China Won't Abandon Its Nuclear Strategy of Assured Retaliation," Belfer Center, December 2015. https://www.belfercenter.org/publication/why-china-wont-abandon-its-nuclear-strategy-assured-retaliation.

for unintentional nuclear escalation than their American counterparts,[16] and American researchers have found that Chinese experts were relatively confident about crisis stability.[17]

Despite these challenges, I view nuclear deterrence between Washington and Beijing as relatively stable and predictable, in that both sides are generally confident in their ability to effectively retaliate against a nuclear strike so as to obviate the benefits of nuclear first use. The larger and more capable Chinese nuclear force expected by the Department of Defense will likely reinforce Beijing's confidence in its own retaliatory capability while remaining far short of a force that would threaten to undermine U.S. nuclear deterrence capabilities – especially as the United States invests in the modernization of its own nuclear forces.

The Conventional Dimension

The primary challenge in the U.S.-China military dynamic lies not in the nuclear dimension, but rather in diminishing American conventional military advantages. As the PLA continues to refine and advance its conventional military capability, the United States faces increasing risks and potential costs in a conventional conflict with China – presumably in the defense of U.S. allies and it interests in the Indo-Pacific. Concerns about the potential for China to employ nuclear coercion under the logic of the stability-instability paradox or present the United States and its allies with a nuclear-backed *fait accompli* do not reflect a fundamental change in the U.S.-China nuclear dynamic, but rather are the result of the dramatic changes in the U.S.-China balance of conventional military power. China's nuclear forces have been sufficient to theoretically attempt to employ nuclear coercion or a *fait accompli* for years (Pakistan has attempted this approach with a much smaller and less sophisticated nuclear capability), but it has lacked the necessary conventional capability.

Yet, now that China's conventional military capabilities have improved and U.S. conventional military advantages have diminished, the United States may be forced to rely more on nuclear weapons to deter attacks on its allies and partners. Indeed, as I wrote with former Deputy Assistant Secretary of Defense for Strategy Elbridge Colby in 2013:

> Nuclear weapons may become more salient to U.S. strategy in the Asia-Pacific if the regional balance of conventional military power were to become unfavorable to U.S. interests. Such a dynamic would likely be intensified if China chose to use its growing military power to attempt to exclude the United States from the region, to shield North Korea from the consequences of its belligerence, to challenge the openness and stability of the global commons, or to take a more assertive approach to the resolution of territorial disputes.[18]

These dynamics have profound implications for U.S. allies and partners. While some are concerned about China's nuclear modernization, far more are focused on the implications of a relative decline

[16] Cunningham and Fravel, "Why China Won't Abandon Its Nuclear Strategy of Assured Retaliation."

[17] Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Strategy and U.S.-China Strategic Stability," *International Security*, Vol. 40, No. 2 (Fall 2015), pp. 7–50, doi.org/10.1162/ISEC_a_00215.

[18] Elbridge Colby and Abraham M. Denmark, "Nuclear Weapons and U.S.-China Relations," Center for Strategic and International Studies, March 2013. https://csis-website-prod.s3.amazonaws.com/s3fs-public/legacy_files/files/publication/130307_Colby_USChinaNuclear_Web.pdf, p. 3.

in American power and perceptions of diminished American resolve. In the minds of most allied and partner strategists, the implications of these dynamics are inextricably interwoven.

Allied and Partner Views of China's Nuclear Modernization

With the exception of India, U.S. allies and partners in East Asia generally view the significance of China's nuclear modernization through the lens of how it effects the ability and will of the United States to support its extended deterrence commitments. Broadly speaking, the perceived credibility of U.S. extended deterrence commitments rests on two pillars: capability (does the United States possess sufficient resources to credibility threaten the effective use of nuclear weapons against China to produce a deterrent effect?) and resolve (does the United States possess the political will to risk tremendous costs in the defense of its allies and partners?). China's nuclear modernization will not substantially undermine U.S. nuclear deterrence capabilities, but it does potentially raise the costs and risks associated with those commitments. It is therefore not U.S. *capabilities* that concern U.S. allies and partners, per se, but worries about the *resolve* of the United States to risk potentially devastating costs in the defense of an ally or partner.

Dependence upon any country for nuclear deterrence is inherently disquieting, because the true intentions of another country are ultimately unknowable, and predictions of how a country will act in a potential crisis are unreliable. Moreover, while an aggressor can be certain that a state will fight to defend itself – even to the point of risking nuclear annihilation to avoid foreign occupation – it may doubt that a state would fulfill a pledge to defend a distant ally from foreign aggression – especially if that defense would lead to its own destruction.

A degree of anxiety about U.S. credibility is therefore understandable, and has been a persistent feature of U.S. extended nuclear deterrence since it was first discussed in the early years of the Cold War. Western Europeans perpetually wondered if the United States would "sacrifice New York for Paris"[19] by threatening nuclear use, and follow through with the threat if necessary, in a crisis with the Soviet Union. Indeed, European questions about the credibility of U.S. extended deterrence commitments constituted "the central concern of deterrence theory in the Cold War."[20]

Those that depend on U.S. extended deterrence commitment in the Indo-Pacific today are familiar with this discomfort. Yet, while these anxieties will never be solved, they can be managed with a mix of robust engagements between the United States and its allies, operations that signal resolve and

[19] Interestingly, discussions of U.S.-China nuclear dynamics have used similar formulations. In 1996, former PLA Deputy Chief of the General Staff Xiong Guangkai told former U.S. Ambassador Chas W. Freeman by that China would consider using nuclear weapons in a Taiwan conflict, noting that "Americans should worry more about Los Angeles than Taipei." This was likely not a specific threat to bomb Los Angeles, but rather a deterrent message referring to past instances of U.S. threats to use nuclear weapons against China. See Joseph Kahn, "Chinese General Threatens Use of A-Bombs If U.S. Intrudes," *The New York Times,* July 15, 2005. https://www.nytimes.com/2005/07/15/washington/world/chinese-general-threatens-use-of-abombs-if-us-intrudes.html; and Katherine Yester, "A Myth Is Born," *Foreign Policy,* November 19, 2009. https://foreignpolicy.com/2009/11/19/a-myth-is-born/.

[20] Austin Long, *Deterrence From Cold War to Long War* (Santa Monica: RAND Corporation, 2008). https://www.rand.org/content/dam/rand/pubs/monographs/2008/RAND_MG636.pdf, p. 13; see also Beatrice Heuser, "Western Europe Between Soviet Threat and American Guarantee," in Beatrice Heuser, *NATO, Britain, France, and the FRG* (London: Palgrave Macmillan, 1997). https://link.springer.com/chapter/10.1057%2F9780230377622_1.

commitment, and investments in capabilities buttress the ability of the United States and its allied and partner military forces to accomplish their objectives. This is why the United States came to believe during the Cold War that its Western European allies must share an understanding of what would be done and the forces needed to maintain deterrence during a crisis, leading to the establishment of NATO's nuclear planning group (NPG).[21]

When considering the views of U.S. allies and partners in the Indo-Pacific, it is incumbent on American policymakers, to distinguish between the normal and manageable levels of uncertainty that are inherent to all extended deterrent relationships, and concerns that reflect deeper, more ominous doubts about the credibility and reliability of the United States. During the Cold War, two U.S. allies in Asia reacted to profound concerns about U.S. abandonment by pursuing indigenous nuclear capabilities: the ROK's covert nuclear program launched in the wake of President Nixon's announcement of his doctrine with the statement that "America cannot…undertake all the defense of the free nations of the world," and Taiwan's clandestine nuclear weapons program initiated out of Taipei's (ultimately well-founded) fear that President Nixon's engagement with Beijing portended a shift of U.S. recognition to the PRC and the end of U.S. security commitments to the island.[22]

Today, U.S. allies and partners in the Indo-Pacific are keenly attentive to the intricacies of U.S.-China competition, and their views of American credibility are similarly complex. While concerns about the reliability of the United States have certainly intensified in recent years, this has not been the result of China's nuclear modernization program or doubts about U.S. extended deterrence capabilities. Rather, ally and partner concerns about U.S. credibility reflect a deeper apprehension about changes to the relative balance of power and uncertainties about the long-term intentions and resolve of the United States to pay a heavy price in the defense of its allies and partners. Yet, if unaddressed, a significant improvement in China's nuclear capabilities could exacerbate these preexisting anxieties about the United States. The following review of allied and partner perceptions of Chinese nuclear modernization and U.S. credibility produces several conclusions in this regard.

For U.S. allies and partners in the Indo-Pacific, nuclear dynamics between China and the United States do not receive significant public attention – especially compared to the prominent role that nuclear deterrence played during the Cold War. While competition between China and the United States has grown more intense in recent years, nuclear issues have not become a driving element of that competition relative to other issue areas. This is primarily because the nature of the U.S.-China competition – fueled by efforts on both sides to gain advantage in the relative distribution of comprehensive national power, and by incompatible visions for the future of the Indo-Pacific and the international order – is not existential. Unlike the Cold War, scenarios in which either China or the United States would seek to annihilate the other with nuclear weapons are vanishingly unlikely. Instead, when they do consider nuclear dynamics, allies and partners are concerned about the potential for nuclear escalation, and that China could strike them with nuclear weapons in order to destroy U.S. bases involved in a conflict, in an attempt to terminate a conflict on favorable terms, in

[21] Long, *Deterrence: From Cold War to Long War,* p. 14-15.

[22] Rebecca K. C. Hersman and Robert Peters, "Nuclear U-Turns: Learning From South Korean and Taiwanese Rollback," *Nonproliferation Review* 13:3 (November 2006). https://www.nonproliferation.org/wp-content/uploads/npr/133hersman.pdf, p. 540-544; *Foreign Relations of the United States*, 1969–1976, Volume I, Foundations of Foreign Policy, 1969–1972, eds. Louis J. Smith and David H. Herschler (Washington: Government Printing Office, 2010), Document 60. https://history.state.gov/historicaldocuments/frus1969-76v01/d60.

the belief that U.S. nuclear threats were not credible, in the fear that its nuclear forces were threatened, or as the result of an accidental or unauthorized launch.[23]

Yet these are generally seen as unlikely and at most playing a limited role in likely military contingencies, meaning that a credible U.S. nuclear retaliatory capability is generally seen by allies and partners as sufficient – even considering China's ongoing nuclear modernization initiatives. Though for different reasons and at various levels of prioritization, strategists in Canberra, New Delhi, Seoul, Taipei, and Tokyo (except when noted otherwise) share the following broad analyses of these issues:

- The risk of a nuclear conflict between China and the United States is generally viewed by U.S. allies and partners as very low, and the deterrent relationship is viewed as stable. Yet some scholars and strategists are concerned about possible nuclear escalation, especially in a crisis involving Taiwan.
- The significant advantages the United States enjoys over China in terms of raw nuclear capability means that concerns about U.S. extended deterrence capabilities are limited – even in the face of China's nuclear modernization initiative.
- Absent dramatic changes to the nuclear balance or a collapse in confidence in American resolve, allied and partner will continue to seek U.S. extended deterrence commitments.
- With the exception of India, China's nuclear modernization has not been the primary factor in driving allied and partner concerns about China or the credibility of U.S. extended deterrence commitments. Rather, concerns have intensified as a result of deepening uncertainties regarding American resolve.
- Uncertainties about American resolve have intensified across the Indo-Pacific as a result of broader changes to the U.S.-China balance of power, perceptions of declining American economic power and vitality, concerns about the predictability and future direction of American domestic politics, inconsistent U.S. foreign and national security policies (especially regarding allies and partners), and persistent questions about the long-term intentions of the United States to support its allies and lead the international community.
- With the exception of India, each U.S. ally and partner in the Indo-Pacific is developing limited conventional counterforce and/or countervalue deterrent capabilities as a hedge against the possibility of abandonment by the United States.
- With the exception of India, no U.S. ally or partner in the Indo-Pacific is seriously considering the development of an indigenous nuclear capability at this time. Nevertheless, (with the exception of Taiwan) each country's policy community is actively debating the possibility.

[23] As noted by Cunningham and Fravel, some Russian strategists have suggested that limited nuclear strikes could be used to coerce an opponent to end a conventional conflict, although Russia scholars dispute whether this concept of escalate to de-escalate has been incorporated into Russia's nuclear doctrine. See Kristin Ven Bruusgaard, "Russia's Nuclear Strategy of Survival," Stanford University, March 2019; and Olga Oliker, "Moscow's Nuclear Enigma: What Is Russia's Arsenal Really For?" *Foreign Affairs*, 97: 6 (November/December 2018), p. 52, 54. As cited in Fiona S. Cunningham, M. Taylor Fravel; Dangerous Confidence? Chinese Views on Nuclear Escalation. *International Security* 2019; 44 (2): p. 61–109. doi: https://doi.org/10.1162/isec_a_00359.

- With the exception of India, each U.S. ally and partner in the Indo-Pacific possesses some degree of a latent nuclear capability, and may pursue such a capability should confidence in U.S. extended deterrent commitments suffer an unlikely catastrophic collapse.
- The Taiwan Strait is generally seen as the most likely driver of a U.S.-China conflict, and is the most likely scenario to involve the use of nuclear weapons.
- To various degrees, East Asian allies and partners fear abandonment by the United States and entrapment into a U.S.-China conflict. Specifically, most fear that China may attack them and/or the U.S. military bases they host with conventional or nuclear weapons, or that they may be pulled into U.S.-China conflict without their prior approval.
- Reflecting anxieties about U.S. extended deterrence commitments, there has been rising interest in Tokyo and Seoul to establish NATO-like nuclear arrangements in order to play a more significant role in nuclear planning and operations.

Country Analyses

Australia

As a long-standing ally of the United States, Australia decided decades ago that its long-term security and interests would be best-served by aligning with the United States. Since the before the alliance officially began, Australia has been a loyal ally in support of American foreign policy objectives around the world – at times at great cost. Yet in recent years, the Australian foreign policy community has roiled with intensifying debates about the implications of a rising China and a United States whose long-term relative power and reliability has for some become more uncertain.[24]

Australian strategists view China's nuclear modernization as an aspect of Beijing's broader military modernization and its expanding geopolitical power. Canberra's concerns about the credibility of the United States are not tied to China's nuclear capabilities, but rather are more about the United States itself. Specifically, observers in Australia see the United States as war-weary, economically and politically troubled, facing diminishing military advantages in comparison to the PRC, and employing an inconsistent approach to alliances across presidential administrations.[25]

Australian perceptions of American reliability were damaged during the Trump administration, when strong disagreements between President Trump and Prime Minister Turnbull were made public and the Australian public viewed the President quite negatively. A 2020 Pew Poll found that 33 percent of Australians had a favorable view of the United States – the lowest figure in Australia since Pew

[24] Rory Medcalf, "The Great Australian China Debate: Issues and Implications for the United States and the World," (presentation, Sigur Center of Asian Studies, Elliot School of International Affairs, The George Washington University, September 10, 2020). https://nsc.crawford.anu.edu.au/news-events/podcasts/audio/13035/great-australian-china-debate-issues-and-implications-united-states; The Economist, "Australia's Debate About China is Becoming Hot, Angry, and Shrill," *The Economist,* May 8th, 2021. https://www.economist.com/asia/2021/05/08/australias-debate-about-china-is-becoming-hot-angry-and-shrill;

[25] Thomas G. Mahnken, Ross Babbage, and Sugio Takahashi, "American, Australian, and Japanese Perspectives on a Changing Security Environment," Phillip Merrill Center for Strategic Studies, Johns Hopkins School of Advanced International Studies, February 2016, https://www.hsdl.org/?view&did=795797, p. 6.

began polling on this topic nearly two decades ago. Australians' confidence in President Trump was even lower at 23 percent.[26] As a leading foreign policy voice in Australia put it, "Today, Australians still look to America. But what they see makes them heartsick and worried."[27]

Still, while debates about Australia's orientation toward China and the United States continue to roil, there is little sign that these concerns will lead to a significant shift in Australia's approach to China or to the alliance. Indeed, the Australia-China relationship has grown increasingly antagonistic in the face of Beijing's harsh reaction to Canberra's call for an investigation into the origins of the COVID-19 pandemic and revelations about China's campaign to interfere in Australia's domestic politics.[28]

Moreover, despite concerns about American power, interests, and resolve, Australia remains broadly confident in the reliability of U.S. extended commitments.[29] Yet, while Australia's recent boost in defense spending was generally viewed as a commitment to contribute more to the alliance in responding to growing Chinese military power,[30] others noted that Canberra's ambition for the Australian armed forces to "be able to hold potential adversaries' forces and infrastructure at risk from a greater distance, and therefore influence their calculus of costs involved in threatening Australian interests"[31] was interpreted by some as an implicit hedge against the possibility that Australia may be forced "to deter China in limited conventional warfare on its own, without the United States."[32]

Yet, Australian strategists know that, without the United States or their own nuclear weapons, such capabilities would have limited to no effect on China's calculations. Australia likely has the technical means to launch a nuclear weapons program, and Australia has the most uranium deposits in the world – roughly 28 percent of global uranium resources. Although debates on this issue have come and gone in Australia for decades, the most recent round reflects the issues being discussed today:

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[26] Richard Wike, Janell Fetterolf, and Mara Mordecai, "U.S. Image Plummets Internationally as Most Say Country Has Handled Coronavirus Badly," Pew Research Center, September 15, 2020. https://www.pewresearch.org/global/2020/09/15/us-image-plummets-internationally-as-most-say-country-has-handled-coronavirus-badly/.

[27] Michael Fullilove, "Australians Haven't Given Up On the United States – Yet," *The Washington Post,* June 9, 2020. https://www.washingtonpost.com/opinions/2020/06/09/australians-havent-given-up-united-states-yet/.

[28] Paul Karp and Helen Davison, "China Bristles at Australia's Call for Investigation Into Coronavirus Origin," *The Guardian,* April 29, 2020. https://www.theguardian.com/world/2020/apr/29/australia-defends-plan-to-investigate-china-over-covid-19-outbreak-as-row-deepens; https://www.bbc.com/news/world-australia-54458638.

[29] The Australian Government's *2020 Defence Strategic Update* is replete with statements committing to a deepening alliance with the United States. Australian Government, Department of Defense, *2020 Defense Strategic Update & 2020 Force Structure Plan,* Australian Government, Department of Defense, July 1, 2020. https://www1.defence.gov.au/strategy-policy/strategic-update-2020.

[30] Steven Stashwick, "Australia to Boost Its Naval Arsenal to Counter China," *The Diplomat,* January 28, 2021. https://thediplomat.com/2021/01/australia-to-boost-its-naval-arsenal-to-counter-china/.

[31] Australian Government, Department of Defense, *2020 Defense Strategic Update & 2020 Force Structure Plan.*

[32] Van Jackson, "The Risks of Australia's Solo Deterrence Wager," *War on the Rocks,* July 20, 2020. https://warontherocks.com/2020/07/the-risks-of-australias-solo-deterrence-wager/.

China's rising power and concerns about the United States.[33] Although these concerns are genuinely felt and seriously argued, they have not risen to the level where the indigenous development of nuclear weapons is being seriously considered by Australian leaders. Crossing that threshold would require a dramatic and explicit collapse of the U.S. extended deterrence commitment, and would force Canberra to reverse its stance on the Treaty on the Non-Proliferation of Nuclear Weapons – which it has championed for decades.

Interestingly, as described by a group of American and Australian scholars assessing the role of nuclear deterrence and the U.S.-Australia alliance, "While fears of abandonment often attract the most attention in public debate, apprehension about potential entrapment in America's deterrence enterprise also runs deep in the thinking of Australian policymakers."[34]Australian policymakers generally do not perceive threats to Australia that would elicit more explicit deterrence commitments from the United States, and they do not see the nuclear dimensions of a potential U.S.-China conflict as specific to Australia.[35]

Ultimately, although Australia's strategic environment has certainly grown more concerning, Canberra's commitment to the U.S. alliance remains robust. Indeed, my sense is that China's rapid growth in military power – and especially as Chinese ambitions and assertiveness extend closer to Australia's periphery – will continue to clarify thinking in Canberra about the United States. While I understand the concerns some in Australia have about the United States, there is no doubt in my mind that America is still Australia's best bet and will remain so for the foreseeable future. And I have no doubt that my Australian friends know that.

India

Unlike other U.S. allies and partners in the region, India does not view China's nuclear modernization through the lens of its implications for U.S. security commitments. The lack of a commitment from the United States, as well as India's own nuclear capability and competitive dynamic with China, means that New Delhi views nuclear issues with China as a direct challenge.

India faces two nuclear rivals in China and Pakistan. Yet, while Pakistan is broadly seen as India's most immediate and pressing security challenge, India's significant conventional military advantage focuses Indian concerns regarding Pakistan on terrorism and its relatively insecure nuclear stockpile.[36] Yet, China's conventional military advantage over India is significant, and its nuclear capabilities are both larger and more sophisticated. Moreover, Indian experts generally see India's nuclear relations with China as inherently stable, and those with Pakistan as inherently unstable.[37] As

[33] Rod Lyon, "Should Australia Build Its Own Nuclear Arsenal?" *The Strategist,* October 24, 2019. https://www.aspistrategist.org.au/should-australia-build-its-own-nuclear-arsenal/.

[34] Fruhling, O'Neill, and Santoro, "Escalating Cooperation: Nuclear Deterrence and the U.S.-Australia Alliance."

[35] Ibid.

[36] See Caleb Larson, "The Scary State of Pakistan's Many Nuclear Weapons," *The National Interest,* April 9, 2020. https://nationalinterest.org/blog/buzz/scary-state-pakistans-many-nuclear-weapons-142277.

[37] Lora Saalman, "India's No-First-Use Dilemma: Strategic Consistency or Ambiguity Towards China and Pakistan," SIPRI, December 2, 2020. https://www.sipri.org/commentary/blog/2020/indias-no-first-use-dilemma-strategic-consistency-or-ambiguity-towards-china-and-pakistan.

the scholar Robert Farley notes, "This places India in the unusual position of needing to deter a more powerful nuclear adversary, while intimidating a weaker opponent."[38]

Yet, the India-China nuclear relationship has been stable, even as the broader relationship has grown increasingly antagonistic. This can be attributed to the limited size of both arsenals, the No-First-Use policies adopted by both sides (both of which are shrouded in uncertainty),[39] and the emphasis both sides place on assured retaliation in their nuclear strategy – minimizing concerns about first use advantages. Scholars assess that New Delhi's nuclear strategy toward China is "countervalue assured retaliation," meaning that India believes it can maintain deterrence with China by holding its economic and population centers at risk.[40] Yet, Indian experts are not entirely sanguine about nuclear dynamics with China. Some are especially concerned that China's technological advances may drive Beijing to adjust its NFU policy,[41] which they presumably would see as destabilizing.

As the India-China relationship has worsened, and the implications of China's nuclear modernization have grown more apparent, China has become the primary driver of India's nuclear planning and investment.[42] New Delhi has already sought to develop nuclear missile submarines and developed longer-range missiles.[43] Most prominent among India's new strategic capabilities has been the 2018 deployment of the road-mobile Agni-V ICBM, which boasts a range sufficient to hold China's east coast at risk. India is also testing a nuclear-capable SLBM known as the K-4.[44] Should Indian strategists believe that further adjustments to their force structure are necessary to account for China's nuclear modernization, there is a possibility they will expand their stockpile of nuclear weapons (debates about whether India should seek a rough nuclear parity with China are ongoing), and New Delhi may invest more in non-nuclear strategic capabilities such as cyber, electronic, and space weapons. India may also seek to emulate China's use of dispersion, mobility, concealment, and co-location of conventional and nuclear-armed missiles.[45]

When contemplating these options, Indian strategists will need to consider how Pakistan may react to a larger and more capable Indian nuclear capability. Indeed, Islamabad may view New Delhi's

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[38] Robert Farley, "India's Mighty Nuclear-Weapons Program: Aimed at China and Pakistan?" *The National Interest,* January 3, 2015. https://nationalinterest.org/feature/indias-mighty-nuclear-weapons-program-aimed-china-pakistan-11956.

[39] Saalman, "India's No-First-Use Dilemma: Strategic Consistency or Ambiguity Towards China and Pakistan."

[40] Christopher Clary and Vipin Narang, "India's Counterforce Temptations," *International Security*, 43:3 (Winter 2018/19), p. 7–52, https://doi.org/10.1162/ISEC_a_00340.

[41] Saalman, "India's No-First-Use Dilemma: Strategic Consistency or Ambiguity Towards China and Pakistan."

[42] Hans M. Kristensen and Matt Korda, "Indian Nuclear Forces, 2018," Bulletin of the Atomic Scientists, 74:6 (2018), p. 361-366. https://www.tandfonline.com/doi/full/10.1080/00963402.2018.1533162.

[43] Murali Krishnan, "Is India Turning Its Nuclear Focus Toward China?" *Deutsche Welle,* July 14, 2017. https://www.dw.com/en/is-india-turning-its-nuclear-focus-toward-china/a-39698420.

[44] Kelsey Davenport, "India Tests Submarine-Launched Missile," Arms Control Association, March 2020. https://www.armscontrol.org/act/2020-03/news/india-tests-submarine-launched-missile.

[45] Kartik Bommakanti and Suyash Desai, "China's Nuclear Ambiguity and Its Implications for India," ORF Occasional Paper No. 309, April 2021, Observer Research Foundation. https://www.orfonline.org/research/chinas-nuclear-ambiguity-and-its-implications-for-india/.

investments in nuclear weapons as threatening to their own deterrent, leading to a general expansion in the of nuclear weapons and the sophistication of their delivery systems across South Asia.

Indian strategists also worry about the possibility of a "collusive threat" between China and Pakistan, arguing that a combined Sino-Pakistani nuclear threat would make India's nuclear arsenal insufficient, even if New Delhi increases its stockpile to match China's.[46] India's so-called "two front challenge" is a wicked problem for military planners in the Indian military, primarily due to resource constraints that force the Indian military to accept a certain degree of risk.[47] Considering China's instrumental role in Pakistan's nuclear and missile programs dating back to the 1970s,[48] and Beijing's ongoing support of nuclear energy projects in Pakistan,[49] New Delhi's concerns are reasonable – even though I am not aware of any credible evidence of any operational nuclear planning between the Pakistan military and the PLA.

Ultimately, the China-India-Pakistan strategic triangle is complex, messy, and disconcerting. Efforts to strengthen nuclear capabilities by one vertex has rippling effects for the other vertices – and rarely in a positive direction. The Council on Foreign Relations' Daniel S. Markey described it well: "Nuclear competition in Southern Asia represents a classic conundrum of international relations: enormously high stakes, conflicting and entrenched interests, and at least in the near term, few realistic avenues for mitigating threats, much less addressing them in a more permanent way."[50]

Japan

As a treaty ally of the United States with a pacifist constitution that renounces the use of force and forswears maintaining "land, sea, and air forces, as well as other war potential," Japan's dependence on the United States for extended deterrence is profound. Yet the role of nuclear weapons in maintaining U.S. extended deterrence commitments is also politically uncomfortable for Japanese leaders, due to the Japanese people's understandable sensitivity regarding the use of nuclear weapons.

Tokyo views China as its most pressing long-term comprehensive security challenge, and it is deeply concerned about the implications of the PLA's modernization for China's intentions and for the will and ability of the United States to fulfill its extended deterrence commitments. Japanese experts

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[46] Gurmeet Kanwal, "India's Nuclear Force Structure", *Regional Insight,* Carnegie Endowment for International Peace, June 30, 2016; as cited in https://www.orfonline.org/research/chinas-nuclear-ambiguity-and-its-implications-for-india/#_edn201.

[47] Sushant Singh, "The Challenges of a Two-Front War: India's China-Pakistan Dilemma," The Stimson Center, April 19, 2021. https://www.stimson.org/2021/the-challenge-of-a-two-front-war-indias-china-pakistan-dilemma/.

[48] John Dori and Richard Fisher, "The Strategic Implications of China's Nuclear Aid to Pakistan," The Heritage Foundation, June 16, 1998. https://www.heritage.org/asia/report/the-strategic-implications-chinas-nuclear-aid-pakistan; G. Parthasarathy, "Beware the China-Pakistan Nuclear Axis," *The Hindu Business Line,* March 9, 2018. https://www.thehindubusinessline.com/opinion/beware-the-china-pakistan-nuclear-axis/article22220540.ece1.

[49] Ayaz Gul, "Pakistan's China-Built Nuclear Reactor Starts Operation," *Voice of America,* March 19, 2021. https://www.voanews.com/south-central-asia/pakistans-china-built-nuclear-reactor-starts-operation.

[50] Eleanor Albert, "Southern Asia's Nuclear Powers," *Council on Foreign Relations,* November 9, 2015. https://www.cfr.org/backgrounder/southern-asias-nuclear-powers.

broadly perceive an "asymmetry of vulnerability" in Asia, where China and North Korea have a credible nuclear strike posture in the region while Japan and South Korea lack any means to put them at risk. While they view the U.S. nuclear deterrent as an effective counterbalance to China's regional advantage, they fear that the United States could be deterred from coming to Japan's defense. In other words, some in Japan worry that the stability of the U.S.-China nuclear relationship could deter the United States from using nuclear weapons in the defense of Japan, thus incentivizing China's conventional and gray-zone aggression.[51]

While it is clear that Tokyo has mixed views on the current state of the U.S.-China nuclear relationship, these concerns are more political than they are technical. While Japan is certainly not pleased by China's nuclear modernization itself, its concerns are centered around the effect of those capabilities on U.S. resolve. Moreover, Japanese concerns about American resolve are based on a broad assessment of the U.S.-China dynamic, which clearly includes the role of conventional and "gray zone" conflict and tension in the shadow of nuclear deterrence. Specifically, Tokyo is displeased with the shortcomings of traditional nuclear deterrence to prevent China's "gray zone" tactics that fall below the traditional threshold of extended deterrence commitments that could present a *fait accompli* forcing Japan and the United States to compel after the fact, rather than deter in advance.[52] Further inflaming Japanese concerns about the reliability of U.S. extended deterrence commitments are its fears about the implications of North Korea's improving nuclear and ballistic missile capabilities, which some fear could allow the DPRK to attempt to use its nuclear capabilities to deter a U.S. intervention into a localized crisis with Japan.[53]

Some in Japan also believe that diminishing U.S. conventional military advantages in the face of PLA modernization could drive the United States to rely more on nuclear deterrence.[54] It is therefore understandable that some in Japan have been concerned by past U.S. statements intending to reduce the role of nuclear weapons in U.S. extended deterrence or declaring that the sole purpose of nuclear weapons is to deter and respond to nuclear attack. If U.S. conventional advantages are receding in Asia, and the United States is reducing the role of nuclear weapons in its approach to deterrence, some in Japan perceive a gap that could be exploited to make Japan vulnerable.[55]

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[51] This is in contrast to broad views across the United States, which see Japan's defensive capabilities and the U.S.-Japan alliance as discouraging China from using force to resolve disputes in the East Chian Sea, therefore contributing to crisis stability. See: James L. Schoff and Li Bin, "A Precarious Triangle: U.S.-China Strategic Stability and Japan," Carnegie Endowment for International Peace, November 7, 2017. https://carnegieendowment.org/2017/11/07/precarious-triangle-u.s.-china-strategic-stability-and-japan-pub-74628.

[52] See Sugio Takahashi, "Challenges to Extended Deterrence in the Japan-U.S. Alliance: From Gray Zone to Nuclear Deterrence," *American, Australian, and Japanese Perspectives on a Changing Security Environment*, Johns Hopkins SAIS, February 2016, p. 58-87, https://www.hsdl.org/?view&did=795797.

[53] See Brad Roberts, "Extended Deterrence and Strategic Stability in Northeast Asia," *NIDS Visiting Scholar Paper Series*, No. 1, August 9, 2013, http://www.nids.mod.go.jp/english/publication/visiting/pdf/01.pdf.

[54] Michito Tsuruoka, "The NATO vs. East Asian Models of Extended Nuclear Deterrence? Seeking a Synergy Beyond Dichotomy," National Institute for Defense Studies, Japan, June 30, 2016. http://www.theasanforum.org/the-nato-vs-east-asian-models-of-extended-nuclear-deterrence-seeking-a-synergy-beyond-dichotomy/.

[55] Masa Takubo, "The Role of Nuclear Weapons: Japan, the U.S., and 'Sole Purpose,'" Arms Control Association, accessed June 1, 2021. https://www.armscontrol.org/act/2009-11/role-nuclear-weapons-japan-us-"sole-purpose".

Yet at the same time, Japanese public opinion has been consistently opposed to the existence, let alone use, of nuclear weapons. A survey of Japanese public opinion conducted in August 2019 found support for the Treaty on the Prohibition of Nuclear Weapons at 75 percent. Tokyo's decision to not ratify the treaty was harshly criticized by several pro-disarmament groups and atomic bomb survivors.[56] This pointed to a fundamental dilemma in Japan's approach to nuclear weapons, which was described in 2009 by then-Foreign Minister Okada thusly: "Hitherto, the Japanese government has said to the U.S., 'We don't want you to declare no first use because it will weaken nuclear deterrence.' However, it cannot be said to be consistent to call for nuclear abolition, while requesting the first use of nuclear weapons for yourself."[57]

Ultimately, Japan's security depends upon American nuclear weapons. Yet as the only country to be struck by atomic weapons, the Japanese people are deeply uncomfortable with the prospect of building weapons that caused such profound suffering within the past century. While a debate about developing a Japanese nuclear weapon has become far less taboo in Japanese policy circles than it once was, the domestic politics surrounding the issue have not substantially changed.

Thus, my sense is that the possibility of Japan developing its own nuclear weapon is very remote. I expect a move in this direction by Tokyo would require both a dramatic collapse in confidence in the U.S. extended deterrence commitment, as well as the emergence of a dire security threat to Japan. Yet, this is not to say that Japanese concerns about U.S. extended deterrence should be ignored. Much to the contrary – concerns in Tokyo about American resolve in the face of building Chinese pressure reflect great concern about the sustainability and reliability of American power.

The Republic of Korea

Unlike other U.S. allies and partners in the Indo-Pacific, China does not loom as the most pressing nuclear challenge to the Republic of Korea (ROK). Instead, the Democratic People's Republic of Korea (DPRK) is by far Seoul's preeminent nuclear challenge – even though Pyongyang's nuclear capabilities are far inferior to the Chinese nuclear capability in every measurable way and geography makes both a persistent challenge for South Korean strategists.

It may surprise some observers, but South Korea's preferred position between China and the United States has traditionally been to hedge between the two and, when possible, accommodate both Washington's and Beijing's preferences.[58] Yet, this does not reflect a naiveté about China's interests or an affinity for Beijing. Quite the contrary, surveys of the South Korean people consistently report positive views of the United States and support for the U.S.-ROK Alliance. For example, a mid-2020 survey by the Asan Institute in Seoul found overwhelming support for the United States (73.2

[56] Thisanka Siripala, "Japan's Dilemma Over Nuclear Disarmament," *The Diplomat,* February 10, 2021. https://thediplomat.com/2021/02/japans-dilemma-over-nuclear-disarmament/.

[57] Katsuya Okada, Remarks at "Atarashii Jidai no Nichibei Kankei" [Japan-U.S. relationship in a new era], Kyoto, October 18, 2009. As cited and translated in Takubo, "The Role of Nuclear Weapons: Japan, the U.S., and 'Sole Purpose.'"

[58] Victor Cha, "Collateral Damage: What U.S.-China Competition Means for Korea," Center for Strategic and International Studies, October 10, 2019. https://www.csis.org/analysis/collateral-damage-what-us-china-competition-means-korea.

percent) over China (15.7 percent), while another survey found that 66 percent of Koreans perceive a threat from China.[59]

Seoul's caution regarding Beijing is driven by cold realpolitik calculations: China is the ROK's largest trading partner, meaning that South Korea's economic destiny is at least partly tied to the PRC. Moreover, the sheer scale of Chinese power as well as its geographic proximity to the Korean peninsula and the critical role it plays in any diplomacy with North Korean means that Seoul cannot afford to antagonize Beijing. Seoul's situation was perhaps best described to me by a South Korean scholar, who once explained to me, "we prefer to work with America, but we have to live with China."

Korean strategists have also monitored China's military modernization with growing concern. Yet, this concern has not been focused on China's nuclear capabilities per se, but rather it has been concerned with the broader modernization of the PLA writ large. If anything, South Korean strategists have been concerned by Beijing's decision to maintain a large contingent of ground forces in its Northern Theater Command headquartered in Shenyang (less than 250 miles away from China's border with North Korea), as well as high-profile exercises conducted by the PLA Navy off of the Korean Peninsula in late-2016 and mid-2017. They recognize that the PLA can therefore intervene quickly into the Korean peninsula with land, sea, and air forces – presenting a significant potential challenge with which the ROK military may need to contend.[60]

Thus, as tension between China and the United States has intensified, the ROK's position between the two has grown increasingly narrow and progressively uncomfortable. As the Korean scholar J. James Kim noted, one survey from 2020 found that nearly 35 percent of South Koreans see U.S.-China competition as a "threat to South Korea's national interest," and more than 60 percent prefer a more "balanced approach."[61]

South Korea's use of hedging to navigate the complexities of U.S.-China competition also extends to Seoul's approach to deterrence writ large.[62] Yet, it would be a mistake to interpret South Korea's hedging as an indication of plans to end its alliance with the United States. Rather, Seoul seeks to

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[59] J. James Kim, "The U.S.-China Competition in South Korean Public Eyes," Asan Institute, August 25, 2020, http://en.asaninst.org/contents/the-u-s-china-competition-in-south-korean-public-eyes/; Victor Cha. "Collateral Damage: What U.S.-China Competition Means for Korea." *CSIS*. Released on October 10, 2019.

[60] Chung Min Lee and Kathryn Botto, *Korea Net Assessment: Politicized Security and Unchanging Strategic Realities,* Carnegie Endowment For International Peace, 2020. https://carnegieendowment.org/files/Korea_Net_Assesment_2020.pdf, p. 59.

[61] Sea Young Kim and Sook Jong Lee. "South Korean Perception of the United States and China: United States, a More Favorable Partner than China." *Issue Briefing,* EAI, July 21, 2020. See also Cha, "Collateral Damage: What U.S.-China Competition Means for Korea,"; Ji Young Lee, "South Korea's Strategic Nondecision and Sino-U.S. Competition," in *Strategic Asia 2020,* NBR, January 21, 2020. https://www.nbr.org/publication/south-koreas-strategic-nondecision-and-sino-u-s-competition/; as cited in J. James Kim, "The U.S.-China Competition in South Korean Public Eyes," *Asan Institute*, August 25, 2020, http://en.asaninst.org/contents/the-u-s-china-competition-in-south-korean-public-eyes/.

[62] For an excellent analysis of these dynamics, see: Ian Bowers, Henrik Stalhane Hiim, "Conventional Counterforce Dilemmas: South Korea's Deterrence Strategy and Stability on the Korean Peninsula," *International Security,* 45:3 (2021), p. 7-39. https://direct.mit.edu/isec/article/45/3/7/95269/Conventional-Counterforce-Dilemmas-South-Korea-s.

bolster its independent deterrence capabilities as a hedge against potential abandonment by the United States.

South Korean concerns of U.S. abandonment have been exacerbated by North Korea's progress in fielding an ICBM that can credibly hold the American homeland at risk, raising the possibility that Pyongyang may attempt to decouple the alliance or act more provocatively in the belief that no one would dare instigate a conflict with a nuclear North Korea – what political scientists call the "stability-instability paradox."[63] Thus, the Trump administration's unilateral threats to attack North Korea with "fire and fury" in 2017, President Trump's statements calling for the reduction of the U.S. military presence in Korea, and his administration's demands for exorbitant cost-sharing payments further inflamed South Korean concerns about the reliability of the United States.[64]

To address these concerns, Seoul has sought to both enhance cooperation with the United States on issues of missile defense and deterrence, while at the same time gradually building an independent conventional counterforce and countervalue capability.[65] While this independent deterrent is primarily oriented toward North Korea, it is likely that Seoul's strategists also have China in mind as a potential adversary to be deterred. As the scholars Ian Bowers and Henrik Stålhane Hiim have noted, "Although Seoul could not hope to defeat China in a conventional conflict, the potential utility of its advanced conventional capabilities for high-impact precision strikes provides Seoul with a limited deterrence by punishment capability."[66]

Yet, despite these concerns, China's nuclear modernization initiative does not seem to have made a particular impact on how ROK strategists view China or the credibility of U.S. extended deterrence commitments. Even when discussing the possibility of Chinese and U.S. involvement in another conflict on the Korean peninsula, strategists have generally seen the possibility of a U.S.-China nuclear exchange to be quite distant. Indeed, I would note that the possibility was not raised during this Commission's April 2018 roundtable on China's role in North Korea contingencies.[67] Even the possibility that China may consider offering a nuclear extended deterrence commitment to North Korea as part of an exchange to denuclearize the DPRK – as implausible as it is – has generally been dismissed by scholars as unlikely to be of interest for either Beijing or Pyongyang.[68]

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[63] See: Ankit Panda and Vipin Narang, "Nuclear Stability, Conventional Instability: North Korea and the Lessons From Pakistan," *War on the Rocks,* November 20, 2017. https://warontherocks.com/2017/11/nuclear-stability-conventional-instability-north-korea-lessons-pakistan/.

[64] Clint Work, "Beyond North Korea: Fractures in the US–South Korea Alliance," *The Diplomat*, February 11, 2020, https://thediplomat.com/2020/02/beyond-north-korea-fractures-in-the-us-south-korea-alliance/.

[65] Bowers and Hiim, "Conventional Counterforce Dilemmas: South Korea's Deterrence Strategy and Stability on the Korean Peninsula," p. 19.

[66] Bowers and Hiim, "Conventional Counterforce Dilemmas: South Korea's Deterrence Strategy and Stability on the Korean Peninsula."; see also Brad Glosserman and S. Paul Choi, "Don't Lose Sight of Under-the-Hood Changes to South Korea's Defense Posture," *The Diplomat*, November 13, 2019. https://thediplomat.com/2019/11/dont-lose-sight-of-under-the-hood-changes-to-south-koreas-defense-posture/.

[67] U.S.-China Economic and Security Review Commission, "Roundtable on China's ole in North Korea's Contingencies," U.S-China Economic and Security Review Commission, April 12, 2018. https://www.uscc.gov/sites/default/files/transcripts/Hearing%20Transcript%20-%20April%2012,%202018.pdf.

[68] Brian J. Kim, "What If China Offered a Nuclear Shield to North Korea?" *The National Interest,* December 30, 2019. https://nationalinterest.org/blog/korea-watch/what-if-china-offered-nuclear-shield-north-korea-109461; Monet Stokes,

Thus, as with other allies and partners in the Indo-Pacific, specific efforts to respond to China's nuclear modernization are unlikely to have a significant impact on the ROK's perception of U.S. extended deterrence commitments. Instead, reassurance would be more effective if it were to reinforce Korean perceptions of American will and resolve.

Taiwan

For decades, U.S. deterrence against Chinese aggression in the Taiwan Strait has been supported by a carefully articulated ambiguity surrounding Taiwan's status, as well as the willingness of the United States to defend Taiwan from attack. Although the United States does not formally recognize Taiwan, the unofficial U.S.-Taiwan relationship – as defined by the three U.S.-China Joint Communiques and the Taiwan Relations Act – has allowed for the development of a robust relationship. While Taiwan is not an ally of the United States, and therefore does not enjoy the protection of explicit U.S. extended deterrence commitments, strategists in Taipei recognize that the United States plays a critical role in deterring Beijing from attempting to use force to unify the island into the People's Republic of China (PRC). Indeed, the *Taiwan Relations Act* declares that it is the policy of the United States "to maintain the capacity of the United States to resist any resort to force or other forms of coercion that would jeopardize the security, or the social or economic system, of the people on Taiwan."[69]

The U.S.-China nuclear relationship therefore has great salience for Taiwan's security interests. Yet, while strategists in Taiwan are keenly aware of China's rapidly improving military capabilities – conventional and nuclear – and are concerned about the shifting conventional balance of power between China and the United States, its options are far more limited than Japan or Australia. Geographically, economically, and politically, Taiwan is far more vulnerable to being isolated by the PRC than any other country. Moreover, the cross-Strait military balance is heavily weighted against Taiwan. According to the Department of Defense, Taiwan's ground force of 88,000 is far smaller than the 412,000 the PRC has stationed in its Eastern and Southern Theaters, let alone the 1,030,000 soldiers across the entire PLA. Taiwan's navy and air force are similarly dramatically outmatched, meaning that Taiwan's options to deter mainland China are quite limited.

Since Taiwan halted its indigenous nuclear program during the 1980s,[70] Taiwan's only credible option to deter aggression from mainland China has been to build as robust a relationship with the United States as possible. Although changes in the U.S.-China military balance have certainly been concerning for Taiwan, the lack of options for Taipei has meant that there is little credible debate in

"North Korea Doesn't Trust China to Protect It," *Foreign Policy,* August 25, 2020. https://foreignpolicy.com/2020/08/25/north-korea-china-nuclear-umbrella-denuclearization-kim-jong-un/; Fei Su, "China's Potential Role as Security Guarantor for North Korea," 38 North, October 24, 2018. https://www.38north.org/2018/10/fsu102418/.

[69] American Institute in Taiwan, "Taiwan Relations Act (Public Law 96-8, 22 U.S.C. 3301 et seq.)," accessed June 1, 2021. https://www.ait.org.tw/our-relationship/policy-history/key-u-s-foreign-policy-documents-region/taiwan-relations-act/.

[70] Kyle Mizokami, "China's Greatest Nightmare: Taiwan Armed with Nuclear Weapons," *The National Interest,* September 12, 2019. https://nationalinterest.org/blog/buzz/chinas-greatest-nightmare-taiwan-armed-nuclear-weapons-80041.

Taiwan about its relationship with – and dependence upon – the United States. Even though China's nuclear capability is set to expand and improve rapidly, reliance upon the United States to deter conflict with the mainland is unlikely to change.

Addressing Ally and Partner Concerns

Clearly, the credibility of U.S. extended deterrence commitments is under pressure in the Indo-Pacific. This is a challenge Washington should take seriously. Yet, while the challenges are significant, they are not insurmountable. However, to address and deal with a problem, we must first understand its cause.

While China's nuclear modernization is indeed concerning, it will not threaten U.S. extended deterrence capabilities for the foreseeable future. The nuclear modernization investments being made by the United States – including in the FY2022 budget that devotes over $10 billion to the B-21, Columbia-class SSBN, and the Ground Based Strategic Deterrent – will ensure the capability of the U.S. nuclear deterrent for decades to come.[71]

Yet, this is not the issue in the minds of U.S. allies and partners. It would be a mistake to view ally and partner uncertainties about the reliability of U.S. extended deterrent commitments as stemming from a shortfall in U.S. nuclear capabilities. Since allied and partner anxieties about American credibility are primarily political and stem from broader considerations of the regional balance of power and American resolve, improvements to U.S. nuclear and missile defense capabilities will not by themselves be effective in addressing their concerns. While some of the issues our allies and partners point to – such as the direction of our politics and the future of our economy – are beyond the scope of this hearing, I would like to address three initiatives that could positively impact allied and partner views of the U.S. extended deterrence commitment.

1: Maintain U.S. and Allied Conventional Military Advantages

Though a discussion on reestablishing American conventional advantages over China is far too broad and complex for the purposes of this hearing, I wanted to offer some thoughts on its relevance to this discussion.

According to then-Commander of Indo-Pacific Command Admiral Phil Davidson in March 2021, "The greatest danger we face in the Indo-Pacific region is the erosion of conventional deterrence vis-à-vis China. Without a valid and convincing conventional deterrent, China will be emboldened."[72] Reestablishing expectations that the United States will maintain its conventional military advantages in the defense of its allies and partners would have a dramatic effect in improving confidence in American nuclear capabilities. Indeed, maintaining the credibility of U.S. conventional deterrence would significantly reduce the risk of conflict in general, and nuclear use in particular.

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[71] Secretary of Defense Lloyd J. Austin, "The Department of Defense Releases the President's Fiscal Year 2022 Defense Budget," U.S. Department of Defense, May 28, 2021. https://www.defense.gov/Newsroom/Releases/Release/Article/2638711/the-department-of-defense-releases-the-presidents-fiscal-year-2022-defense-budg/.

[72] Lara Seligman and Connor O'Brien, "Austin wants to pivot to China. But can he pay for it?" *Politico*, 3/3/2021, https://www.politico.com/news/2021/03/03/lloyd-austin-china-pentagon-473405.

Though it may seem counterintuitive at first, the perceptions of U.S. allies and partners about American credibility and the potential for Chinese nuclear coercion are framed most prominently by their comprehensive understanding of the overall balance of military power between China and the United States. Fears of a Chinese *fait accompli* backed up by threats of nuclear use, and concerns that the United States may not be willing to use nuclear weapons to overcome a conventional disadvantage, are both driven primarily by expectations that U.S. conventional advantages in the Indo-Pacific will continue to deteriorate. Proposals to maintain a "direct defense" posture in the Western Pacific, which would involve shaping the joint force to be capable of fighting and winning a limited conventional war and "offset" Chinese advantages in proximity and mass, should be considered.[73]

Importantly, allied fears of a Chinese *fait accompli* have not been primarily discussed in the context of nuclear deterrence, but rather out of fears of Chinese gray zone pressure on disputed islands in the East and South China Seas – in other words, in the context of conventional deterrence.[74] In response to these gray zone challenges, the 2010 U.S.-Japan National Defense Program Guidelines introduced the concept of "dynamic deterrence." Intended to complement traditional deterrence against high-end threats by establishing continuous steady-state ISR in disputed areas, this approach sought to "sensitize a challenger (e.g., China) to the notion that they are always being watched, and there are no physical gaps or 'windows of opportunity'" for a *fait accompli.*[75]

The more effectively the United States and its allies and partners can prevail at the conventional level and prevent a Chinese *fait accompli*, any Chinese attempt at nuclear coercion will be that much less credible. Considering their reasonable concerns, it is clear that the United States and its allies and partners should inject considerations of nuclear deterrence into these concepts.

2: Increase Risk Tolerance

For over a decade, East Asia has witnessed repeated instances of Chinese coercion and "gray zone" tactics that seek to gradually advance Chinese interests using tactics that are tailored to not provoke a military retaliation. These activities also serve to determine American and allied and partner

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[73] Colby, "Testimony Before the U.S.-China Economic and Security Review Commission: 'China's Offensive Missile Forces: Implications for the United States.'"; Evan Braden Montgomery, "Contested Primacy in the Western Pacific: China's Rise and the Future of U.S. Power Projection," *International Security*, 38:4 (Spring 2014): p. 115-149; David Ochmanek, *Sustaining U.S. Leadership in the Asia-Pacific Region: Why a Strategy of Direct Defense Against Antiaccess and Area Denial Threats is Desirable and Feasible*, (Santa Monica: RAND Corporation, 2015), http://www.rand.org/content/dam/rand/pubs/perspectives/PE100/PE142/RAND_PE142.pdf; and James B. Thomas and Evan B. Montgomery, "Developing a Strategy for a Long-Term Sino-American Competition," in *Competitive Strategies for the 21st Century: Theory, History, and Practice*, ed. Thomas Mahnken, (Palo Alto: Stanford University Press, 2012), p. 257-274.

[74] Sugio Takahashi, "Rebuilding Deterrence: Post-2015 Defense Guidelines Challenges Facing the U.S.-Japan Alliance," Project 2049 Institute, May 2015. https://project2049.net/wp-content/uploads/2018/06/Takahashi_2015_Defense_Guidelines_Challenges_US_Japan_Alliance.pdf; https://www.tandfonline.com/doi/abs/10.1080/09512748.2018.1513551.

[75] Takahashi, "Rebuilding Deterrence: Post-2015 Defense Guidelines Challenges Facing the U.S.-Japan Alliance," p. 4.

resolve, described as "a combination of assertive diplomacy and small but bold military actions to test the outer reaches of American power and in particular the resilience of frontier allies."[76] In recent years, Beijing has used this approach to increase pressure on Japan in the East China Sea, advance Beijing's territorial claims in the South China Sea against the Philippines, Vietnam, Malaysia, and Indonesia, and intensify pressure on Taiwan. Yet Beijing's actions have also been adaptive to specific conditions, flexible to broader strategic trends, and opportunistic to perceptions of weakness or distraction in its adversaries.[77] While accidents certainly happen from time to time, the number and regularity of these incidents make it clear that these are not the reckless gambles they may initially appear to be. Rather, they are premeditated probes seeking to identify weakness and opportunities. In multiple instances, Beijing has continued to push when it perceives that its actions are unlikely to cause a significant response. But when Chinese assertiveness has been met with counterpressure,[78] Beijing's response has not been predictably escalatory.[79]

As the established power in the Indo-Pacific that is usually on the strategic defensive (such as defending alliance commitments, preserving a rules-based order, or maintaining regional stability), the United States often finds itself in a position seeking to avoid incidents created by Chinese provocations. Yet, while prudent in the short-term, it has the potential to be interpreted by allies and partners that are already worried about American resolve that the United States can be intimidated. Indeed, as a scholar from the Philippines once expressed to me when discussing China's aggressiveness near the Scarborough Shoal: "How can we trust you to defend us when you're intimidated by a few fishing boats?"

The United States has an opportunity to be tactically active in response to pressure from China, which would send a signal of resolve to U.S. allies, partners, and adversaries alike. Establishing a steady pace of presence operations by the U.S. Navy – including regular freedom of navigation operations in the South China Sea and transits of the Taiwan Strait – have sent a message that the United States will stick to its principles and not be intimidated.

But the United States can do more to rapidly respond to Chinese provocations against an ally or partner with a commensurate action that highlights U.S. commitments while signaling a willingness to upset Beijing. For example, operating within the guidelines of their own policies, the United States and its allies and partners should pre-plan peaceful military operations – such as multilateral exercises or combined maritime and air patrols – that can be executed quickly in response to a Chinese provocation. Similarly, American diplomats and economic officials should work with their ally and partner counterparts to prepare agreements and initiatives that can be announced in response to an effort by Beijing to coerce or pressure an ally or partner. This approach could also apply to my second recommendation, taking deliberate steps toward establishing a more robust framework for allied cooperation on deterrence.

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[76] A. Wess Mitchell and Jakub Grygiel, "Predators On The Frontier," *The American Interest,* 11:5 (February 12, 2016). https://www.the-american-interest.com/2016/02/12/predators-on-the-frontier/.

[77] Abraham M. Denmark, Charles Edel, and Siddharth Mohandas, "Same As It Ever Was: China's Pandemic Opportunism On Its Periphery," *War on the Rocks,* April 16, 2020. https://warontherocks.com/2020/04/same-as-it-ever-was-chinas-pandemic-opportunism-on-its-periphery/.

[78] Charles Edel, "Limiting Chinese Aggression: A Strategy of Counter-Pressure," *The American Interest,* 13:5, February 9, 2018. https://www.the-american-interest.com/2018/02/09/limiting-chinese-aggression-strategy-counter-pressure/.

[79] https://warontherocks.com/2020/04/same-as-it-ever-was-chinas-pandemic-opportunism-on-its-periphery/.

3) Enhance Allied Deterrence Cooperation

As the conventional military balance evolves, China's nuclear modernization continues, and questions about America's political and economic future persist, Washington should recognize that its old approach to deterrence and reassurance is insufficient. Allies are investing in more independent strike capabilities (largely in response to the trends described above), yet continue to view the United States as their only option to credibly deter aggression and maintain a rules-based international order.

The United States should accelerate efforts empower its allies and partners to contribute more to regional conventional deterrence by establishing regular multilateral engagements examining conventional deterrence, and exploring possible revisions to joint regional force posture and distributed concepts of operations to account for emerging threats and opportunities.[80] A key area that will require deep consultations between the United States and its Indo-Pacific allies and partners will be the introduction of conventional American ground-based intermediate-range missiles – potentially including both cruise and ballistic missiles.[81]

While the United States tends to group these two types of missiles together because they were both previously prohibited by the INF Treaty, I expect allies and partners will react more positively to proposals to deploy ground-based intermediate-range cruise missiles than to ballistic missiles, primarily because of their escalatory implications. Specifically, allies and partners would be more likely to consider mobile anti-ship cruise missiles largely because their narrow target set have less potential to be seen as undermining China's nuclear deterrent, whereas the deployment of ballistic missiles could be seen as escalatory.[82] While such discussions would be difficult, I expect the development and employment of these capabilities by the U.S. military will demonstrate their tremendous potential value, and allies and partners will gradually warm to the prospect of accepting them for forward deployment.

Concurrently, the United States should consider a significant upgrade to engaging and reassuring its Indo-Pacific allies on regional nuclear deterrence. While the United States has established separate Extended Deterrence Dialogues with Japan and the ROK, Washington should broaden these dialogues both geographically and substantively, turning them into a high-level mechanism for the United States and its allies to discuss deterrence and identify ways ahead. While some have proposed

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[80] For more on a U.S. strategy to empower Indo-Pacific allies and partners, see Abraham M. Denmark, *U.S. Strategy in the Asian Century: Empowering Allies and Partners* (New York, NY: Columbia University Press), 2020.

[81] Hope Hodge Seck, "Marine Corps Invests in Drone Truck-Based Ship-Killer Missile as it Ditches Some MRAPs," *Military.com,* May 28, 2021, https://www.military.com/daily-news/2021/05/28/marine-corps-invests-drone-truck-based-ship-killer-missile-it-ditches-some-mraps.html; Joseph Trevithick, "The Marines' New Unmanned Ship Killing Missile Launcher Truck Breaks Cover," *The Drive,* April 29, 2021, https://www.thedrive.com/the-war-zone/40390/the-marines-new-unmanned-ship-killing-missile-launcher-truck-breaks-cover; Kingston Reif and Shannon Bugos, "U.S. Tests Second Medium-Range Missile," *Arms Control Today,* January/February 2020, https://www.armscontrol.org/act/2020-01/news/us-tests-second-medium-range-missile.

[82] Rupert Schulenburg, "Deploying U.S. Intermediate-Range Missiles in the Asia-Pacific: Will Allies Cooperate?" *Foreign Affairs Review,* March 19, 2021, https://www.foreignaffairsreview.com/home/deploying-us-intermediate-range-missiles-in-the-asia-pacific-will-allies-cooperate.

copying NATO's Nuclear Planning Group (NPG),[83] the greatly different histories and political contexts of Europe and Asia mean that such an arrangement would be inappropriate for the Indo-Pacific, and unlikely to succeed. Rather than a large and active formal mechanism like the NPG, the United States should work with Australia, Japan, and the ROK to establish a Secretary-level Indo-Pacific Deterrence Dialogue that augments existing bilateral deterrence dialogues and provides a venue for the allies to openly discuss their concerns and consult on initiatives to buttress conventional and nuclear deterrence without inflaming regional allergies surrounding collective self-defense and regional institutionalization.

Conclusion

The past twenty years have witnessed massive changes in the Indo-Pacific's balance of power and regional views of the United States. China's economy had grown more than five-fold and its estimated defense spending had grown nearly six-fold, while U.S. growth in both categories had been far slower.[84] Moreover, over the same period, allies and partners have seen a succession of events that have negatively impacted perceptions of American power, capability, reliability, and competence. These factors have raised questions in the minds of allies, partners, and adversaries alike about America's commitment and ability to lead the international community.

Despite all these challenges, however, U.S. allies and partners across the Indo-Pacific have remained committed to sustaining a robust relationship with the United States. This speaks to their fundamental (and, I believe, justified) confidence in the United States, and also reflects the deep anxieties that have been fueled by China's rising power and aggression. Yet they have also concluded that they must seriously consider the possibility that the United States may not be willing to come to their defense, and have begun to hedge accordingly.

This is the context to best understand how U.S. allies and partners view China's nuclear modernization – an aspect of a broader trend in need of arresting. While China's nuclear modernization is certainly concerning, its practical effects on the ability of the United States to deter China are rather limited. Yet a China with a larger and more sophisticated nuclear force contributes to broader concerns among our allies and partners about the implications of a shifting regional balance of power.

For the United States to revitalize allied confidence in its extended deterrence commitments in the Indo-Pacific, Washington should therefore explore opportunities to rebuild American power relative to that of China, reinforce its conventional military advantages, and revitalize its alliances and partnerships to be better suited for the challenges we will face in a more competitive and geopolitically vital Indo-Pacific.

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[83] For an excellent analysis of the NATO and East Asian models of external deterrence, see http://www.theasanforum.org/the-nato-vs-east-asian-models-of-extended-nuclear-deterrence-seeking-a-synergy-beyond-dichotomy/#3.

[84] Economic data reflects GDP measured by PPP in current international $. https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.KD?end=2019&locations=CN&start=2000; https://www.sipri.org/databases/milex.

OPENING STATEMENT OF VALERIE LINCY, EXECUTIVE DIRECTOR, WISCONSIN PROJECT ON NUCLEAR ARMS CONTROL

COMMISSIONER WONG: Mr. Denmark, thank you for your testimony and your time being here.

Ms. Lincy?

MS. LINCY: Thank you. I appreciate all the preparatory work of the Commission staff in bringing this hearing together, and I'm pleased to have the opportunity to present the Wisconsin Project's work through my testimony.

The Commission has asked me to comment on China's role in the proliferation of missile and nuclear technologies, both as a supplier and an end user, the Chinese entities that are involved in such activities, and the extent to which these activities affect U.S. national security interests and the global non-proliferation regime.

I would characterize the proliferation threat from China as threefold.

First, entities in China are a source of nuclear and missile-related supply to countries of proliferation concern.

Second, China undermines U.S.-led efforts to use sanctions and export controls to reduce the proliferation risk from those countries, notably, Iran and North Korea.

And third, China is illicitly acquiring or diverting sensitive U.S. technology.

So, I'll review each of these threats in turn, and then offer several policy recommendations.

First, the supplier problem. Here, it is useful to consider how the nature of China as a source of WMD supply has shifted over time to include both state-owned enterprises and, increasingly, the private sector. In the 1980s and '90s, the Chinese government and prominent SOEs were at the forefront of strategically significant transfers which served as the building blocks for nuclear weapon programs in a number of countries. We are still dealing with the consequences of those sales.

Beginning in the mid-1990s, China began seeking to burnish its international image with regard to non-proliferation and made a series of commitments in this regard. At that point, confirmed nuclear-capable ballistic missile transfers from SOEs largely ended and SOEs no longer transfer fissile material to countries without the requirement of IAEA safeguards on those transfers.

However, SOEs are still leading exporters of technology for nuclear and missile programs, notably, to Pakistan, a country without full-scope safeguards, and also, of MTCR Category I and near-Category I drones. Both of these types of transfers have negative consequences for the non-proliferation regime.

Since the 2000s, the proliferation supply problem from China has been increasingly from private China-based companies and individuals. And this trade involves both controlled goods as well as items below control thresholds that still have applications in nuclear and missile programs.

Iran has benefitted from the support of private entities in China maybe more than any country, with Li Fang Wei serving as the best example of this trend. Li supplied ballistic missile technology to Iran over the course of years and has been sanctioned by the United States countless times.

Syria and Pakistan have also benefitted from the support of private entities in China. Syria's main supplier, North Korea, uses front companies in China to facilitate the delivery of

chemical weapon and ballistic missile-related items. Numerous Chinese companies have been added to the Commerce Department's Entity List for supplying Pakistan's missile and unsafeguarded nuclear program.

And generally speaking, the motivation of these actors is probably financial, which is a motivation you can do something about, if you want to, by making it more costly, ideally, too costly, for firms to pursue such trade, through fines and prosecutions. But the Chinese government has adopted an, at best, passive response to this trade, neither actively preventing nor punishing private entities for such exports or re-exports.

The nature of China's support for North Korea is the second aspect of the Chinese proliferation threat that I'll highlight. China plays a critical role in facilitating Pyongyang's access to foreign currency, in violation of U.N. sanctions. Cutting off this access at this point is the key piece in countering North Korean proliferation by preventing the country from financing its WMD programs, since technology controls at this point are less relevant.

China hosts representatives and front companies from North Korean financial networks. China-based trading companies help North Korea trade in prohibited commodities, and China allows hundreds of North Korean workers to remain in China and remit income to North Korea. And this kind of facilitation has provided the Kim regime with billions of dollars in funds.

I'll touch briefly on the third and final proliferation threat from China, which is the illicit acquisition or diversion of sensitive U.S. technology by SOEs. This is a key part of the proliferation threat, and it shouldn't just be considered a question of industrial espionage or an effort by China to gain economic advantage. China uses direct collaboration and technology transfer through joint ventures, has since the 1990s. China SOEs are also increasingly using subsidiaries and front companies to circumvent U.S. trade controls, which also gives SOEs a bit more distance from the illicit acquisition, and also, theft and hacking. And I'll just note that, in addition to SOEs, Chinese universities affiliated with military research programs have also used these methods.

In light of the threats I've described, I propose several recommendations for the Commission's consideration, which I'll go through briefly.

First, continue to sanction China-based suppliers. While most private entities operating in China may not have a footprint in the United States, designating them and publicizing their support still has a value for U.S. non-proliferation objectives. It raises awareness among U.S. suppliers about the ongoing risks of China-based illicit procurement, and it may harm the operation of sanctioned parties in third countries because of U.S. secondary sanctions.

Second, take public action on U.N. Panel of Expert Findings on North Korea. This is a way to get around Chinese obstructionism at the United Nations. So, this might mean bringing forward and designating entities and vessels that are recommended for sanction by the panel or publishing additional advisories highlighting typologies of North Korean sanction evasion that are described in panel reports.

Third, expand the Chinese Military-Industrial Complex Companies List. Any entity that's, quote, "owned or controlled by, directly or indirectly, a company either on the list or operating in the Chinese defense or surveillance industry" can be added to the list, but they have to be named and fully identified. And doing so would help prevent listed companies from using unlisted subsidiaries to evade U.S. investment restrictions, which is a common play in Chinese sanctions evasion, and has been for a long time.

Fourth, manage the proliferation risk posed by cooperation with Chinese universities. A number of universities could be added to the Commerce Department's Entity List or the Military

End User List. At present, there are only 10. Congress could also consider directing the administration to create a Chinese Military University List modeled on the Chinese Military Company List.

And then the final recommendation is support the development of a CFIUS-like review process in partner countries. China is expanding investment in many parts of the world, and while countries may welcome this investment, many don't have a process for evaluating the national security risks that it poses. And the U.S. could certainly help countries establish such a process.

Thank you for your attention. I look forward to discussing some of these issues during the Q&A.

PREPARED STATEMENT OF VALERIE LINCY, EXECUTIVE DIRECTOR, WISCONSIN PROJECT ON NUCLEAR ARMS CONTROL

Hearing on "China's Nuclear Forces"

Testimony before the U.S.-China Economic and Security Review Commission

June 10, 2021

By Valerie Lincy
Executive Director, Wisconsin Project on Nuclear Arms Control

I am pleased to appear today before the U.S.-China Economic and Security Review Commission. The Commission has asked me to comment on China's role in the proliferation of missile and nuclear technologies, both as a supplier and an end user, the Chinese entities that are involved in such activities, and the extent to which these activities have affected U.S. national security interests and the global nonproliferation regime.

The Wisconsin Project has long focused on the type of entity contributing to proliferation, and identifying and profiling such entities using open source data and research methods. The organization also conducts capacity building outreach on export controls, which has provided insight into the challenges China poses to the global nonproliferation regime. My testimony is therefore focused on these aspects of the proliferation threat from China.

I would characterize the present proliferation threat from China as threefold: first, entities in China continue to be a source of nuclear and missile related items to countries of proliferation concern; second, China undermines U.S.-led international efforts to use sanctions and export controls to reduce the proliferation risk from those countries, notably Iran and North Korea; and third, China is illicitly acquiring or diverting sensitive U.S. technology that increases the proliferation risk from China.

To understand the present day threat, it is useful to examine the entities involved in key imports and exports over time. This has value both because such transfers are the building blocks of, and continue to fuel, contemporary programs, and because it illustrates the changing nature of the proliferation threat from China.

Introduction

The proliferation threat posed by China has been a source of concern for the United States for several decades. However, the nature of this threat has changed during that time, in terms of Chinese exports (and other forms of support) to countries of proliferation concern, what China

seeks to acquire abroad for end use in China, and the involvement of the Chinese government and state-owned enterprises (SOEs) in this trade.[1]

The 1980s and early 1990s were years that saw nuclear and missile exports from China that were consequential for proliferation to Iran, Pakistan, and Saudi Arabia, among other countries. This trade was led by newly established, state-directed firms. Illicit imports by China from the United States during this period likewise directly involved SOEs.

By the mid-1990s, China began seeking to burnish its international image with regard to nonproliferation, which led it to adopt new laws regulating trade and to support multilateral nonproliferation initiatives and regimes. This coincided with economic development in China driven by the expansion of private enterprise. From this period, China has remained a regular source of sensitive items for countries of proliferation concern, but the trade is driven by nominally private companies and individuals and involves dual-use material and technology. The Chinese government has adopted an (at best) passive response to this burgeoning trade, neither actively preventing nor punishing private entities for such exports or re-exports.

Similarly, the Chinese government has balked at preventing its territory from hosting proliferation facilitators who provide financial and other support for North Korea, in violation of U.N. sanctions. Such facilitation has provided the Kim regime with billions of dollars in funds that could be used to support North Korea's nuclear and missile programs.

SOEs remain leading exporters of technology for nuclear energy programs and of unmanned aerial vehicles, which undermine the global nonproliferation regime. However these companies no longer transfer fissile material or fissile material production equipment to countries without the requirement of International Atomic Energy Agency (IAEA) safeguards, as was the case in earlier decades. SOEs also are responsible for misusing imports of advanced U.S. nuclear technology in the context of cooperative agreements with U.S. firms. This has led the U.S. Department of Energy to conclude that such imports pose a risk of proliferation or military diversion in China.[2] More recent trends reflect an effort by SOEs to use evasive techniques and exploit state-led hacking to obtain U.S.-controlled technology.

More broadly, the role of SOEs in carrying out formal Chinese government policies, such as Military-Civil Fusion (MCF), Made in China 2025, and the Strategic Emerging Industries Plan, should also be seen as a proliferation threat. Such policies seek to exploit the tools of modern commerce and the overlap between the commercial and military demand for dual-use

[1] An earlier report by the Wisconsin Project explores this shift. See Matthew Godsey and Valerie Lincy, "Gradual Signs of Change: Proliferation to and from China over Four Decades," Strategic Trade Review, Volume 5, Issue 8, Winter/Spring 2019, pp. 3-21, available at https://strategictraderesearch.org/wp-content/uploads/2019/02/Strategic-Trade-Review-WinterSpring-2019.pdf.

[2] "DOE Announces Measures to Prevent China's Illegal Diversion of U.S. Civil Nuclear Technology for Military or Other Unauthorized Purposes," Press Release, U.S. Department of Energy, October 11, 2018, available at https://www.energy.gov/articles/doe-announces-measures-prevent-china-s-illegal-diversion-us-civil-nuclear-technology.

technologies as a means of enhancing China's defense industrial base. Recent action by the U.S. government has rightly taken aim at this practice by targeting SOEs with financial, trade, and other restrictions.

Finally, China's expanding economic influence in many parts of the world makes it more difficult for the United States to convince partner countries to support U.S. counter and nonproliferation policies and undermines U.S. export control and nonproliferation capacity building in these countries.

Past nuclear and missile transfers by SOEs fueled proliferation that continues to present a challenge today.

The Chinese government and prominent Chinese SOEs were at the forefront of strategically significant transfers in the 1980s and early 1990s. These transfers have served as the building blocks for nuclear weapon and weapon delivery programs in countries not party to the nuclear Non-Proliferation Treaty (NPT) that have developed nuclear weapons, in countries that have violated their NPT commitments, as well as in countries that have expressed a willingness to abrogate NPT commitments.

Major, confirmed nuclear-capable missile transfers ended following a series of commitments by the Chinese government beginning in the mid-1990s not to help states develop ballistic missiles capable of delivering nuclear weapons, using the Missile Technology Control Regime (MTCR) parameters to define such systems. Similarly, Chinese SOEs have increasingly observed nuclear nonproliferation norms in their nuclear export policies and practices. More recent transfers, while bounded to some extent by these norms, nevertheless have negative consequences for the nonproliferation regime.

I will examine several countries that have greatly benefited from Chinese support, describing key transfers over time and the Chinese entities involved in those transfers.

Pakistan

The Chinese government has strong historic links to Pakistan's nuclear weapon and missile programs. China provided Pakistan with the material and expertise that served as the foundation for its nuclear weapon program from its inception, from sharing the complete design of a tested nuclear weapon in the early 1980s, to the supply of weapon-grade uranium to fuel the design, to support in helping Pakistan produce its own weapon-grade uranium using gas centrifuges.[3]

[3] For a description of key transfers from China to Pakistan (and other countries) in the 1980s, see: Gary Milhollin and Gerard White, "Bombs from Beijing: A Report on China's Nuclear and Missile Exports," Wisconsin Project on Nuclear Arms Control, May 1, 1991, available at https://www.wisconsinproject.org/bombs-from-beijing-a-report-on-chinas-nuclear-and-missile-exports/.

China also provided Pakistan with a means of nuclear weapon delivery, with the export of the solid-fueled, short-range DF-11 (M-11) ballistic missile in the early 1990s.[4] This sale equipped Pakistan with a reliable, nuclear capable delivery system as it was in the midst of developing a nuclear weapon, which it would first test in 1998. This transfer was made by a now-notorious SOE, China Precision Machinery Import-Export Corporation (CPMIEC), which markets and sells missiles abroad on behalf of other state-owned firms.[5]

Between 1994 and 1995, another state-owned enterprise, China Nuclear Energy Industry Corporation (CNEIC), shipped 5,000 ring magnets to Dr. A.Q. Khan Research Laboratories, a facility in Pakistan not subject to international nuclear safeguards.[6] Ring magnets are key components that stabilize centrifuges used in uranium enrichment. Again, the timing of the transfer was critical; Pakistan was actively developing nuclear weapons. The transfer from a subsidiary of China National Nuclear Corporation (CNNC), which is China's largest nuclear energy SOE,[7] to one of the primary research organizations working on Pakistan's nuclear weapon program left no doubt that the export was a knowing contribution to Islamabad's accelerating nuclear effort.

While China may have since ceased direct transfers in support of Pakistan's nuclear weapons program, the nuclear partnership between the two countries remains extensive and problematic. China is Pakistan's primary nuclear partner, supplying a string of power reactors despite a commitment to avoid such sales to countries that do not have a comprehensive safeguards agreement with the IAEA, which Pakistan does not.[8] When China joined the Nuclear Suppliers Group (NSG) in 2004, it indicated that it would continue to provide fuel and other services for the two reactors it had built at the Chashma facility (CHASNUPP-1 and CHASNUPP-2). Then in 2010, China announced that it would build two more reactors at Chashma (CHASNUPP-3 and CHASNUPP-4), arguing that these new units were grandfathered by a previous bilateral agreement with Islamabad.[9] In 2013, China and Pakistan signed an agreement for the construction of two additional reactors in Karachi (KANUPP-2 and KANUPP-3). Most

[4] "China and Weapons of Mass Destruction: Implications for the United States," Conference Report, National Intelligence Council, November 5, 1999, available at https://www.dni.gov/files/documents/China_WMD_2000.pdf.
[5] Evan S. Medeiros and Bates Gill, "Chinese Arms Exports: Policy, Players, and Process," Strategic Studies Institute, August 2000, pp. 45-47, available at https://press.armywarcollege.edu/monographs/132.
[6] Shirley A. Kan, "China and Proliferation of Weapons of Mass Destruction and Missiles: Policy Issues," Congressional Research Service, February 26, 2003, available at https://fas.org/asmp/resources/govern/crs-rl31555.pdf; "China and Weapons of Mass Destruction: Implications for the United States," Conference Report, National Intelligence Council, November 5, 1999, available at https://www.dni.gov/files/documents/China_WMD_2000.pdf..
[7] Pakistan Country Profile (Updated 2020), International Atomic Energy Agency World Wide Web site, available at https://cnpp.iaea.org/countryprofiles/Pakistan/Pakistan.htm.
[8] Guidelines for Nuclear Transfers, Part 1, Nuclear Suppliers Group, October 18, 2019, available at https://www.iaea.org/sites/default/files/publications/documents/infcircs/1978/infcirc254r14p1.pdf. Pakistan has implemented site-specific IAEA safeguard for its civilian nuclear facilities. But it does not allow access to its military nuclear facilities.
[9] "Grid connection for Pakistani Hualong One unit," Press Release, China National Nuclear Corporation, March 22, 2021, available at https://en.cnnc.com.cn/2021-03/22/c_605154.htm. The first reactor in Kararchi (KANUPP-1), is a PHWR built by Canada that became operational in the 1970s.

recently, in 2017, China signed an agreement with Pakistan to build a fifth reactor at Chashma.[10]

SOEs play a vital role in these projects. All four operational reactors at Chashma were constructed by CNNC subsidiary China Zhongyuan Engineering Corporation (CZEC).[11] CZEC also built KANUPP-2, is currently building KANUPP-3,[12] and will build the fifth reactor at Chashma.[13] Another CNNC subsidiary, CNEIC, supplied fuel assemblies and related core components to KANUPP-2 and KANUPP-3 in 2020, according to trade data reviewed by the Wisconsin Project. CNNC's main Pakistani counterpart in these projects is the Pakistan Atomic Energy Commission (PAEC). Since 1998, PAEC has been on the U.S. Department of Commerce's Entity List of end users subject to heightened export license requirements due to involvement in proliferation activities,[14] in response to Pakistan's nuclear weapon tests that year.

While the reactor projects described above are subject to site-specific IAEA safeguards, China's nuclear assistance to Pakistan nevertheless presents several proliferation challenges. First, it undermines China's NSG commitment. Second, it allows Pakistan to devote more of its unsafeguarded nuclear infrastructure to fissile material production for nuclear weapons. Islamabad produces enough fissile material for approximately 14 to 27 nuclear warheads per year, according to estimates from non-governmental experts.[15] Third, it provides Pakistan access to advanced nuclear technologies that would not otherwise be available to it, which could ultimately benefit the unsafeguarded program.

Major missile-related transfers from SOEs to Pakistan declined after China agreed to adhere to (some) MTCR export standards. But such transfers have not ceased. In 2014, for example, Wuhan Sanjiang Import and Export Co. Ltd. shipped defense-related items to Pakistan's National Development Complex (NDC), which develops the Shaheen series of solid-fueled

[10] "Third HPR1000 unit to build overseas," Press Release, China National Nuclear Corporation, November 22, 2017, available at https://en.cnnc.com.cn/2017-11/22/c_112681.htm.
[11] "CZEC at a Glance," China Zhongyuan Engineering Corporation World Wide Web site, available at https://web.archive.org/web/20170122121640/http://www.czec.com.cn/zgzydwgcyxgsywbm/au/caag/index.htm; "Nuclear Power Reactors in the World," International Atomic Energy Agency, 2012, pp. 29, 71, available at http://www-pub.iaea.org/MTCD/publications/PDF/RDS2-32_web.pdf.
[12] Pakistan Country Profile (Updated 2020), International Atomic Energy Agency World Wide Web site, available at https://cnpp.iaea.org/countryprofiles/Pakistan/Pakistan.htm; "Nuclear Power: A Viable Option For Electricity Generation," Pakistan Atomic Energy Commission World Wide Web site, available at http://www.paec.gov.pk/NuclearPower/.
[13] "Third HPR1000 unit to build overseas," Press Release, China National Nuclear Corporation, November 22, 2017, available at https://en.cnnc.com.cn/2017-11/22/c_112681.htm.
[14] "India and Pakistan Sanctions and Other Measures," U.S. Department of Commerce, Bureau of Export Administration, Federal Register, Vol. 63, No. 223, November 19, 1998, pp. 64322, 64325, 64341, available at https://www.govinfo.gov/content/pkg/FR-1998-11-19/pdf/98-30877.pdf.
[15] Hans M. Kristensen, Robert S. Norris, and Julia Diamond, "Pakistani Nuclear Forces, 2018," Bulletin of the Atomic Scientists, Vol. 74, No. 5, 2018, p. 352, available at https://doi.org/10.1080/00963402.2018.1507796.

ballistic missiles.[16] Wuhan Sanjiang is subordinate to China Aerospace Science and Industry Corporation (CASIC).[17] In 2017, Wuhan Sanjiang shipped components with applications in missile transporters and launchers to an entity connected to Pakistan's nuclear and missile work.[18]

Pakistan is also a beneficiary of China's expansive armed drone exports, including MTCR category I or near-category 1 systems, as well as the ability to produce them. These systems are produced by SOEs such as China Aerospace Science and Technology Corporation (CASC) and highlight the problematic nature of China's voluntary adherence to the MTCR.[19]

Saudi Arabia

As Iran expands its nuclear program, there is ongoing concern that Saudi Arabia may seek to hedge against a future Iranian nuclear weapon by building its own expansive nuclear energy program. For instance, Saudi Arabia plans to build nuclear power reactors and has so far been unwilling to accept restrictions on uranium enrichment and reprocessing in the context of a nuclear technology cooperation agreement with the United States. Early transfers from SOEs in China provided Saudi Arabia with a means of nuclear weapon delivery and more recent support could improve delivery capability and help the Kingdom develop an indigenous uranium enrichment program.

In a well-document case from 1988, China supplied 36 DF-3 (CSS-2) liquid-fueled, intermediate-range ballistic missiles to Saudi Arabia.[20] The sale was negotiated by Poly Technologies, a firm formed in 1984 through the joint investment of China International Trust and Investment Corporation (CITIC) and the General Armament Department of the People's Liberation Army

[16] Trade data reviewed by the Wisconsin Project; Haris N Khan, "Pakistan's Nuclear Program: Setting the Record Straight," Defense Journal, August 2010, p. 36, available via www.scribd.com; Feroz Hassan Khan, *Eating Grass: the Making of the Pakistani Bomb*, (Stanford: Stanford University Press: 2012), pp. 240, 242.
[17] Wuhan Sanjiang Export and Import Co., Ltd., National Enterprise Credit Information Publicity System, available at http://www.gsxt.gov.cn/; "Brief Introduction of Space Sanjiang," China Space Sanjiang Group Co., Ltd. World Wide Web site, available at http://www.yzjs.casic.cn/n13740039/n13740062/c13740102/content.html (in Chinese).
[18] Trade data reviewed by the Wisconsin Project; Wu Xuelei, "Development History, Status and Tendency of Foreign Military Truck (Part IV)," June 2001, China Academy of Launch Vehicle Technology World Wide Web site, available at https://web.archive.org/web/20060831204645/http://www.calt.com/information/magazine/200106/016WXL.htm (in Chinese).
[19] Franz-Stefan Gafney, "China, Pakistan to Co-Produce 48 Strike-Capable Wing Loong II Drones," the Diplomat, October 8, 2018, available at https://thediplomat.com/2018/10/china-pakistan-to-co-produce-48-strike-capable-wing-loong-ii-drones/; Gabriel Dominguez, "Pakistan receives five CH-4 UAVs from China," Jane's Defense Weekly, January 27, 2021, available at https://www.janes.com/defence-news/news-detail/pakistan-receives-five-ch-4-uavs-from-china; George Nacouzi et al., "Assessment of the Proliferation of Certain Remotely Piloted Aircraft Systems," RAND Corporation, 2018, p. 15, available at https://www.rand.org/pubs/research_reports/RR2369.html.
[20] Ethan Meick, "China's Reported Ballistic Missile Sale to Saudi Arabia: Background and Potential Implications," U.S.-China Economic and Security Review Commission, June 16, 2014, available at https://www.uscc.gov/sites/default/files/Research/Staff%20Report_China's%20Reported%20Ballistic%20Missile%20Sale%20to%20Saudi%20Arabia_0.pdf.

(PLA).[21] This was the first time that any country had sold intermediate-range missiles to a country in the Middle East and the first time that China had sold a strategic missile. The DF-3 was used in the Chinese arsenal to deliver nuclear warheads over 1,500 miles. Because of its poor accuracy, the DF-3 was considered suitable mainly for nuclear missions, making it a worrisome choice for Saudi Arabia, a country without nuclear weapons; however, the variant sold to Saudi Arabia was reportedly modified to allow it to carry a conventional payload. The sale included assistance in the construction of two missile bases south of Riyadh, as well as the provision of Chinese military personnel for help with maintenance, operations, and training.[22]

In 2007, Saudi Arabia reportedly received China's DF-21 (CSS-5) ballistic missile,[23] a solid-fueled, medium-range missile, with both nuclear and conventional variants. The missile is a product of China's largest missile producer, CASIC.[24] The alleged transfer would provide Saudi Arabia with a shorter-range but more mobile and accurate alternative to the DF-3 – more effective for conventional missions but also potentially providing the Kingdom with a much-improved nuclear weapon delivery option. Little is known about those involved in negotiating the alleged transfer of the DF-21 and China has not confirmed it. However, any such transfer could not take place without the involvement of the state. The transfer allegedly took place well after the Chinese government's pledge to follow MTCR export standards.

Most recently, in 2019, open source analysis by private research groups indicate that Saudi Arabia has built a solid fuel missile engine production and test facility at al-Watah, possibly with Chinese assistance.[25] The location had previously been identified as a missile base but commercial satellite imagery indicates new construction elements that would support missile production.[26] Again, this support would have been provided after China's informal MTCR adherence and necessarily would have involved the state.

Saudi Arabia has also benefited from armed drone exports from China, potentially including MTRC category I or near-category 1 systems, as well as production lines. Armed drones

[21] Evan S. Medeiros, *Reluctant Restraint: The Evolution of China's Nonproliferation Policies and Practices, 1980-2004* (Stanford: Stanford University Press, 2007), pp. 104-108.
[22] Ethan Meick, "China's Reported Ballistic Missile Sale to Saudi Arabia: Background and Potential Implications," U.S.-China Economic and Security Review Commission, June 16, 2014, available at https://www.uscc.gov/sites/default/files/Research/Staff%20Report_China's%20Reported%20Ballistic%20Missile%20Sale%20to%20Saudi%20Arabia_0.pdf.
[23] Jeff Stein, "The CIA Was Saudi Arabia's Personal Shopper," Newsweek, January 29, 2014, available at https://www.newsweek.com/2014/01/31/cia-was-saudi-arabias-personal-shopper-245128.html.
[24] "CASIC DF-21D Unveiled at the Victory Parade," China Aerospace Science and Industry Corporation World Wide Web site, September 6, 2015, available at http://www.casic.com.cn/n12377419/n12378214/n2354949/n2354967/c2367928/content.html (in Chinese).
[25] Paul Sonne, "Can Saudi Arabia produce ballistic missiles? Satellite imagery raises suspicions," Washington Post, January 23, 2019, available at https://www.washingtonpost.com/world/national-security/can-saudi-arabia-produce-ballistic-missiles-satellite-imagery-raises-suspicions/2019/01/23/49e46d8c-1852-11e9-a804-c35766b9f234_story.html.
[26] Jamie Withorne, "Saudi Arabia's Suspect Missile Site and the Saudi Nuclear Program," James Martin Center for Nonproliferation Studies, Middlebury Institute of International Studies at Monterey, March 26, 2019, available at https://nonproliferation.org/saudi-arabia-briefing-dc/.

produced by SOEs Aviation Industry Corporation of China's (AVIC) Chengdu Aircraft Industry Group (CAIG) and CASC have been delivered to the Kingdom, and a license agreement allowing for domestic production of such systems has reportedly been signed.[27] These sales undermine U.S. efforts to control the proliferation of armed drones, with China serving as a ready supplier of such technology with little to no requirements placed on potential clients.

Leading Chinese SOEs are also involved in Saudi Arabia's civilian nuclear energy and nuclear material mining programs. In 2016, China Nuclear Engineering and Construction Corporation (CNECC), a CNNC subsidiary, signed a memorandum of understanding with King Abdullah City for Atomic and Renewable Energy to construct a high-temperature gas-cooled reactor in Saudi Arabia.[28] In 2017, CNNC signed a memorandum of understanding with the Saudi Geological Survey (SGS) to explore uranium and thorium deposits in Saudi Arabia.[29] That same year CNECC reportedly signed a memorandum of understanding with the Saudi Technology Development Corporation to study the feasibility of constructing a high-temperature reactor seawater desalination plant in Saudi Arabia.[30] In 2019, another CNNC subsidiary, the Beijing Research Institute of Uranium Geology (BRIUG), reportedly completed a survey of Saudi uranium ore reserves, identifying reserves that could produce over 90,000 tons of uranium.[31] In the same year, BRIUG held talks with the Saudi Ministry of Industry and Mining on uranium and thorium exploration projects in Saudi Arabia.[32] While these activities all relate to civilian nuclear energy development plans, they nonetheless undermine U.S. efforts to convince the Kingdom not to pursue uranium enrichment, which would increase Saudi Arabia's latent ability to develop nuclear weapons in the future.

Iran

[27] Cholpon Orozobekova and Marc Finaud, "Regulating and Limiting the Proliferation of Armed Drones: Norms and Challenges," Geneva Centre for Security Policy, August 2020, pp. 15-17, available at https://dam.gcsp.ch/files/doc/regulating-and-limiting-the-proliferation-of-armed-drones-norms-and-challenges.
[28] "Updates on Saudi National Atomic Energy Project (SNAEP)," Second Meeting of the Technical Working Group for Small and Medium-sized or Modular Reactor (TWG-SMR), Saudi National Atomic Energy Project, July 2019, p. 15, available at https://nucleus.iaea.org/sites/htgr-kb/twg-smr/Documents/TWG-2_2019/B07_Updates%20on%20Saudi%20National%20Atomic%20Energy%20Project%20(SNAEP)%20for%20IAEA%20SMR-TWG%2020190708.pdf; "China, Saudi Arabia agree to build HTR," World Nuclear News, January 20, 2016, available at https://www.world-nuclear-news.org/NN-China-Saudi-Arabia-agree-to-build-HTR-2001164.html.
[29] "CNNC and Saudi Arabia Expedite Uranium and Thorium Collaborations," Press Release, China National Nuclear Corporation, September 01, 2017, available at http://en.cnnc.com.cn/2017-09/01/c_101806.htm.
[30] "Memorandum of Understanding Signed for the Joint Venture Company of the Saudi High Temperature Reactor Desalination Project," China Nuclear Power Information Network, August 29, 2017, available at http://www.heneng.net.cn/index.php?mod=news&category_id=8?oclnynhfkbtdgmyn&action=show&article_id=46812 (in Chinese).
[31] Emma Graham-Harrison, Stephanie Kirchgaessner, and Julian Borger, "Revealed: Saudi Arabia May Have Enough Uranium Ore to Produce Nuclear Fuel," the Guardian, September 17, 2020, available at https://www.theguardian.com/world/2020/sep/17/revealed-saudi-arabia-may-have-enough-uranium-ore-to-produce-nuclear-fuel.
[32] "President Li Ziying Led a Delegation to Visit Saudi Arabia's Deputy Minister of Industry and Mining Mudaifei," Press Release, Beijing Research Institute of Uranium Geology, November 6, 2019, available at http://www.briug.cn/index.php?m=content&c=index&a=show&catid=23&id=1569 (in Chinese).

China was an early supporter of Iran's nuclear program in the years after the Iran-Iraq War, when that program was once again moving forward. China is believed to have supported uranium mining in Iran, including at the Saghand uranium mine.[33] Experts from BRIUG have conducted scientific exchanges with Iranian nuclear scientists and Chinese experts allegedly participated in exploration work in Iran.[34] China is also widely acknowledged to be the source of information for the conversion plant at Isfahan. Despite a 1997 agreement with the United States to end cooperation with Iran in the nuclear field, China appears to have provided Iran with a blueprint for the plant as well as design information and test reports for equipment.[35]

Both the Saghand mine and conversion plant remain in operation today. They are key facilities in the front end of Iran's nuclear fuel cycle, providing a domestic source of uranium hexafluoride – the feedstock for Iran's gas centrifuge enrichment program.[36]

Beijing has also been a major supplier of ballistic missile technology to Iran, beginning in the late 1980s. In 1998, the Commission to Assess the Ballistic Missile Threat to the United States reported that China had "carried out extensive transfers to Iran's solid-fueled ballistic missile program."[37] In June 2006, the U.S. Treasury Department sanctioned CPMIEC for the sale of MTCR-controlled goods to Shahid Bagheri Industrial Group (SBIG), an organization responsible for Iran's solid-fueled ballistic missile program.[38]

SOEs continue to play a role in supplying Iran's missile program, although they have done so less overtly than in previous decades. In 2017, the Treasury Department sanctioned Wuhan Sanjiang Export and Import Co. Ltd. for selling more than $1 million worth of navigation-related gyrocompasses and specialized sensors to Shiraz Electronics Industries (SEI), a producer of military electronics subordinate to Iran's Ministry of Defense and Armed Forces Logistics

[33] David Albright, Jacqueline Shire, and Paul Brannan, "Is Iran Running out of Yellowcake?," Institute for Science and International Security, February 11, 2009, p. 2, available at https://isis-online.org/uploads/isis-reports/documents/Iran_Yellowcake_11Feb2009.pdf.
[34] Prepared Testimony by Gary Milhollin Before the Senate Foreign Relations Committee Hearing: The Arming of Iran, May 6, 1997, available at https://www.iranwatch.org/library/governments/united-states/congress/hearings-prepared-statements/prepared-testimony-gary-milhollin-senate-foreign-relations-committee-hearing-0.
[35] "Implementation of the NPT Safeguard Agreement in the Islamic Republic of Iran," International Atomic Energy Agency, GOV/2003/75, November 10, 2003, annex 1, p. 1, available at https://www.iaea.org/sites/default/files/gov2003-75.pdf.
[36] For a complete list of Iran's declared and suspected nuclear sites, see "Table of Iranian Nuclear Sites and Related Facilities," Iran Watch, updated March 31, 2021, available at https://www.iranwatch.org/our-publications/weapon-program-background-report/table-irans-principal-nuclear-facilities.
[37] "Executive Summary of the Report of the Commission to Assess the Ballistic Missile Threat to the United States," Commission To Assess the Ballistic Missile Threat to the United States, July 15, 1998, available at https://fas.org/irp/threat/bm-threat.htm.
[38] "Treasury Designates U.S. and Chinese Companies Supporting Iranian Missile Proliferation," Press Release, U.S. Department of the Treasury, June 13, 2006, available at http://www.treasury.gov/press-center/press-releases/Pages/js4317.aspx.

(MODAFL).[39] The State Department also sanctioned Wuhan Sanjiang in February 2020 pursuant to the Iran, North Korea, and Syria Nonproliferation Act (INKSNA) for supporting Iran's missile program.[40]

North Korea

SOEs have provided some support for North Korea's ballistic missile program through technology and knowledge transfers since the 1990s. In 1998, SOE China Academy of Launch Vehicle Technology (CALT), a CASC subordinate,[41] allegedly worked with North Korea on its space program to develop satellites, with reports suggesting that the cooperation may have been linked to development of the Taepodong-1 medium-range ballistic missile. In 1999, China reportedly sold specialty steel with missile applications to North Korea, as well as accelerometers, gyroscopes, and precision grinding machinery.[42]

While Chinese support for North Korea's missile program shifted away from SOEs after the 1990s, one notable exception was the 2011 transfer of six eight-axle, off-road lumber transporters manufactured by Hubei Sanjiang Space Wanshan Special Vehicle Co., Ltd and exported by Wuhan Sanjiang Import and Export Co. Ltd. Both firms are subordinate to China Space Sanjiang Group Co., Ltd., which is overseen by CASIC.[43] Subsequent investigations by the United Nations and the United States concluded that North Korea had illicitly converted the vehicles to ballistic missile transporter-erector-launchers (TELs), and the United Nations recommended that countries deny the export of such items to North Korea. China is known to have disregarded this recommendation on at least one occasion, exporting three-axle trucks that were converted by North Korea for use transporting guided artillery rockets.[44] The trucks

[39] "Treasury Designates the IRGC under Terrorism Authority and Targets IRGC and Military Supporters under Counter-Proliferation Authority," Press Release, U.S. Department of the Treasury, October 13, 2017, available at https://www.treasury.gov/press-center/press-releases/Pages/sm0177.aspx.
[40] "New Sanctions under the Iran, North Korea, and Syria Nonproliferation Act (INKSNA)," Press Release, U.S. Department of State, February 25, 2020, available at https://2017-2021.state.gov/new-sanctions-under-the-iran-north-korea-and-syria-nonproliferation-act-inksna/index.html.
[41] "Organization," China Aerospace Science and Technology Corporation World Wide Web site, available at http://english.spacechina.com/n16421/n17138/n2357690/index.html.
[42] Shirley A. Kan, "China and Proliferation of Weapons of Mass Destruction and Missiles: Policy Issues," Congressional Research Service, January 5, 2015, pp. 18-19, available at https://fas.org/sgp/crs/nuke/RL31555.pdf.
[43] "Treasury Designates the IRGC under Terrorism Authority and Targets IRGC and Military Supporters under Counter-Proliferation Authority," Press Release, U.S. Department of the Treasury, October 13, 2017, available at https://www.treasury.gov/press-center/press-releases/Pages/sm0177.aspx; "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2013/337, June 11, 2013, pp. 26-28, available at https://undocs.org/S/2013/337; "Brief Introduction of Space Sanjiang," China Space Sanjiang Group Co., Ltd. World Wide Web site, available at http://www.yzjs.casic.cn/n13740039/n13740062/c13740102/content.html (in Chinese).
[44] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2016/157, February 24, 2016, pp. 39-40, available at https://undocs.org/S/2016/157.

were reportedly manufactured by China National Heavy Duty Truck Group Co., Ltd. (Sinotruk), an SOE truck manufacturer.[45]

Chinese SOEs have had little involvement in nuclear-related proliferation to North Korea. However, China's support to Pakistan's nuclear program is recognized as a case of secondary proliferation to North Korea. North Korea is believed to have received technology and knowledge transfers from Pakistan and the A.Q. Khan network, which was originally supplied by SOEs.[46]

The rise of the private actor: Recent transfers and support by China-based entities make it more difficult to address challenges to the nonproliferation regime.

Since the early 1990s, China has increasingly observed international non-proliferation norms and multilateral export control regimes, for instance by ratifying the NPT in 1992, joining the Zangger Committee in 1997, and joining the NSG in 2004. Alongside these actions, China has formalized and expanded its national export control laws to reflect these norms and regimes. While Beijing's formal application to join the MTCR in 2004 was rejected, the government nevertheless committed to adjust its missile technology control lists to match those of the MTCR (though not comprehensively).[47] China has also held discussions with the Wassenaar Arrangement and has pledged to align itself with the group's controls on conventional arms and dual-use goods and technologies.

While the export practices of SOEs appear to have improved in conjunction with these national nonproliferation commitments, the problem of proliferation from China remains – perhaps most acutely in the form of Chinese-based companies and individuals transferring dual-use items. This trade involves both controlled goods as well as items below control thresholds that still have applications in nuclear and missile programs. While the activity may not be government directed, it is tolerated if not openly encouraged by the state.

[45] Joost Oliemans and Stijn Mitzer, "N.Korea's 'conservative' display contrasts with past WPK celebrations," NK News, October 10, 2015, available at https://www.nknews.org/2015/10/analysis-of-new-updated-equipment-in-october-10-parade/; "Group Profile," China National Heavy Duty Truck Group Co., Ltd. World Wide Web site, available at http://www.cnhtc.com.cn/View/AboutGroup.aspx (in Chinese); China National Heavy Duty Truck Group Co., Ltd., National Enterprise Credit Information Publicity System, available at http://www.gsxt.gov.cn/.
[46] Shirley A. Kan, "China and Proliferation of Weapons of Mass Destruction and Missiles: Policy Issues," Congressional Research Service, January 5, 2015, pp. 20-21, available at https://fas.org/sgp/crs/nuke/RL31555.pdf; Michael Laufer, "A. Q. Khan Nuclear Chronology," Carnegie Endowment for International Peace, September 7, 2005, available at https://carnegieendowment.org/2005/09/07/a.-q.-khan-nuclear-chronology-pub-17420; S.S. Hecker, R.L. Carlin, and E.A. Serbin, "A technical and political history of North Korea's nuclear program over the past 26 years," Center for International Security and Cooperation, Stanford University, May 24, 2018, available at https://fsi-live.s3.us-west-1.amazonaws.com/s3fs-public/narrativescombinedfinv2.pdf.
[47] Cholpon Orozobekova and Marc Finaud, "Regulating and Limiting the Proliferation of Armed Drones: Norms and Challenges," Geneva Centre for Security Policy, August 2020, pp. 15-17, available at https://dam.gcsp.ch/files/doc/regulating-and-limiting-the-proliferation-of-armed-drones-norms-and-challenges.

In addition, China hosts entities that facilitate proliferation, particularly to North Korea, through the evasion of sanctions and illicit financing. Here too, the government has taken little action against these facilitators, despite numerous detailed reports from the United Nations about the nature and scope of their support.

The contribution of these private actors in proliferation-related trade and support from China, beginning in the 2000s, has expanded over the past decade. Examples of how they have helped North Korea, Iran, Pakistan, and Syria are described below.

North Korea

While private actors in China support North Korea's acquisition of dual-use goods, the primary contribution of these actors to North Korea's missile and nuclear programs in recent years has been indirect: facilitating Pyongyang's access to foreign currency used to fund these programs. The China-based actors providing this support are trading companies and individuals with no direct connection to the state. This support falls into three main categories: hosting entities that are part of North Korean financial networks; hosting North Korean nationals who remit their income; and allowing private entities to facilitate the evasion of sectoral sanctions.

1. North Korean Financial Networks in China

China-based entities provide financial services for North Korea in violation of U.N. sanctions.[48] For instance, a network of representatives and front companies linked to North Korea's Foreign Trade Bank (FTB), which was sanctioned by the United Nations in August 2017,[49] operate in China. In February 2020, the United States indicted individuals linked to FTB, including six North Korean nationals based in China and four Chinese nationals, for their roles in facilitating over $2.5 billion in illegal transactions through over 250 front companies, including front companies based in China.[50]

China-based trading companies also facilitate North Korea's access to the financial system by importing prohibited goods, such as coal, and transferring payment for the goods to North Korean front companies in China that use the proceeds to purchase commodities on behalf of North Korea. For example, Dandong Zhicheng Metallic Material Co., Ltd., a Chinese trading

[48] U.N. Security Council resolution 2094 (2013), March 7, 2013, p. 3, available at https://www.undocs.org/S/RES/2094(2013); U.N. Security Council resolution 2270 (2016), March 2, 2016, pp. 3-4, available at https://www.undocs.org/S/RES/2270(2016); U.N. Security Council resolution 2321 (2016), November 30, 2016, p. 7, available at https://www.undocs.org/S/RES/2321(2016);
[49] U.N. Security Council resolution 2371 (2017), August 5, 2017, p. 9, available at https://undocs.org/S/RES/2371(2017).
[50] Indictment, United States of America v. Ko Chol Man et al., U.S. District Court for the District of Columbia, Case No. 1:20-cr-32-RC, February 5, 2020, available via PACER.

company, operated a network of front companies to facilitate transactions and bulk commodity purchases on behalf of North Korea via the sale of North Korean coal.[51]

North Korea also takes advantage of "over the counter" brokering services based in China with weak "know your customer" protocols to launder stolen cryptocurrency and convert it into fiat currency, including with the help of Chinese nationals.[52]

2. North Korea Individuals Based in China

North Korean workers continue to reside in China and earn income that is remitted to North Korea, in violation of a U.N. Security Council resolution that requires countries to repatriate all North Korean nationals generating revenue abroad no later than December 2019.[53]

For example, North Korean information technology (IT) workers linked to the U.N.-sanctioned Munitions Industry Department (MID), which oversees North Korea's nuclear and missile programs, have established Chinese companies and sponsored visas for North Korean workers, according to the U.N. Panel of Experts on North Korea. In 2019 and 2020, the Panel documented over 500 IT and other North Korean workers based in China.[54] Chinese companies that have worked with North Korea IT workers are allegedly aware of their links to North Korea.[55]

Representatives of U.N.-sanctioned entities involved in procurement for North Korea's military, nuclear, and missile programs, such as Korea Ryonbong General Corporation and Namchongang Trading Corporation, have also operated out of China.[56]

[51] Verified Complaint for Forfeiture In Rem and Civil Complaint, United States of America v. $4,083,935.00 of Funds Associated with Dandong Chengtai Trading Limited et al., U.S. District Court for the District of Columbia, Case No. 1:17-cv-01706, August 22, 2017, pp. 2-3, 15-16, 19-20, available at https://www.justice.gov/usao-dc/press-release/file/992451/download; "Treasury Targets Chinese and Russian Entities and Individuals Supporting the North Korean Regime," Press Release, U.S. Department of the Treasury, August 22, 2017, available at https://www.treasury.gov/press-center/press-releases/Pages/sm0148.aspx.

[52] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2020/840, August 28, 2020, pp. 43-44, available at https://undocs.org/S/2020/840; "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2021/211, March 4, 2021, p. 56, available at https://undocs.org/S/2021/211; "Two Chinese Nationals Charged with Laundering Over $100 Million in Cryptocurrency From Exchange Hack," Press Release, U.S. Department of Justice, March 2, 2020, available at https://www.justice.gov/opa/pr/two-chinese-nationals-charged-laundering-over-100-million-cryptocurrency-exchange-hack.

[53] U.N. Security Council resolution 2397 (2017), December 22, 2017, p. 4, available at https://undocs.org/S/RES/2397(2017).

[54] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2020/840, August 28, 2020, pp. 33-34, available at https://undocs.org/S/2020/840.

[55] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2021/211, March 4, 2021, p. 48, available at https://undocs.org/S/2021/211.

[56] "Treasury Sanctions North Korean Overseas Representatives, Shipping Companies, and Chinese Entities Supporting the Kim Regime," Press Release, U.S. Department of the Treasury, January 24, 2018, available at https://home.treasury.gov/news/press-releases/sm0257; "Report of the Panel of Experts established pursuant to

3. Lax Enforcement of U.N. Sectoral Sanctions

Chinese entities also help North Korea breach an annual cap set by the United Nations[57] on refined petroleum imports and a U.N. prohibition on coal exports.[58] China is one of only two countries (with Russia) to report refined petroleum shipments to North Korea, but claims there is insufficient evidence to reach the conclusion that North Korea is breaching the U.N. cap.[59] Yet China-flagged vessels have been involved in direct deliveries of refined petroleum products to North Korea, in addition to conducting ship-to-ship (STS) transfers for refined petroleum shortly before making port calls in North Korea.[60] China also allows vessels suspected of involvement in illicit petroleum exports to North Korea to enter its territorial waters without penalty.[61]

China continues to import North Korean coal and allow ship-to-ship (STS) transfers of coal in its waters, primarily in the Ningbo-Zhoushan area. According to the U.N. Panel of Experts, from January through September 2020, North Korea exported over 2.5 million tons of coal to China's territorial waters. To avoid detection, North Korean vessels engaged in STS transfers of coal with China-flagged vessels, which subsequently delivered the coal to Chinese ports, according to the U.N. Panel.[62]

4. Dual-use Transfers

Private entities in China are also supplying North Korea with dual-use items; these same entities may also be suppliers to Chinese SOEs. For instance, in 2013 and 2016, Shanghai Zhen Tai

resolution 1874 (2009)," United Nations, S/2019/171, March 5, 2019, p. 32, available at https://undocs.org/S/2019/171.

[57] Since 2018, the United Nations has restricted the sale of refined petroleum products to North Korea, with the first 500,000 barrels exempted each year. See U.N. Security Council resolution 2397 (2017), December 22, 2017, pp. 2-3, available at https://undocs.org/S/RES/2397(2017).

[58] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2019/171, March 5, 2019, p. 7, available at https://undocs.org/S/2019/171; "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2020/151, March 2, 2020, pp. 7-8, available at https://undocs.org/S/2020/151; "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2021/211, March 4, 2021, pp. 14-15, available at https://undocs.org/S/2021/211.

[59] "Supply, sale or transfer of all refined petroleum products to the DPRK," 1718 Sanctions Committee (DPRK), United Nations, available at https://www.un.org/securitycouncil/sanctions/1718/supply-sale-or-transfer-of-all-refined-petroleum; "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2019/171, March 5, 2019, pp. 7-8, 81, available at https://undocs.org/S/2019/171; "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2020/151, March 2, 2020, pp. 7-8, available at https://undocs.org/S/2020/151.

[60] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2020/151, March 2, 2020, pp. 16-19, available at https://undocs.org/S/2020/151.

[61] Christoph Koettl, "How Illicit Oil Is Smuggled Into North Korea With China's Help," New York Times, March 24, 2021, available at https://www.nytimes.com/2021/03/24/world/asia/tankers-north-korea-china.html; "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2020/151, March 2, 2020, pp. 106-108, available at https://undocs.org/S/2020/151.

[62] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2021/211, March 4, 2021, pp. 28-32, 218-224, available at https://undocs.org/S/2021/211.

Instrument Corporation Limited supplied pressure transducers to North Korean national Kang Mun Kil, a China-based representative of U.N.-sanctioned Namchongang Trading Corporation, for export to North Korea.[63] Shanghai Zhen Tai Instrument Corporation Limited also supplies SOE CNNC.[64]

In another example, investigations of missile debris conducted by the U.N. Panel of Experts have revealed China to be the source of missile and space launch vehicle components, including pressure transmitters and camera electromagnetic interference filters. These components were either manufactured or sold by private Chinese companies, according to the Panel. In one instance, North Korea procured the components from a Chinese firm that apparently sold them via an electronics market.[65] Many of these items fall below control thresholds, emphasizing the need for China to implement strong "catch-all" controls.[66]

Iran

Publicly documented transfers of concern from China to Iran over the past decade or more are predominantly carried out by small, private enterprises and individuals, with no clear government involvement. These transfers can be divided into two broad categories: those in which Chinese entities are active conspirators, and those in which China hosts Iranian sanctions evaders.

1. Chinese Entities as Active Conspirators

Chinese nationals, often using their own China-based companies, have been active participants in schemes to transfer dual-use items to Iran. Karl Lee (also known as Li Fang Wei) personifies this category. Lee, a businessman operating out of Dalian, China, became notorious for being behind a string of sales, beginning in the late 2000s, made directly to ballistic missile developers in Iran. Using a cluster of China-based front companies, Lee shipped gyroscopes, accelerometers, high-strength alloys, graphite cylinders, and other items to SBIG. Lee has been sanctioned repeatedly by the State Department – twelve times since 2010, most recently in May 2019.[67] He was indicted twice in New York, most recently in 2014,[68] for making transfers

[63] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2019/171, March 5, 2019, p. 32, available at https://undocs.org/S/2019/171.
[64] "Company Profile," Shanghai Zhen Tai Instrument Co., Ltd. World Wide Web site, available at http://en.shzhentai.com/intro/1.html.
[65] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2017/150, February 27, 2017, p. 27, available at https://undocs.org/S/2017/150.
[66] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2017/150, February 27, 2017, p. 28, available at https://undocs.org/S/2017/150; "North Korea Ballistic Missile Procurement Advisory," U.S. Departments of Commerce, State, and the Treasury, September 1, 2020, available at https://home.treasury.gov/system/files/126/20200901_nk_ballistic_missile_advisory.pdf.
[67] List of Sanctioned Entities, U.S. Department of State, available at https://www.state.gov/key-topics-bureau-of-international-security-and-nonproliferation/nonproliferation-sanctions/.
[68] "Karl Lee Charged in Manhattan Federal Court with Using a Web of Front Companies to Evade U.S. Sanctions," Press Release, Federal Bureau of Investigation, New York Field Office,, April 29, 2014, available at

through U.S. banks in connection with his illicit transactions, effectively using the U.S. financial system to facilitate his proliferation efforts.

Despite the sanctions and indictments, the Chinese government does not appear to have applied any pressure to Lee to cease his trade with Iran. A 2018 study suggests that Lee remains active in Dalian, China, assisted by family members in the operation of his network of front companies.[69] In 2019, the U.S. State Department concluded that Lee's support has helped Iran improve the accuracy, range, and lethality of its missiles.[70]

Chinese businessman Sihai Cheng provides another example. From 2005 through 2012, working in cooperation with an Iranian national, Cheng supplied thousands of items to an Iranian firm involved in the country's uranium enrichment program.[71] Some of these items were of Chinese origin and included titanium sheets and tubes, seamless steel tubes, pressure valves, bellows, and flanges. Cheng also managed to procure hundreds of U.S.-origin pressure transducers, a component that is essential for the operation of centrifuges used in uranium enrichment. Cooperating with employees at a China-based subsidiary of a leading U.S. manufacturer of pressure transducers, Cheng was able to use front companies in China to act as false end users for the exports. He then re-routed the shipments to Iran upon their arrival in China. This scheme only came to an end when Cheng was arrested in London in 2014 and extradited to the United States for trial, where he was sentenced to nine years in prison.[72] China took no action against Cheng or his co-conspirators, and Chinese government officials reportedly objected to the United States taking export enforcement actions against Chinese nationals.[73]

A third example involved Zongcheng Yi, a Chinese national who conspired with Iranian national Parviz Khaki between 2008 and 2011 to obtain U.S.-origin dual-use items including maraging steel, aluminum rods, pressure transducers, vacuum pumps, lathes, and nickel alloy on behalf of Iranian end users. Yi allegedly used his Guangzhou-based company to arrange purchases of

https://www.fbi.gov/contact-us/field-offices/newyork/news/press-releases/karl-lee-charged-in-manhattan-federal-court-with-using-a-web-of-front-companies-to-evade-u.s.-sanctions.

[69] Daniel Liu, "Karl Lee, where is he now?," Project Alpha, October 26, 2018, available at https://www.kcl.ac.uk/news/karl-lee-where-is-he-now.

[70] "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," U.S. Department of State, August 2019, p. 42, available at https://www.state.gov/wp-content/uploads/2019/08/Compliance-Report-2019-August-19-Unclassified-Final.pdf.

[71] "Chinese National Detained in United Kingdom for Illegally Exporting U.S. Manufactured Parts with Nuclear Applications," Press Release, U.S. Immigration and Customs Enforcement, April 4, 2014, available at https://www.ice.gov/news/releases/chinese-national-detained-united-kingdom-illegally-exporting-us-manufactured-parts.

[72] "Extradited Chinese National Sentenced to Nine Years for Providing U.S. Goods to Iran to Support its Nuclear Program," Press Release, U.S. Department of Justice, January 27, 2016, available at https://www.justice.gov/usao-ma/pr/extradited-chinese-national-sentenced-nine-years-providing-us-goods-iran-support-its.

[73] Ian J. Stewart, "The Chinese Smuggler and the Iran Deal," the Diplomat, March 21, 2016, available at https://thediplomat.com/2016/03/the-chinese-smuggler-and-the-iran-deal/.

these items from unwitting U.S. suppliers and their transshipment to Iran via Hong Kong.[74] Yi remains at large, presumably in China; U.S. prosecutors moved to dismiss the case against him in August 2020, apparently so as not to continue expending resources prosecuting a fugitive whose arrest is unlikely.[75]

2. Iranian Sanctions Evaders Active in China

In other instances, Iranian individuals and companies have operated freely from inside China to arrange transfers of dual-use items, either without the direct involvement of Chinese nationals or with Chinese nationals playing only supporting roles as local facilitators.

The activities of Rayan Roshd Afzar Company, a Tehran-based defense production firm that has supplied components to the Islamic Revolutionary Guard Corps (IRGC)'s UAV and aerospace programs,[76] are illustrative of this pattern. Rayan Roshd Afzar's parent company, Rayan Group, operated out of Beijing as recently as 2017,[77] and the Treasury Department's press release sanctioning Rayan Roshd Afzar that year alleged that company officials had "obtained a range of military-applicable items from China."[78]

In another scheme running from 2011 to 2017, Iranian-born Canadian national Ghobad Ghasempour set up several front companies in China with the aid of a Chinese national, Yi Xiong, for the purpose of transshipping a variety of dual-use items from the United States, Germany, and Canada through China to Iran. These items, some of which shipped successfully, included a precision lathe machine, thermal imaging cameras, and an inertial guidance system test table (which can be used to test missile guidance systems), all of which are subject to U.S. export controls. Their ultimate recipient was alleged by U.S. prosecutors to be an Iranian state-controlled engineering company that purchases items for Iranian government agencies. Ghasempour was arrested in the United States in 2017 and sentenced to 42 months in prison,[79] but Xiong remains at-large, presumably in China.

[74] "Two Indicted for Alleged Efforts to Supply Iran with U.S.-Materials for Gas Centrifuges to Enrich Uranium," Press Release, U.S. Department of Justice, July 13, 2012, available at https://www.justice.gov/opa/pr/two-indicted-alleged-efforts-supply-iran-us-materials-gas-centrifuges-enrich-uranium.
[75] Government's Motion to Dismiss Indictment, United States of America v. Parviz Khaki and Zongcheng Yi, U.S. District Court for the District of Columbia, Case No. 1:12-cr-00061-RWR, Document 10, August 7, 2020, available via PACER.
[76] "Treasury Targets Persons Supporting Iranian Military and Iran's Islamic Revolutionary Guard Corps," Press Release, U.S. Department of the Treasury, July 18, 2017, available at https://www.treasury.gov/press-center/press-releases/Pages/sm0125.aspx.
[77] "Services," Rayan Group World Wide Web site, available at https://web.archive.org/web/20160317035631/http://www.raygr.com/services.html; Homepage, Rayan Group World Wide Web site, available at https://web.archive.org/web/20161006050653/http://www.raygr.com/.
[78] "Treasury Targets Persons Supporting Iranian Military and Iran's Islamic Revolutionary Guard Corps," Press Release, U.S. Department of the Treasury, July 18, 2017, available at https://www.treasury.gov/press-center/press-releases/Pages/sm0125.aspx.
[79] Mana Mostatabi, "Illicit Procurement Network Used Firms in China, Portugal, and Turkey to Supply Iran," Iran Watch, October 31, 2018, available at https://www.iranwatch.org/our-publications/international-enforcement-actions/illicit-procurement-network-used-firms-china-portugal-turkey-supply-iran.

There are numerous other instances of Iranian sanctions evaders using China-based front companies to transship nuclear and missile dual-use materials from third countries to Iran, during a period when Iran's uranium enrichment program was expanding. The contents of these shipments have included: carbon fiber (one Japanese-origin shipment seized in 2012 en route from China to Bandar Abbas);[80] aluminum powder (one North Korean-origin shipment seized in 2010 en route from China to Bandar Abbas);[81] and U.S.-origin dual-use electronics (with multiple attempts documented between 2007 and at least 2011).[82]

China does not appear to have taken concerted action to prevent its territory from being used as a base of operations and transshipment point for Iranian sanctions evaders, nor to prevent its nationals from facilitating or participating in schemes to transfer dual-use items to Iran.

Syria

Syria has relied on China-based front companies to facilitate delivery of chemical weapon- and ballistic missile-related items from North Korea, which is Syria's primary source of supply. In the period from 2007 to 2012, for instance, these Chinese companies transferred equipment for Scud missile propellant,[83] alloy tubes for manufacturing rockets,[84] graphite cylinders with ballistic missile applications,[85] and items used in the handling of military-grade chemical

[80] "Carbon Fiber Seized en Route to Iranian Businessman with Ties to Georgia and Hong Kong," Iran Watch, August 20, 2014, available at https://www.iranwatch.org/our-publications/international-enforcement-actions/carbon-fiber-seized-en-route-iranian-businessman-ties-georgia-hong-kong; "Final report of the Panel of Experts established pursuant to resolution 1929 (2010)," United Nations, June 11, 2014, available at https://undocs.org/S/2014/394.

[81] "Iran-Bound Rocket Fuel Component Seized in Singapore," Iran Watch, September 1, 2011, available at https://www.iranwatch.org/our-publications/enforcement-news-summary/iran-bound-rocket-fuel-component-seized-singapore; "Final report of the Panel of Experts established pursuant to resolution 1929 (2010)," United Nations, May 1, 2011, available at https://www.iranwatch.org/library/international-organization/united-nations-un/un-security-council/final-report-panel-experts-established-pursuant-resolution-1929-2010-0.

[82] Indictment, United States of America v. Susan Yip, Mehrdad Foomanie, and Mehrdad Ansari, U.S. District Court, Western District of Texas, San Antonio Division, Case No. 5:11-cr-00516-XR, June 15, 2011, available at https://www.iranwatch.org/library/governments/united-states/judicial-branch/indictment-susan-yip-mehrdad-foomanie-mehrdad-ansari.

[83] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2016/157, February 26, 2016, pp. 29-30, 118-120, available at https://undocs.org/S/2016/157; "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2012/422, June 14, 2012, p. 24, available at https://undocs.org/S/2012/422.

[84] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2013/337, June 11, 2013, pp. 36-37, 103-105, available at https://undocs.org/S/2013/337; "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2012/422, June 14, 2012, p. 29, available at https://undocs.org/S/2012/422.

[85] "Report of the Panel of Experts established pursuant to Resolution 1874 (2009)," United Nations, S/2014/147, March 6, 2014, pp. 20-21, available at https://undocs.org/S/2014/147.

agents.[86] In many cases, the Syrian end users were front companies or subsidiaries of the Scientific Studies and Research Center (SSRC), which oversees Syria's chemical weapon and ballistic missile programs.

China also hosts several SSRC affiliates. Since 2018, the French government has designated four of these affiliates for their involvement in the procurement of chemical weapon- and ballistic missiles-related items, including precursors for sarin gas.[87] North Korea also appears to source dual-use items from Chinese firms for supply to Syria.

Pakistan

The rise in support from private Chinese firms to Pakistan began over a decade ago. In a report to Congress on proliferation in 2011, the Director of National Intelligence assessed that "Chinese entities – primarily private companies and individuals – continue to supply a variety of missile-related items" to Pakistan.[88]

More recently, the U.S. Commerce Department has designated numerous Chinese companies for supplying Pakistan's missile and unsafeguarded nuclear programs with dual-use goods. One such company, Taihe Electric (Hong Kong) Limited (which has offices in Chengdu and Hong Kong), was designated in August 2020.[89] Taihe Electric supplies Pakistani front companies, as well as PAEC subsidiaries and the Chashma plant.[90] In some cases the items originate in China, while in others they are transshipped through China from other countries, including the United States. Typically the declared Pakistani end user is a front company and the transfers are in fact

[86] "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2010/571, November 5, 2010, pp. 25-26, available at https://undocs.org/S/2010/571; "Report of the Panel of Experts established pursuant to resolution 1874 (2009)," United Nations, S/2012/422, June 14, 2012, pp. 27-28, available at https://undocs.org/S/2012/422.
[87] "Joint Press Release by Bruno Le Maire and Jean-Yves Le Drian, Chemical Weapons in Syria - asset freezing against individuals and entities," French Ministry for Europe and Foreign Affairs, May 18, 2018, available at https://minefi.hosting.augure.com/Augure_Minefi/r/ContenuEnLigne/Download?id=A8547195-27F0-4BC9-A808-66B5A4880B3F&filename=491.pdf (in French); "Order of 17 May 2018 Implementing Articles L. 562-3 et seq. of the Monetary and Financial Code," French Ministry of Economy and Finances, Text No. 26, May 18, 2018, available at https://www.legifrance.gouv.fr/eli/arrete/2018/5/17/ECOT1813353A/jo/texte/fr (in French); "Joint Press Release from Messrs. Le Drian and Le Maire," French Ministry for Europe and Foreign Affairs, January 23, 2018, available at https://www.diplomatie.gouv.fr/fr/politique-etrangere-de-la-france/desarmement-et-non-proliferation/evenements-lies-au-desarmement-et-a-la-non-proliferation/evenements-lies-aux-armes-chimiques/article/communique-de-presse-conjoint-de-mm-le-drian-et-le-maire-23-janvier-2018 (in French).
[88] "Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, Covering 1 January to 31 December 2011," U.S. Director of National Intelligence, available at http://fas.org/irp/threat/wmd-acq2011.pdf.
[89] "Addition of Entities to the Entity List, and Revision of Entries on the Entity List," U.S. Department of Commerce, Bureau of Industry and Security, Federal Register, Vol. 85, No. 167, August 27, 2020, pp. 52898-52899, 52904, available at https://www.govinfo.gov/content/pkg/FR-2020-08-27/pdf/2020-18909.pdf.
[90] "Taihe Electric (Hong Kong) Limited," PakTradeInfo World Wide Web site, available at http://www.paktradeinfo.com/international-trade/pakistan/import/1/buyername()-sellername(taihe-electric)-itemdesc()-startdate()-enddate()/.

destined for government entities subject to U.S. trade restrictions, including PAEC and the Advanced Engineering Research Organization (AERO).[91]

The proliferation threat from SOEs: End users of U.S. controlled technology.

In addition to the outward proliferation from China described above, SOEs have long sought U.S.-origin controlled goods and technology illicitly. SOEs have pursued three acquisition paths for such transfers: by exploiting direct collaboration with U.S. firms, through brokers, front companies, or other evasive tactics to mask the ultimate end user, and through acts of theft or espionage. SOEs that direct nuclear and missile work in China, as well as related exports, have been among the beneficiaries.

Direct Collaboration, Joint Ventures, and Technology Transfer

During the 1990s, as China began reforming its defense industry, the Chinese government increasingly encouraged Chinese companies operating in strategic sectors to focus on civilian, dual-use markets related to those sectors. At this time, China's domestic technology lagged behind that of the United States and other developed nations. Chinese companies sought to form joint ventures (JVs) with leading U.S. firms, as a means of gaining access to key equipment and technical know-how.[92] During the 1990s, accordingly, cases of Chinese acquisition of U.S. dual-use technology often arose from collaboration between prominent American firms and their Chinese counterparts.

For instance, as part of a joint project between China National Aero-Technology Import-Export Corporation (CATIC) and McDonnell Douglas for the production of airliners in China, U.S.-origin machine tools were transferred to factories in China overseen by AVIC, for use only in the production of civilian aircraft.[93] The machine tools were transferred to companies under AVIC involved in military projects, including anti-ship cruise missile production.[94]

[91] "Newly Unsealed Federal Indictment Charges Iranian Businessman with Illegally Exporting Nuclear Nonproliferation-Controlled Materials from Illinois," Press Release, U.S. Department of Justice, June 21, 2018, available at https://www.justice.gov/usao-ndil/pr/newly-unsealed-federal-indictment-charges-iranian-businessman-illegally-exporting-0; "Business World," Paktradeinfo World Wide Web site, available at http://www.paktradeinfo.com/international-trade/pakistan/import/1/buyername(pakistan-atomic-energy-commission)-sellername()-itemdesc()-startdate()-enddate().

[92] For instance, through such collaboration China gained access to computer aided design (CAD) software and commercial naval engine design and construction methods and learned how to engineer complex systems like civilian turbofan aero-engines. See Evan S. Meideros, Roger Cliff, Keith Crane, and James C. Mulvenon, *A New Direction for China's Defense Industry* (Santa Monica, CA: RAND Corporation), 2005, pp. 131, 141-142, 170, available at https://www.rand.org/pubs/monographs/MG334.html.

[93] "U.S. China Commission Export Controls and China," Hearing Transcript, U.S.-China Economic and Security Review Commission, January 17, 2002, p. 1069, available at https://www.uscc.gov/sites/default/files/transcripts/1.17.02HT.pdf.

[94] "Action Affecting Export Privileges; TAL Industries, Inc.," U.S. Department of Commerce, Bureau of Export Administration, Federal Register, Vol. 66, No. 100, May 23, 2001, available at https://www.gpo.gov/fdsys/pkg/FR-2001-05-23/pdf/01-13024.pdf.

Chinese companies may use such cooperation as a stepping stone, gaining manufacturing know-how and then cutting out their foreign partner. The case of Westinghouse and CNNC provides an illustrative example of this dynamic. In the 2000s and early 2010s, Westinghouse worked with CNNC to jointly produce pressurized water reactors for use in China with designs from Westinghouse.[95] According to a U.S. Department of Justice indictment related to a hack of Westinghouse's systems, information stolen from Westinghouse around May 2010 included design and technical specifications related the AP1000 pressurized water reactor that would "enable a competitor to build a plant similar to the AP1000 without incurring significant research and development costs."[96] Although the indictment does not identify the beneficiary of the hacked information, it was reportedly CNNC.[97] CNNC now produces the Hualong One pressurized water reactors, cutting Westinghouse out of China's nuclear power plant construction market.[98]

Circumventing Trade Controls Via Subsidiaries and Front Companies

SOEs have relied on evasive procurement tactics since the mid-2000s, as a means of skirting increasingly strict U.S. export controls in order to obtain dual-use technology. These tactics included using obscure U.S.-based brokers to obtain such technology from unwitting U.S. manufacturers, the use of foreign procurement agents, and transshipment through third countries.

Beginning in the 2000s, SOEs began using small U.S.-based companies as a source of illicit supply. These firms often do little or no business outside of exports to China, and sometimes deal with a sole customer. For instance, a family-run firm based in New Jersey procured and supplied integrated circuits and components to two institutes under China Electronics Technology Group Corporation (CETC),[99] the 14th and the 20th Institute, both of which are involved in the development of military electronics and have conducted research on ballistic missiles.[100]

[95] "Westinghouse signs deal to build 4 nuclear reactors in eastern China," New York Times, July 24, 2007, available at https://www.nytimes.com/2007/07/24/business/worldbusiness/24iht-energy.1.6800478.html.
[96] Indictment, United States of America v. Wang Dong et al., U.S. District Court for the Western District of Pennsylvania, Case No. 2:14-cr-118, May 1, 2014, available at https://www.justice.gov/iso/opa/resources/5122014519132358461949.pdf.
[97] Austin Ramzy, "Charges of Chinese Cyberspying, Wanted Posters," New York Times, May 20, 2014, available at https://sinosphere.blogs.nytimes.com/2014/05/20/charges-of-chinese-cyberspying-wanted-posters-included/.
[98] "Hualong One - HPR 1000," China National Nuclear Corporation World Wide Web site, available at http://en.cnnc.com.cn/HPR1000.html; "Products," China National Nuclear Corporation World Wide Web site, available at http://en.cnnc.com.cn/cnncproducts.html.
[99] Indictment, United States of America v. Terry Tengfang Li and Nei-Chien Chu, United States District Court, District of New Jersey, July 28, 2004; "Order Relating to Terry Tengfang Li (AKA 'Terry Li')," U.S. Department of Commerce, Bureau of Industry and Security, June 23, 2006, available at https://efoia.bis.doc.gov/index.php/documents/export-violations/681-e991/file.
[100] "Enterprise Summary," 14th Institute of China Electronics Technology Group Corporation World Wide Web site, available at https://web.archive.org/web/20201015030722/http://14.cetc.com.cn/14/338552/338540/index.html (in Chinese); "Enterprise Summary," 20th Institute of China Electronics Technology Group Corporation World Wide Web site, available at

The case of Hong Wei Xian also illustrates this trend. Hong, a Chinese national, was arrested in 2010 for attempting to procure, on behalf of CASC, more than 1,000 radiation-hardened programmable read-only memory (PROM) microchips designed to withstand space-based conditions.[101] He operated his own company, Beijing Starcreates Space Science and Technology Development Company Limited, which based much of its business on importing these microchips to supply CASC. In order to evade detection, Hong requested that a Virginia-based supplier send the components in smaller quantities to several third countries, where they would be transshipped for ultimate delivery to China.[102]

Chinese companies also sought expertise from the United States. China General Nuclear Power Company (CGNPC), a leading nuclear SOE,[103] was charged in 2016 with conspiring to produce special nuclear material outside the United States with U.S. technical consulting. Between 1997 and 2016, a CGNPC employee created a Delaware-based company, Energy Technology International, to facilitate technical consulting from U.S. experts on CGNPC's Small Modular Reactor Program, Advanced Fuel Assembly Program, Fixed In-Core Detector System, and other nuclear reactor-related computer programs. According to the U.S. Department of Justice, this CGNPC employee organized flights and payments for U.S.-based experts to travel to China and provide consulting services.[104]

Major Chinese research universities affiliated with military research programs have also used these methods to procure U.S. technology. In one recent case, Northwest Polytechnical University (NWPU) used a middle man, Shuren Qin, and his U.S.-based company, LinkOcean Technologies, LTD., to illicitly import technology with underwater and marine applications to China from the United States, Canada, and Europe without export licenses. These items included at least 50 hydrophones for use in anti-submarine warfare, side scan sonar systems, unmanned underwater vehicles, and robotic boats. NWPU has been listed on the Commerce

http://webcache.googleusercontent.com/search?q=cache%3A%2F%2F20.cetc.com.cn%2F20%2F338813%2F338801%2Findex.html&oq=cache%3A%2F%2F20.cetc.com.cn%2F20%2F338813%2F338801%2Findex.html (in Chinese).

[101] Indictment, United States of America v. Hong Wei Xian aka "Harry Zan" and Li Li aka "Lea Li", U.S. District Court for the Eastern District of Virginia, Case No. 1:10-cr-00207-GBL, June 10, 2010, pp. 5-7, available via PACER.

[102] "2 Chinese nationals charged with illegally attempting to export military satellite components to the PRC," Press Release, U.S. Immigration and Customs Enforcement, April 4, 2011, available at https://www.ice.gov/news/releases/2-chinese-nationals-charged-illegally-attempting-export-military-satellite-components; "2 Chinese nationals pleaded guilty to illegally attempting to export radiation-hardened microchips to the PRC," Press Release, U.S. Immigration and Customs Enforcement, May 31, 2011, available at https://www.ice.gov/news/releases/2-chinese-nationals-pleaded-guilty-illegally-attempting-export-radiation-hardened.

[103] Indictment, United States of America v. Szuhsiung Ho, et al., U.S. District Court, Eastern District of Tennessee, Case No. 3:16-cr-00046, April 5, 2016, p. 2, available via PACER.

[104] "U.S. Nuclear Engineer, China General Nuclear Power Company and Energy Technology International Indicted in Nuclear Power Conspiracy against the United States," Press Release, U.S. Department of Justice, April 14, 2016, available at https://www.justice.gov/opa/pr/us-nuclear-engineer-china-general-nuclear-power-company-and-energy-technology-international.

Department's Entity List since 2001, so the university would not have otherwise received permission for these imports.[105]

Theft and Espionage

Chinese SOEs have relied on trade secret theft and espionage, occasionally carried out by employees of the SOEs but more often by organs of the Chinese central government, including the Ministry of State Security (MSS) and People's Liberation Army (PLA). The beneficiaries of trade secrets obtained through these actions are likely SOEs, although such a connection is not always easy to establish.

In one such example, a Chinese MSS operative, Yanjun Xu, attempted to steal aerospace technology from U.S. companies, including General Electric.[106] Xu worked with China's leading aerospace engineering-focused university, the Nanjing University of Aeronautics and Astronautics (NUAA), to fly employees of leading U.S. aerospace firms to China to recruit them as spies for China's aerospace research programs. Xu and his associates at NUAA successfully obtained sensitive company information from at least one engineer at an undisclosed leading U.S. aerospace company.[107]

These espionage activities also occur over the internet, facilitated by China's advanced cyberattack capabilities. In one case, beginning around 2006, Chinese nationals Zhu Hua and Zhang Shilong, two members of a Chinese MSS hacking unit, targeted the computer systems of leading U.S. firms in dual-use sectors. These hacks provided the MSS with data from seven companies in the aviation/aerospace industry, three companies involved with communication technology, three companies in the advanced electronics systems, a company in the maritime industry, NASA's Goddard Space Flight Center and Jet Propulsion Laboratory, and the Department of Energy's Lawrence Berkeley National Laboratory, among others.[108]

Conclusion and policy recommendations

[105] "Chinese National Pleads Guilty to Illegal Exports to Northwestern Polytechnical University," Press Release, U.S. Department of Justice, April 28, 2021, available at https://www.justice.gov/opa/pr/chinese-national-pleads-guilty-illegal-exports-northwestern-polytechnical-university.
[106] "Chinese Intelligence Officer Charged with Economic Espionage Involving Theft of Trade Secrets from Leading U.S. Aviation Companies," Press Release, U.S. Department of Justice, October 10, 2018, available at https://www.justice.gov/opa/pr/chinese-intelligence-officer-charged-economic-espionage-involving-theft-trade-secrets-leading.
[107] Affidavit in Support of Criminal Complaint, United States of America v. Xu Yanjun, U.S. District Court for the Southern District of Ohio, Case No. 1118MJ-190, March 21, 2018, pp. 3-4, 6-11, available at https://www.justice.gov/opa/press-release/file/1099881/download.
[108] "Two Chinese Hackers Associated With the Ministry of State Security Charged with Global Computer Intrusion Campaigns Targeting Intellectual Property and Confidential Business Information," Press Release, U.S. Department of Justice, December 20, 2018, available at https://www.justice.gov/opa/pr/two-chinese-hackers-associated-ministry-state-security-charged-global-computer-intrusion.

The nonproliferation regime is constructed around the NPT, buttressed by technology controls set forth in multilateral supply regimes that are implemented through national regulations, and enforced through U.N. and other sanctions and counterproliferation measures. Despite a series of nonproliferation pledges and commitments over decades, the actions of the Chinese state, SOEs, and China-based entities have continued to undermine each component of this regime, as illustrated in the examples above. Through its actions, China continues to:

- selectively ignore MTCR and NSG-related commitments when commercial or other imperatives have prevailed;
- support the evasion of U.N. sanctions on Iran and North Korea by hosting firms and individuals supplying or financing those countries; and
- flout U.S. export controls and cooperative agreements in order to obtain sensitive technology.

In light of these trends, U.S. policy vis-a-vis China has shifted from seeking engagement with China to a more competitive paradigm. It remains useful and important for the United States to press China to fulfill its NSG commitments, to join and fully adhere to the MTCR, and to enforce U.N. sanctions and its new comprehensive export control law. However, the U.S. policy shift would also benefit from pursuing, in tandem, the following more punitive measures:

1. Continue to Target China-based Suppliers of Proliferation Concern and Sanctions Evaders
2. Take Public Action on U.N. Findings on North Korea to Circumvent Chinese Obstruction
3. Expand the Chinese Military-Industrial Complex List (NS-CMIC List)
4. Mitigate the Proliferation Risk Posed by Cooperation with Chinese Universities
5. Support the Development of a CFIUS-like Review Process in Partner Countries

Continue to Target China-based Suppliers of Proliferation Concern and Sanctions Evaders

Most private firms and individuals operating in China and supplying countries of concern, as well as Chinese SOEs, may not have a footprint in the United States and therefore may not be harmed economically by the imposition of U.S. sanctions. Designating them and publicizing their support nevertheless has value for U.S. nonproliferation objectives. First, it raises awareness among U.S. suppliers about the ongoing risk of illicit procurement when dealing with potential new clients and the critical role that China-based entities play in this trade. Second, it identifies specific parties involved; while these parties may not have assets or interests in the United States, they may well operate in other countries. Their operations there could be harmed once U.S. sanctions, particularly secondary sanctions, are enacted. Third, it provides U.S. partners with information they can use to prevent proliferation.

Take Public Action on U.N. Findings on North Korea to Circumvent Chinese Obstruction

The U.N. Panel of Experts has recommended numerous entities and vessels for designation by the Security Council's 1718 Committee. However, none have ultimately been sanctioned,

largely because of the unwillingness of China (and Russia) to support such action. This harms the overall implementation of U.N. sanctions against North Korea and deprives a number of countries that are regularly exploited by North Korean sanctions evaders of clear guidance on how to counter their actions.

The United States could raise awareness about the Panel's findings through the imposition of sanctions on these entities and vessels. Of the 25 entities and individuals and 31 vessels recommended for designation since the Panel's March 2018 report, only one entity, two individuals, and two vessels have been sanctioned by the United States, and these sanctions were already in effect when the Panel made its recommendations. U.S. sanctions play a key role in public diplomacy efforts to increase compliance with U.N. sanctions and send a strong signal to countries implementing these sanctions.

The United States should also continue to publish advisories highlighting information presented in the Panel reports, in particular typologies of North Korean sanctions evasion tactics. This information provides partner countries with tangible steps they can take to counter North Korean procurement and more effectively enforce sectoral sanctions. U.S. government advisories are widely disseminated among public and private sector actors and have been useful in the past in engaging countries on improving their implementation of U.N. sanctions.[109]

Expand the Chinese Military-Industrial Complex List (NS-CMIC List)

The growth of China's defense industry directly contributes to the quality and kind of technology China and Chinese companies can proliferate. The Biden administration's recent executive action refining the previous administration's restriction on outbound investment in Chinese military companies is an important step forward. By cutting off investment flows to these companies, the U.S. government will help limit the resources available for their efforts to develop leading edge military and dual-use technology.

In its current version, however, the list does not yet adequately name all companies involved in the Chinese defense industry. Specifically, the list does not include key subsidiaries of major defense SOEs, despite the fact that many of these subsidiaries are independently listed on financial markets. Under the executive order, any entity "owned or controlled by, directly or indirectly," a company either on the NS-CMIC list or operating in the Chinese defense or

[109] "North Korea Ballistic Missile Procurement Advisory," U.S. Departments of Commerce, State, and the Treasury, September 1, 2020, available at https://home.treasury.gov/system/files/126/20200901_nk_ballistic_missile_advisory.pdf; "North Korea Sanctions Advisory: Updated Guidance on Addressing North Korea's Illicit Shipping Practices," U.S. Departments of State and the Treasury and the U.S. Coast Guard, March 21, 2019, available at https://home.treasury.gov/system/files/126/dprk_vessel_advisory_03212019.pdf; "North Korea Sanctions and Enforcement Actions Advisory: Risks for Businesses with Supply Chain Links to North Korea," U.S. Departments of Homeland Security, State, and the Treasury, July 23, 2018, available at https://home.treasury.gov/system/files/126/dprk_supplychain_advisory_07232018.pdf.

surveillance industry can also be listed.[110] Accordingly, the administration should identify additional subsidiaries of NS-CMIC listed companies in order to ensure that these subsidiaries cannot evade U.S. investment restrictions. The Treasury Department should also provide a comprehensive list of additional identifier information, including International Security Identification Numbers (ISIN) and aliases, to better inform investors and improve screening.

Manage the Proliferation Risk Posed by Cooperation with Chinese Universities

Chinese universities contribute to the quality of technology that China and Chinese companies develop and can proliferate abroad. Some of these universities directly contribute to military research projects and in some cases, as described above, engage in economic espionage and export control evasion in the United States. The U.S. government could more actively regulate how U.S. parties interact with some of these universities.

The Commerce Department could list additional Chinese universities connected to the Chinese military on its Entity List and Military End User List, as a means of controlling the flow of U.S. dual-use technology and know-how to these universities. Commerce currently has trade restrictions on the seven major Chinese defense universities (colloquially known as the "Seven Sons of National Defense") and two other Chinese universities.[111] Based on research from the Australian Strategic Policy Institute and subsequent research conducted by the Wisconsin Project, however, some 50 universities directly affiliated with the Chinese defense industry regulatory agency, the State Administration of Science, Technology, and Industry for National Defense (SASTIND), do not appear on any U.S. government trade control list.[112] These universities receive funding from SASTIND, in collaboration with other ministries, to invest in academic departments and research capabilities related to national defense subjects.

[110] "Executive Order 14032 of June 3, 2021 - Addressing the Threat From Securities Investments That Finance Certain Companies of the People's Republic of China," the White House, Federal Register, Vol. 86, No. 107, June 7, 2021, pp. 30145-30149, available at https://www.govinfo.gov/content/pkg/FR-2021-06-07/pdf/2021-12019.pdf.
[111] The "Seven Sons of National Defense" are Beihang University, Beijing Institute of Technology, Harbin Engineering University, Harbin Institute of Technology, Nanjing University of Aeronautics and Astronautics, Nanjing University of Science and Technology, and Northwest Polytechnical University. The other two universities are Sichuan University and the University of Electronic Science and Technology. For the "Seven Sons" see: "The Seven National Defense Schools Including Xi'an University of Technology Hosted the '2017 National Defense Seven Schools' Sichuan Key Central School Leadership Forum," Northwest Polytechnical University World Wide Web site, November 13, 2017, available at https://news.nwpu.edu.cn/info/1002/52306.htm (in Chinese); for the Entity List, see: "Supplement No. 4 to Part 744 - Entity List," U.S. Department of Commerce, Bureau of Industry and Security, June 1, 2021, pp. 32, 36, 90, 130, 135, 154, 170, available at https://www.bis.doc.gov/index.php/documents/regulations-docs/2326-supplement-no-4-to-part-744-entity-list-4/file.
[112] "Jilin University was Included in the 13th Five Year Plan of SASTIND and the Ministry of Education," Jilin University World Wide Web site, July 6, 2017, available at https://web.archive.org/web/20191011004621/https://news.jlu.edu.cn/info/1021/42984.htm (in Chinese); "National Defense Science and Technology Key Laboratory Management Methods," Harbin Institute of Technology Architecture School World Wide Web site, April 1, 2017, available at https://web.archive.org/web/20190522041912/http://jzxy.hit.edu.cn/2018/0518/c10586a208951/page.htm (in Chinese).

Additional measures to highlight the potential proliferation threat from Chinese universities might include creating a "Chinese military university list" modeled on the Chinese military company list authorized in Section 1260H of the 2021 National Defense Authorization Act (NDAA).[113] The Wisconsin Project has found that if the administration were to apply the 2021 NDAA's definition of "military-civil fusion contributor" to Chinese universities, at least 61 Chinese universities would fall into this category based on their collaboration with SASTIND or other Chinese military projects.

Publishing such a list, even in the absence of specific regulatory action, could help inform U.S. universities engaging with their Chinese counterparts. While U.S. universities cannot collaborate on dual-use technologies with universities and research institutes that appear on U.S. restricted party lists, they may engage in other forms of collaboration that facilitates the proliferation of U.S. know-how to China. In a 2018 career fair, for instance, the Massachusetts Institute of Technology hosted two universities that are part of the "Seven Sons of National Defense" – Beihang University and Northwestern Polytechnical University – who were seeking to recruit job candidates with advanced degrees.[114]

Support the Development of a CFIUS-like Review Process in Partner Countries

China is expanding its influence in many parts of the world through state policies such as MCF, Made in China 2025, the Strategic Emerging Industries Plan, and the Belt and Road Initiative (BRI). Many countries, while welcoming Chinese investment, may not have a process for evaluating the national security risks that it poses. The United States could usefully provide support in this regard, by advocating for and providing technical support on establishing a review process for such investment, modeled on the Committee on Foreign Investment in the United States (CFIUS).

Without such a mechanism for formal review, it may be difficult for U.S. partner countries to evaluate the risk of Chinese investment or acquisitions in strategic sectors. The CFIUS review process may cover a broad range of transactions, which is well adapted to the diversity of risk from Chinese acquisition, from obvious investments in the dual-use or military sectors, to robotics, green energy, medicine and biotechnology, and more. By supporting the creation of such a review process, the United States would create a permanent institutional mechanism within partner countries, which could have a more sustained impact on China's ability to enter new markets of strategic significance in U.S. partner countries.

[113] "DOD Releases List of Chinese Military Companies in Accordance With Section 1260H of the National Defense Authorization Act for Fiscal Year 2021," Press Release, U.S. Department of Defense, June 3, 2021, available at https://www.defense.gov/Newsroom/Releases/Release/Article/2645126/dod-releases-list-of-chinese-military-companies-in-accordance-with-section-1260/.
[114] "Beihang University," 2018 Fair Company Info, MIT Asia Club World Wide Web site, available at http://asianclub.mit.edu/2018/beihang-university.

Appendix: Chinese SOEs Involved in Proliferation Activities Mentioned in the Prepared Testimony

Aerospace Industry

- Aviation Industry Corporation of China (AVIC)
    - Chengdu Aircraft Industry Group (CAIG)
    - China National Aero-Technology Import-Export Corporation (CATIC)
- China Aerospace Science and Industry Corporation (CASIC)
    - China Space Sanjiang Group Co., Ltd.
        - Hubei Sanjiang Space Wanshan Special Vehicle Co., Ltd.
        - Wuhan Sanjiang Import and Export Co., Ltd.
- China Aerospace Science and Technology Corporation (CASC)
- China International Trust and Investment Corporation (CITIC)
- China Precision Machinery Import-Export Corporation (CPMIEC)

Nuclear Industry

- China General Nuclear Power Company (CGNPC)
- China National Nuclear Corporation (CNNC)
    - Beijing Research Institute of Uranium Geology (BRIUG)
    - China Nuclear Engineering and Construction Corporation (CNECC)
    - China Nuclear Energy Industry Corporation (CNEIC)
    - China Zhongyuan Engineering Corporation (CZEC)

Other

- Beihang University
- China Electronics Technology Group Corporation (CETC)
- China National Heavy Duty Truck Group Co., Ltd. (Sinotruk)
- Nanjing University of Aeronautics and Astronautics
- Northwest Polytechnical University (NWPU)
- Poly Technologies Inc.

PANEL III QUESTION AND ANSWER

COMMISSIONER WONG: Thank you, Ms. Lincy. And thanks to the rest of our panelists for the cogent testimony and the very good recommendations. Let me just kick off the question-and-answer period.

Ms. Lincy, you've detailed a lot there regarding China's activities, or perhaps inactivities and neglect, of proliferation transactions, activities happening within its borders. So, in my time in government, I dealt with a piece of this related to North Korea proliferation concerns. And in my discussions with Chinese authorities, Chinese diplomats, about amping up enforcement against a number of sanctions evaders within their borders, but, in particular, the WMD trade agents and financial reps, one of the responses they gave me was China's a big country. We have lots of transactions and interactions with the North Koreans, if you give us the information, we'll try to move on it, but it's difficult for us to enforce. So, we give them the information and they come back, and sometimes they say, well, the evidence wasn't good enough and we have laws, and we can't violate those evidentiary laws.

If that's the response in the main, my question for you is, do you buy that? And if you don't buy that, what is the motivation on the part of the Chinese government not to make more aggressive moves to crack down on proliferation happening within its borders?

MS. LINCY: Thanks very much for the question, Commissioner Wong. I don't buy it at all. I don't think that anyone can have any doubt about the ability of China to control what happens within its borders. It defies logic.

I think something similar could be said for what happens in the context of discussions at the United Nations about punishing North Korean proliferation, and China always is going to come back and say, well, we did this investigation, but we don't find the evidence to be conclusive. And so, it requires further investigation.

What would be the motivation for not doing something? In a more general sense, anything that benefits U.S. policy priorities is something that China might seek to minimize. And I think that full and robust implementation of U.N. Security Council sanctions on North Korea is one of those things that the United States is seeking to do. And I think that it is in China's interest to sort of not have that succeed or not have it succeed as fully as it could.

COMMISSIONER WONG: Thank you.

Dr. Roberts, thank you for your testimony.

I think I've read a number of your pieces of work, not just your testimony. I'm not sure if if it's your line or if you took this line from someone else, but I think I've read something you've written which is, if the U.S. is not modernizing our strategic forces, we are disarming. And I'm aware that, looking at the life cycle and timeline for some parts of our nuclear triad that we're looking at in the next 10 or 20 years, that we're going to have to start retiring things if we don't keep up with our modernization plans.

So, my question for you is, if that happens, in a world where we begin retiring because we are not modernizing at the right pace, what is the Chinese reaction to that? How does that affect their calculus? How do they view that?

And then, perhaps for Abe, how do our allies view that, in that situation in the next 10 to 15 years?

DR. ROBERTS: Well, it's true we, as a nation, have postponed nuclear modernization as long as possible and painted ourselves into a corner. I served in the Obama administration. We were compelled by the legacy of inattention to this matter to put together a modernization

program, which was largely endorsed by the Trump administration with some modifications, and is now in discussion again. And if we don't modernize, we will be retiring capability in the second half of this decade and beyond.

I don't really know how China views that possibility. Most people haven't really doubted that we would get on with the modernization. But it's clear that President Xi Jinping views the United States as a country in decline and unwilling to defend its interests, if push comes to shove. And this could be seen as confirmatory evidence that we're unwilling to make the investments needed in our defense strategy.

Let me stop there.

MR. DENMARK: Yes, and very quickly, my sense is that our allies and partners would have a similar take, that the nuclear dynamic is not the driving force of their conceptions of American credibility, but, rather, I expect it would be seen within a broader context of concerns that the United States simply isn't taking these issues seriously and would be concerned about what it suggests in terms of American commitment to extended deterrence over the long term.

COMMISSIONER WONG: Just to quickly follow up, if they did see us retiring parts of our forces, where we're dipping below the numbers that we have now, whether it's in our ground-based forces or in our aerial piece of the triad, what do you think the policy reaction would be from our allies? Will they begin to move on some of these capabilities that they are at least perhaps looking at or at least thinking about?

MR. DENMARK: I don't think there's a clear tipping point. One capability here or there, a pushed timeline here or there, I don't think would generate a huge reaction. But if delays compound on one another, to start to severely limit the ability of the United States to use its nuclear capabilities, if needed, then that could have a major impact. But any specific issue I think would be less important than the broader trend that they see it conveying.

COMMISSIONER WONG: Thank you.

Let me turn to my Co-Chair.

COMMISSIONER FIEDLER: So, if we discount for the moment nuclear capability, the Chinese military modernization has certainly boosted their ability in the Indo-Pacific. It's a long way from the United States, so that they have a natural advantage compounded by modernization. We, in a conflict scenario, tend to be at a certain disadvantage. Yes, we have enormous firepower, but we have to protect our forces in ways that we never had to worry about before.

I'm not surprised that allies wonder whether we have the will in every instance, okay, to defend them, and whether or not we, in fact, have a priority list of interests that are more important than others, so that the Chinese have an advantage. Put the nuclear shadow on top of that, and we have a diplomatic problem, it seems to me, of considerable consequence in terms of communicating our will, our resolve. You've characterized it as resolve; I call it our will, our political will, to defend everybody in the way that they thought we were going to defend them when we first made the commitments.

Am I off in an analytic sense on the sort of dilemma that we're facing? Abe?

MR. DENMARK: Not to put him on the spot, but I expect Dr. Roberts have views on this as well.

COMMISSIONER FIEDLER: Yes, I'm sure he does, too.

MR. DENMARK: And I write about this in my written testimony. There is an inherent level of discomfort or uncertainty in any extended deterrence relationship.

COMMISSIONER FIEDLER: Right.

MR. DENMARK: And a constant refrain throughout the Cold War in Europe was would the United States sacrifice New York in order to defend Paris, right?

COMMISSIONER FIEDLER: Right.

MR. DENMARK: So, there's a very understandable regular pace of this. The key for analysts is to be able to pick out the signal from the noise. Is there something going on that's different than a normal level of anxiety? And I think that in Asia that signal is increasing, but I don't see it as generated by China's nuclear modernization, but, rather, the broader geopolitical developments that have been occurring in the Indo-Pacific over the past 20 years, of which the nuclear dimension is just a piece.

COMMISSIONER FIEDLER: That's way I framed it in the conventional sense, in the nuclear shadow.

Dr. Roberts?

DR. ROBERTS: So, I start where Abe started. Extended deterrence is inherently an uncertain circumstance. When one important country, one country capable of defending itself is counting on another to do the job, this is inherently uncertain.

I don't quite see China's advantage in the same way, which is to say, I know China's leaders perceive that they have a greater stake and greater interests in the pursuit of their interests in the region than do we. And thus, they expect that we would back down. The point of nuclear saber rattling in a Taiwan conflict for them would be to awaken us to the asymmetry of stake, and thereby, we back down.

They don't understand what we would have at stake

COMMISSIONER FIEDLER: Yes.

DR. ROBERTS: in a conflict over Taiwan.

COMMISSIONER FIEDLER: Yes, I don't think they do.

DR. ROBERTS: We have at stake our reputation in the eyes of our allies in East Asia, our reputation in the eyes of our allies in Europe. We have an attentive audience in Mr. Putin and other world leaders. And we're committed to the success of the experiment in democracy there. That's a large stake and that's not wished away by the nuclear shadow.

COMMISSIONER FIEDLER: Thank you very much.

Ms. Lincy, I'm going to come back to you in a second round on the China Academy of Engineering Physics. Okay?

Thank you.

COMMISSIONER WONG: Thanks, Jeff.

Let me turn to Commissioner Kamphausen.

COMMISSIONER KAMPHAUSEN: Thank you very much, and thanks to our panelists.

Dr. Roberts, Brad, in the last panel, we had a discussion about the degree to which reassurance at some level on the part of the United States would be perhaps a helpful tactic in reducing some of the growing risks that we face in the area of strategic stability with China. I would infer from your testimony that you might take a somewhat different view than the way that discussion went earlier, which saw the promise of it and lesser downsides.

Would you offer your views on the degree to which reassuring China, perhaps on the issue of missile defense, as an example, is a priority effort, or how would you otherwise characterize it?

DR. ROBERTS: Well, I'd parse out the differences between reassurance and restraint because the conversation in the last panel went to both topics how much restraint to exercise

vis-a-vis China in the development of our strategic posture and how much to compete. And we tend to debate that choice between the two extremes, either restrain or compete. Neither extreme would serve the American national interest well. We need to balance competition in areas where we must compete with restraint where it makes sense from the perspective of our interests.

Now what about missile defense? Missile defense, it's the old consensus, which is attenuated a bit, the old consensus was that we should have protection of the American homeland sufficient to negate the strategic deterrence of rogue states like North Korea and Iran, but not so robust as to cause China or Russia to think that the large-scale strikes of which they are capable would no longer be assured in reaching their targets.

That was the old consensus. It has faltered in various ways, in part, because, as North Korea continues to develop its nuclear capabilities and missiles, to stay ahead requires that we grow the force, the missile defense force, and potentially, put capabilities in outer space. This begins to impinge in a way we haven't intended on China's confidence in its assured retaliation force.

So, I see some well, let me make one further argument about restraint. Whatever we owe or don't owe China, we do owe something to the American public and to our allies. Our allies want to know what they're being asked to sign up to when they're asked to support the American missile defense project, and if it's destabilizing, they're reluctant. And if the American public is being asked to run risks on behalf of other countries, which they are, they should understand what we're prepared to do in the way of protecting ourselves and our allies in that circumstance.

So, I would argue that we owe the American people and our allies a clear statement of our missile defense posture as it looks to the future, rather than the past. And it's probably going to combine elements of restraint and competition both.

COMMISSIONER KAMPHAUSEN: Thanks very much, Brad.

Abe, let me turn to you. In your time when you were responsible for defense policy for Northeast Asia, I'm curious the degree to which discussion of nuclear posture and strategic issues was a part of your interaction with your Chinese colleagues, and perhaps contrast that with your interaction with our allies in Japan, South Korea, and also, Taiwan.

MR. DENMARK: So, in our discussions with the Chinese and our engagements with the Chinese, in government-to-government interactions, the PLA has been extremely reluctant to address these issues. I'm only aware of one such discussion, official discussion, between the United States and China on these issues, dating back to the George W. Bush administration. Just speaking in terms of my engagements with my counterpart in the PLA, the question of nuclear deterrence, nuclear posture, didn't come up at all.

In terms of our engagements with our allies in East Asia, we have established engagements with Japan and Korea on extended deterrence that I participated in regularly, along with the DASD for Nuclear Issues, Dr. Roberts' successor, in which we discussed these issues in great detail.

COMMISSIONER KAMPHAUSEN: Thank you.

I'm going to come back to you in a question for the record. It sounds like it's not the case that - or maybe I'll invite your conjecture on this if the issue was not a part of your discussions in terms of general defense policy, and Dr. Roberts has already said it was not a part of a more specialized dialogue, what do we conclude from that? And I'll frame the question with a little more edge to it in the question for the record to draw your response.

Thank you.

COMMISSIONER WONG: Thanks, Roy.

Commissioner Scissors?

COMMISSIONER SCISSORS: I want to compliment all the witnesses on the clarity of their verbal testimony. I don't know a lot about this field. So, I appreciate when people are especially clear, and I thought all three of you were. So, thank you. And since I just attacked the previous panel, you should know this is a heartfelt thanks.

(Laughter.)

COMMISSIONER SCISSORS: But my question is for Ms. Lincy. I'm in the econ field. I have argued for years, failing the argument has not carried the day that in economics it's rarely effective to sanction individual Chinese firms, unless you sanction a whole lot of them, because the activity will just be switched to another firm. And that is true in anything the Chinese government considers strategic, whether the firm is private or not. They just don't let those activities die and say, "Oh, well, bad firm. Forget it. We're going to lose that economic capability."

The situation may be different here, or it may not, but I'd like you to address, when you're talking about responsive sanctions, or whatever targeting the U.S. does of Chinese entities, is it going to work to sanction individual entities or do we have to think, look, this is an activity the Chinese government is supporting or tolerating, and if we sanction one Chinese entity, it's just going to shift to another Chinese entity, and we really have to be sanctioning anyone involved in the activity or sectors or products?

MS. LINCY: Thanks. It's a great question and one that we get a lot, since we spend a lot of time identifying entities, and you have people who argue that it's kind of a Whack-a-Mole problem. And so you sanction one entity, and then another one just pops up.

I see a real distinction here between sort of the newer phenomenon of the private Chinese actor and the front companies that that actor may set up as compared to the state-owned enterprises and their subsidiaries. And so, I think that, well, if we go back to sort of the early days of U.S. sanctions on China, some of the very early missile-related sanctions, that really targeted the entirety of the Chinese sort of aerospace missile complex, and those penalties were consequential.

There was a period of time of more than a decade where most of the U.S. sanctions on China very much focused on the Li Fang Wei-type party. And I think it's certainly true that the direct benefit of that kind of sanction on preventing proliferation is it's a harder argument to make. I think it still has value, for the reasons that I said earlier and that are explained in more detail in my testimony. Because it just raises transaction costs for that entity; it makes it that much harder for them to continue to operate. It slows things down a bit. But it certainly doesn't stop the trade and again, Li Fang Wei as long as China itself is unwilling to take action on these parties, which it is not willing to do.

I do feel like we have a resurgence over the last couple of years in U.S. sanctions and other types of restrictive measures targeting consequential Chinese entities. That Military Company List, for example, the Military End User List, the sort of investment-related sanctions, there is both, I would say, the foundation for something that can be quite meaningful and the ability to go even further. And I do feel like that can make a difference.

I mean, if you're a Chinese university doing a military project with a major aerospace SOE, and you get added to the Military End User List, for instance, or the Commerce Department's Entity List, like you're not going to close up shop as a giant university and change

your name and do something else. I mean, that will have consequences for academic collaborations and all sorts of things. So, I do feel like some of the sanctions that we've seen more recently have been, and can be, quite consequential.

COMMISSIONER SCISSORS: Thank you. I yield back the rest of my time.

COMMISSIONER WONG: Thank you, Derek.

Let me turn to Senator Talent. Senator?

COMMISSIONER TALENT: Thank you. Yeah, I had to unmute. Thank you, Commissioner.

I'll join Commissioner Scissors in congratulating you all, both on your oral and your written testimonies. I have one question for all three of you, and then, one for Mr. Denmark.

So, I think virtually every other witness we had on the first two panels suggested that we recommend crisis communications with China in order to establish, or attempt to establish, some off-ramps in order to prevent escalation in the event of conflict. Do you all agree with that, and are there any constraints or conditions you would attach to it?

For you, Mr. Denmark, I just have to say I really appreciated your emphasis on the importance of conventional deterrence as a solution to a whole lot of problems, and I especially appreciated your recommendation that the United States seek to move as quickly as possible to establish or to change our posture and include ground-based intermediate-range cruise missiles, particularly, anti-ship missiles. And I'd like to give you an opportunity to elaborate on what I thought was a sterling recommendation. Why do you think that's important? How would we do it, in your view? How would the Chinese view it? That's the end of my question.

MR. DENMARK: Well, why don't I

COMMISSIONER TALENT: If you want to take the second question first, that's fine.

MR. DENMARK: Sure. Why don't I take both, and then, turn it over to the other panelists?

COMMISSIONER TALENT: Okay.

MR. DENMARK: Thank you. Thank you, Commissioner, Senator.

In terms of crisis communications, I do think we need to have mechanisms necessary in order to find off-ramps in order to manage crises. We have established several such mechanisms between the PLA and the U.S. military. I've been involved in the establishment of some of them. The challenge, I think, is not in the mechanism, but, rather, in the willingness of the Chinese to use them in a crisis. And my sense is that the way they make decisions, the way they share information, does not lend itself well to those sorts of communications. But I do think it's something that we should continue to pursue because of the tremendous challenges that crises would represent.

In terms of ground-based intermediate-range missiles, I wanted to make a couple of points on this. I specifically said cruise missiles primarily because I think they have different implications than intermediate-range ballistic missiles, both in terms of how the Chinese would view them, but also in terms of how our allies and partners would view them.

I see the anti-ship cruise missiles as the most operationally effective in terms of enhancing our ability to deter and undermine Chinese counterintervention efforts. And I think that they would be a financially more sustainable and efficient way to deliver those capabilities than from aircraft and ships and submarines that are far more expensive.

Our allies and partners, some of them have expressed a degree of skepticism about this, about deploying them onto their territory. I expect that, as they see the capabilities develop, that their approach may change. And I think we could start by developing these capabilities,

deploying them to a U.S. territory, as in Guam and other places, and then, working with them on exercises to see how they could best be used.

How the Chinese would view it, obviously, I can't speak for them, but I expect they wouldn't like it. I expect they would express deep concerns about stability, that the United States has the temerity to develop something that they've already developed thousands of, which in itself, I think, suggests that there may be something to it. But, overall, I think that it would help the U.S. military present a far more complex and difficult calculation for the PLA, should they decide to try to use force to achieve any of their objectives.

COMMISSIONER TALENT: Thank you.

And I understand my video I can see you all and I see myself and I understand that you can't see me. Staff just told me. So, I'm sorry this is a disembodied voice coming at you.

So, Mr. Roberts, do you want to take the other question, the first question, if you have an opinion?

DR. ROBERTS: I do have an opinion. Thank you.

I agree in the potential value of such mechanisms. I agree with Abe that the political will on the Chinese side doesn't exist. And I think we should bear in mind that in the Cold War, and now, U.S.-Russian context, what made the mechanisms valuable was the fact that they structured a conversation that was already ongoing, that our civilian and military leaders sat together through the Cold War and talked about the problems that were in front of us, not always happily, not always productively, but there was a shared vocabulary, a shared set of concepts, and people who knew each other. Those are all missing and a mechanism won't substitute for them.

Let me just offer one comment on the cruise missile topic. Cruise missiles would add significantly to the American ability to fight its way through an anti-access area denial strategy, but what they contribute they also lack in terms of speed. They are slow to arrive, and against fleeting targets, they're not particularly effective, mobile targets. So, we need a mix of strike capability, both cruise and ballistic, at the theater level.

Let's recall the basic fact that, while we were in compliance with the INF Treaty, China was not constrained. And the basic balance right now, the force balance, is roughly a thousand missiles to zero, not congenial.

COMMISSIONER TALENT: All right. I see my time is up. Ms. Lincy, if you would like to respond maybe, you can do it for the record, to my other question. I don't mean to shut you off, but I'm way over time.

And I will try to re-establish visual contact.

Thank you, Mr. Chairman.

COMMISSIONER WONG: Well, Ms. Lincy, if you do have comments, we do have some time if you would like to. No? That's a head shaking no.

So, let's turn to Chairwoman Cleveland.

VICE CHAIRMAN CLEVELAND: Thank you.

And, Jim, you're never disembodied. You are fully present, even when you're not in the room with us.

(Laughter.)

COMMISSIONER TALENT: Even if only by voice. Okay, great.

VICE CHAIRMAN CLEVELAND: Thank you, all, for your really thoughtful testimony.

And because I'll forget at the end, I want to thank our staffers, particularly Will, who this

is his last effort for the Commission and last day, is that right? So, thank you for a really significant effort in putting this all together for us.

Mr. Abrams, I may summarize your testimony inaccurately, and please challenge it if it's wrong. But in describing in your written testimony U.S. commitments, you described Australia as broadly confident; Japan, deeply concerned, and Korea, hedging. I'm just extracting words from your testimony.

And so, I'm curious, given that range of views on U.S. deterrence policy or posture, what you anticipate the goals or the direction that your recommendation that we have a Secretary-level INDOPAC deterrence dialogue. How would you envision that working? And given this range of views, how would we bring about a hoped-for consensus?

MR. DENMARK: Thank you.

If I were to describe them in total, I think that each is confident in the U.S. extended deterrent commitment, but concerned, and concerned in different ways about different things, but broadly concerned about the broad trends of American power compared to Chinese power, about our shrinking conventional advantages, et cetera, as I detailed in my testimony.

The reason I inserted a discussion about establishing a supplementary dialogue on extended deterrence is because I think we need to take our allies' concerns seriously in a way that we haven't previously, I should say to a degree that we haven't previously, in that with our European allies, we have a multi-decade, robust mechanism to address these issues. Whereas, in our bilateral alliances in Asia, we have some bilateral dialogues that are taken at the Deputy Assistant Secretary level, and sometimes the issues are raised higher. But I don't believe, as some have argued, I don't agree with some analyses that the United States should copy what we do in Europe for Asia.

In fact, there's a very interesting dynamic happening where allies in Europe are looking at our alliance relationships in Asia, and vice versa. My sense is that Asia needs something, our Asian allies need something that's less institutionalized, less formal. They're not looking for collective security between multiple allies, but rather a way to engage with one another and discuss these at a very high level, these issues of deterrence, both at a conventional and nuclear level.

So, my sense was to establish a Secretary-level dialogue on deterrence between these key allies of the United States in order to be able to have these discussions, but not going so far as to institutionalize it in a way that would generate allergies, that would cause a lot of challenges, but, rather, in a way that's tailored to the interests, needs, and concerns of our allies in East Asia.

VICE CHAIRMAN CLEVELAND: Allergies is the word that exactly came to mind as you were talking. When you say, wouldn't generate allergies, are you talking about on the part of the Chinese or on the part of our partners and allies?

MR. DENMARK: Amongst our allies and partners in that concerns about having one security tied to another security, political issues, and historical issues between some of our allies that prevent and make these discussions especially challenging, but a less institutionalized dialogue on deterrence that supplements what we're already doing, I think would be a bit easier for them to consider.

VICE CHAIRMAN CLEVELAND: Okay. Thank you.

And, Mr. Roberts, I have two questions for you.

In your discussion about tailored deterrence, how would you envision tailored deterrence fitting in with something along the lines of what Mr. Abrams just described?

And then, the second question for you is, you talked in your written testimony about

deepening cooperation between Russia and China, and that both are growing their forces and they are talking, if not collaborating, more. I'm curious how your emphasis on an approach of the United States taking of second to none fits into a context where it may be two coordinating or collaborating or cooperating against one.

DR. ROBERTS: Well, so am I. That's one of the big questions we're going to have to answer in the years ahead, whether, as China's nuclear force grows, if it grows to become much more substantial, whether we need a strategic force of our own that's larger as well; whether these are an additive problem or whether China remains a lesser-included problem because it's a smaller force. I think we need to cover both bets, but I also think the barriers to building up the U.S. nuclear arsenal are pretty substantial politically. And one footnote to the China-Russia discussion, and that's the Russians have announced that they're providing assistance to the Chinese in the development of their early warning systems, which has various consequences.

On tailored deterrence, and Abe Denmark's proposal, tailored deterrence we thought of in terms of our adversaries. We've also talked about tailored assurance, recognizing that it takes different things to assure different allies. In Europe, assuring the Poles or the Baltic States is very different from assuring Germany about its security, and there's similar varieties of challenges in the Asia Pacific.

I think that what the allies in East Asia are most anxious about at the core, yes, they're worried about American decline and retreat, and that we might not be prepared to defend them, if we're under severe nuclear threat. They want to know - they understand that, if their vital interests are at risk, the only person with the finger on an American nuclear button is the American president, but they want to know they have a seat at the table when he or she is deliberating whether or not to push the nuclear button.

That's the core deal that the Europeans have at NATO. They not only have a seat at the table, they know where the table is. It's in Conference Room 1 at NATO Headquarters, and there's a nuclear consultative process.

Our allies in East Asia don't have this kind of mechanism at all, and I think they feel its absence. They want to know that, if the chips are really down, their voices will be heard when the American president is deciding whether or not to employ nuclear weapons on their behalf.

VICE CHAIRMAN CLEVELAND: Thank you.

I'm going to have a follow-up for the record on your point on Chinese-Russian collaboration.

I have one final question, and that is for Mr. Abramson and Mr. Roberts. What do you view Chinese perceptions of North Korea's nuclear capability as being? Do you think they view North Korea as leverage, as a threat to their interests? How do you think the Chinese view North Korean capabilities at this point?

DR. ROBERTS: Abe, I'll follow you.

VICE CHAIRMAN CLEVELAND: Either one, Mr. Abrams or Mr. Roberts.

MR. DENMARK: I'm trying to defer to my elder.

VICE CHAIRMAN CLEVELAND: Sorry.

MR. DENMARK: In terms of China's views, I think there's a proliferation of views no pun intended on North Korea, depending on who you talk to, often dependent on which part of the bureaucracy, which part of the Chinese party state they belong to.

But I think, broadly speaking, they see, the Chinese see North Korea as a problem, both in terms of its propensity to cause instability, to cause trouble along China's periphery, but also as a focus for the United States, and as something that keeps the United States, and especially the

United States military, closely engaged in sensitive areas of China's geographic periphery.

Others in China do see necessity for North Korea as a buffer, as leverage, as a useful communist counterpart; whereas, others see North Korea just as a problem that China should get rid of. But, broadly speaking, I think the Chinese leadership, as far as I can tell, sees North Korea as something that they're going to have to manage, as is the United States; that they're concerned about collapse. They're concerned about the implications of what may happen in North Korea for the United States, and that they broadly see those questions through the lens of competition with the United States and what it would mean for that dynamic.

VICE CHAIRMAN CLEVELAND: As North Korea does as well in terms of using us as leverage.

And I apologize. I don't know what I was thinking, Mr. Denmark.

MR. DENMARK: It happens.

(Laughter.)

VICE CHAIRMAN CLEVELAND: Mr. Roberts, do you have anything to add on China's perception of North Korea?

DR. ROBERTS: Well, again, I think Abe sketched it out very ably. I would just add one dimension, and I think that's that they are also concerned about the possibility of war on the Peninsula, where they, as an ally of the North, have to choose sides. And, of course, the context would be not only their thinking about the fate of the political arrangement on the Peninsula, but also the broader U.S. role in the region. And so, I think we shouldn't overlook the fact that China also thinks about the possibility of being at war with the United States over a Korean contingency.

VICE CHAIRMAN CLEVELAND: Thank you.

COMMISSIONER WONG: I think Ms. Lincy has something to say on this point.

MS. LINCY: If that's all right.

I think that we can extrapolate something from China's perspective on North Korea's nuclear capability from sort of the supply. And this comes back to something that Commissioner Wong asked at the beginning. When we look at sort of state-level transfer from China to North Korea, unlike Pakistan, Iran, even early transfers to Saudi Arabia, you don't see the same type of assistance. I mean, North Korea has benefitted from secondary proliferation through Pakistan, but the nuclear program, the missile program, didn't get the same kind of, in my opinion, high-level SOE support.

And what they do get is a lot of this sort of economic help and financial facilitation, and all of that, which speaks to the point that, while China doesn't necessarily want to see North Korea expand its nuclear program and its nuclear weapon delivery program, it doesn't want to see a North Korea collapse, which is what would, I think, motivate and justify a lot of the sort of economic-related support and permissiveness with regard to that sort of economic support from private actors.

VICE CHAIRMAN CLEVELAND: Thank you. Very helpful addition.

COMMISSIONER WONG: Thank you.

Let's move to Commissioner Borochoff.

COMMISSIONER BOROCHOFF: Thank you.

First, I want to say to Dr. Roberts and Mr. Denmark that both of you are answering questions and giving testimony in a way that is very articulate and succinct in the area of nuclear weapons that I know so very little about. And I sincerely appreciate that, and particularly at the beginning, Dr. Roberts, you did it in a way you answered

the question I asked earlier in the day in less than two sentences. And I sincerely appreciate that because I was waiting for an answer.

Ms. Lincy, my question is for you. I'm curious, because I have a great interest in this, how are you it's kind of a rubber-meets-the-road question. You mentioned that you were spending a lot of your time identifying the non-SOE actors that are operating and ought to be on the Entity List. And I'm curious how you're identifying those actors. Methodology-wise, not, you know

MS. LINCY: Yeah. In different ways. And I think it depends to some extent on the sort of beneficiary of the Chinese support. As a starting point, obviously, official designations lead to information about related parties that have not been designated. So I would say from a methodological point of view, our first port of call is which parties have been officially identified as contributing to proliferation in China? If it's an individual, what other companies does that individual own or control? And there's a lot of commercially available information that provides those kinds of relationships. If it's a company, who are the persons that sit on that company's board? Who are its employees? Do those people have any connections to other companies? And then, sort of cross-referencing that with trade data. What are these persons or companies providing to which persons or companies in the countries of concern?

And then, following it up the chain on the recipient side. So, particularly in Pakistan, where there's a great deal of traffic, you know, where China has a lot of sort of SOE direct support to Pakistan, but there is, also this more illicit trade route. So, a lot of Pakistan Atomic Energy Commission front companies or procurement agents, or other representatives of major Pakistani firms are often on the recipient side of these transfers, and then, making the connection up the chain in Pakistan.

But I would say it's a combination of collating corporate registry information, tax information, trade data; in some cases, shipping information; information on business-to-business websites, tenders; sometimes noticing multiple parties sharing the same address, that kind of thing.

The drawback, I'll just acknowledge, is that the information that's available can be uneven from one country to another. Sometimes things can be commercially available, and that makes it easier to research a country. And I would put Pakistan and Russia in that boat.

China previously sold its customs-related data and you could buy it and consult it. And a number of organizations like ours used that information to identify sanctions evaders in China that were supporting, in particular, North Korea. And now, the information is no longer available. So, there's, obviously, something of a cost to mining this type of information.

I hope that answers you question.

COMMISSIONER BOROCHOFF: Yeah, you did. And I think it leaves the obvious question or open space as to how we're going to figure out the rest of the information we need to actually accomplish filling out the Entity List the way it should be.

So, I really do appreciate it. Thank you.

COMMISSIONER WONG: Thanks, Bob.

Commissioner Glas?

COMMISSIONER GLAS: Hi. Thank you, all, so much for your testimony. Your written comments were very detailed, and each of you had different types of recommendations for the Commission that I thought were extremely helpful.

Ms. Lincy, just actually to sort of fill out some of the comments that you had on the last question, I'm trying to get a better understanding from your testimony how pervasive some of

these activities are behind the scenes with Chinese firms, with those in Pakistan, Iran, and Saudi Arabia, other locations of the world that may not share our same interests, and what the national security implications are.

We've spent a lot of time in the first two panels talking about the Chinese weapons systems comparative to U.S. and other areas of the world, but I'm trying to think about some of the illicit trade that's happening to other countries of the world and how we're controlling not just that illegal activity, but ensuring that this does not get into the wrong hands. And what is our crisis communication going to be like when it is in the wrong hands of somebody in Iran, for example?

So, I don't know if there's a way to quantify it based on some of your research. I know you're developing lists and you are reporting those lists. But if there's a way that you could provide a little bit more background, I think that would be helpful.

MS. LINCY: Sure. I will try, and hopefully, provide an answer that's not too scattered.

I think it depends on the country. I would say the activities are very pervasive, particularly because we're talking about an enormous volume of trade that's in the sort of catch-all category of dual use, the majority of which is not controlled at all by sort of multilateral export control regimes. So, it may be controlled in the context of certain broad catch-all type controls that countries like the United States place on trade with countries of concern, but we're talking about items, materials, equipment, that can be very commonly traded around the world. So, you have that additional layer or challenge of identifying the illicit transaction or the transaction that's going to a party of concern.

One of the, let's say, rising risks I see is that many of the earlier cases of transfers of dual-use items that are useful in missile and nuclear programs, organized by, let's say, private actors in China, were often either sort of second-rate Chinese-produced technology or re-transfers, re-exports of U.S. or European technology, which countries like Iran have preferred.

But, with the heavy investment by China in things like military-civil fusion and other state-run programs, you have a real qualitative improvement in the Chinese domestic manufacturing market. And so, in the way that before we were able to, the United States, identify routes of concern or end users of concern through our monitoring of this kind of trade originating in the United States, the more that originates in China, I think maybe the harder it will be for us to sort of understand the bounds of it and where it's going.

So, I'll leave it there. I don't know if I confused you more or I provided greater insights.

COMMISSIONER GLAS: No, that was helpful.

Any additional comments?

Okay. Thank you.

COMMISSIONER WONG: Thank you, Commissioner.

Next, we have Chairwoman Bartholomew.

CHAIRMAN BARTHOLOMEW: Thanks very much.

And thank you to all of our witnesses for the work that you do and for the testimony today.

I have two questions, one of which I'm going to take, since Alex started all of this by noting that some of the Commission's recommendations in our early years were peculiar, I'm going to end with what I --

COMMISSIONER WONG: All of those recommendations did not come from or, no, did come from Commissioner Bartholomew. Those are the ones I found peculiar.

(Laughter.)

CHAIRMAN BARTHOLOMEW: I have a question that might sound kind of peculiar. But, before I ask that question, I wanted to ask, actually, about Hong Kong. There had been some concerns before the CCP took over Hong Kong about Hong Kong being used as a platform or sort of a way station for North Korea and others to move goods, dual-use goods or items for proliferation purposes through Hong Kong. And I'm wondering if you have any thoughts on how now the CCP's presence might change that. Is this something that we need to be more concerned about? That's the first question. And I won't call that the peculiar one.

The peculiar one is I'm just curious what you think China would do if Pakistan and India got into a nuclear war. Anybody?

All right, Abe, I'm going to put you on the spot.

(Laughter.)

VICE CHAIRMAN CLEVELAND: I didn't think the question was peculiar, but the silence is.

MR. DENMARK: To address your question on China, Pakistan, India, I have no idea how China would react. I think China would be extremely concerned about containing a conflict, be it conventional or nuclear, so that China itself is not affected by it. I think they would be concerned about the implications of such a conflict, be it, if nuclear weapons were used, what happens with fallout, the regional instability, the economic downturn that comes from that? But, before all that, I think the main concern would be keeping whatever instability is happening out of China.

CHAIRMAN BARTHOLOMEW: Anybody else on that one or on the Hong Kong question?

DR. ROBERTS: Well, I would add to the South Asia discussion that I think the concern underlying your not very peculiar question, the underlying concern might be that China might choose to jump into such a war on the side of its ally. I think that's unlikely. Sticking your neck out into an ongoing nuclear war, pretty high risk. My sense of it is that China would default to its role as a Security Council member and seek joint action aimed at the earliest possible cessation of the conflict, joint political action.

CHAIRMAN BARTHOLOMEW: All right. Thank you.

Anything else?

MS. LINCY: I'm happy to jump in on the Hong Kong question.

CHAIRMAN BARTHOLOMEW: Please.

MS. LINCY: So, when I was preparing my testimony, we sort of deliberately kept Hong Kong off of the list when we were looking at sort of re-transfers through China and Chinese private entities, because, for the period of time that we're looking at, Hong Kong was sort of separately, you could say separately administered and controlled, and I think had all of the problems previously of a major trading hub geographically proximate to China that was exploited for the purposes of transferring technology, because you could very easily sort of receive, repackage, and send on goods of concern.

I think that now the Hong Kong question becomes even more of a challenge because it kind of dovetails with the concern about China's control of critical infrastructure around the world, and the Port of Hong Kong, and the role that the Port of Hong Kong plays in global trade. And so, I would have a concern that the problem would shift from one of this is what happens when you are dealing with a place that sees a lot of trade to this is going to be an opportunity for China to sort of streamline or allow its private actors to streamline the sort of proliferation supply

path, let's say.

CHAIRMAN BARTHOLOMEW: All right. Thanks very much.

COMMISSIONER WONG: Thank you.

My Co Chair, Mr. Fiedler.

COMMISSIONER FIEDLER: I want to come back to Ms. Lincy, since you've done so much research into individual companies. You made reference to the EO, the Executive Order, restricting investment in the Chinese military-related companies and the phrase directly controlled/owned, blah, blah, blah.

What would your definition of control be, in your mind, of a subsidiary or a secondary company to a primary Chinese military-related entity? So, if CETC owns 47 percent of somebody, do you think they control them?

MS. LINCY: I don't have a good answer to your question. I would say, yes, in most cases, that level of stake I would consider to be, even if it's not a controlling stake, it's probably a majority stake. So, I would consider that to be a controlling stake. But this is the kind of question that I think lawyers spend a great deal of time parsing, particularly when it comes to advising companies about implementing U.S. sanctions like this.

COMMISSIONER FIEDLER: Okay. Thank you. Yeah, I'm fine.

COMMISSIONER WONG: Thank you.

We have some time here and I wanted to go back to Abe. You reference in your written testimony the prospect of a fait accompli, in particular, in a Taiwan scenario. Now we've had a hearing here on Taiwan this year, and a number of the Commissioners are quite familiar with the dynamics of a Taiwan contingency.

But, for the purpose of refreshing our knowledge, and, also, for those who are watching this testimony, perhaps you could talk a little bit about and explain the fait accompli scenario, and in particular, how that is affected or exacerbated by China's diversification and expansion of its nuclear forces.

MR. DENMARK: Sure, and happy to do that.

Taiwan is, I think, the most pressing and large-scale version of this concern, but certainly not the only, in that there are concerns that China could attempt something similar either in the South China Sea or the East China Sea on features also held by U.S. allies, partners, or other countries. But Taiwan I think is the largest and most pressing.

The concern is that China may attempt a fast, sharp military stab at Taiwan that would be over before the United States would have the ability to respond with the full weight of its capability; that it would take time for the United States to move capabilities from other theaters, to build up enough force in order to decisively intervene against a large, sharp invasion, attempted invasion, by the Chinese the concern being that China would try to accomplish its military objectives quickly, declare victory, declare an end to the conflict, and then, put the United States in a position where it would be, basically, attempting to restart a conflict in order to compel China to leave what is already occupied.

And the role of nuclear weapons, theoretically, in this scenario would be China saying, we've accomplished our objectives. We are done, and if the United States or any other country tries to do something about it, then we will use nuclear weapons to defend ourselves.

And the concern that some have would be that China, by building a more diversified, a more sophisticated nuclear capability, would have a more tailored ability to threaten and, potentially, even use nuclear weapons in that way, both in a regional context and against a specific military counterforce, in a counterforce way in a regional theater.

I think that's certainly a reasonable concern for people to have. It's not a concern that I am deeply focused on, especially in the nuclear realm. I should say, especially in the nuclear realm because my sense is that the calculus of nuclear deterrence still works; that if China were to threaten nuclear use in any of those sorts of scenarios, that it would necessarily need to consider how the United States would respond.

As Dr. Roberts said, these issues are extremely important to us. The status of Taiwan, our commitments to our allies, is of deep importance to the United States. And the idea that China would be able to threaten us with a nuclear response I think would be lacking credibility because of the tremendous advantages that the United States has, and I expect will continue to have, in these scenarios.

But the main point I would make and I'll finish on this, Commissioner Wong is that, to me, the concerns about the fait accompli is not a nuclear concern, but, rather, it's a conventional military concern. And the appropriate response to it is not to beef up a nuclear capability, but rather, to ensure our conventional capability to make sure that China does not have the ability to try to present us with that sort of a challenge.

COMMISSIONER WONG: I agree with you that this is mainly a conventional issue for us, an issue of conventional deterrence.

But, going back to the nuclear point, in the logic of deterrence, which you are confident still applies in that fait accompli scenario, how is that affected by U.S. development of low-yield theater nuclear weapons? And this is what I mean by that: if the fait accompli scenario is dependent perhaps in part on the Chinese not expecting the United States to or, basically, putting us in the position of having to decide to use nuclear force in order to dislodge them from Taiwan, and if that nuclear force is limited to mainly strategic weapons, we're likely not going to make that decision, or it would be much harder to make that decision. But when we have access to low-yield theater tactical nuclear weapons, perhaps a decision is less hard. Is that something that affects the logic in that scenario in your view?

MR. DENMARK: The discussion is getting a bit theoretical here. So, it's difficult for me to really comment on the utility or lack of utility in any specific scenario, other than to say that, in the writings of the PLA that I've seen on nuclear use, they see a pretty clear division between conventional and nuclear, in that there are concerns about uncontrolled escalation, as we talk about them, their concerns are much more they have much fewer concerns about uncontrolled escalation than we do.

So, how China may react to those sorts of capabilities, the use of tactical nuclear weapons, the threatened use of tactical nuclear weapons, I think is very unclear. Unfortunately, because the scenario is pretty vague, it's impossible for me to say how one system would be more effective than another at this point.

COMMISSIONER WONG: Thanks.

Dr. Roberts?

DR. ROBERTS: May I jump in?

COMMISSIONER WONG: Sure. Please.

DR. ROBERTS: So, the argument in favor of a low-yield option in the deterrence toolkit is really an argument about the use, the possible employment of nuclear weapons on land, on targets where you might generate a lot of debris from the contact of the fireball with the ground. But, in a maritime environment, you don't have that particular issue.

So, the argument in favor of a low-yield option in the U.S. nuclear arsenal is really an argument that relates to Russia and the European theater. There hasn't been an argument made

in the Asian theater.

There has been an argument made about the value of being able to forward-deploy non-strategic nuclear weapons with fighter bombers. We do deploy such weapons in Europe, and we say that they are a symbol of the transatlantic link, of the fact that somebody can't attack a U.S. ally in Europe and expect not to automatically engage U.S. strategic forces.

And when we retired the Tomahawk nuclear cruise missile in 2009, we told our Japanese and South Korean allies that these dual-capable aircraft with bombs, nuclear bombs, would be available for crises and wartime deployment if they were deemed necessary and appropriate in the circumstance by the United States and its allies.

That's a part of the nuclear modernization plan that gets very little attention and that our allies in Japan, in particular well, and South Korea keep a close eye on to make sure that we are not relinquishing the capability that they uniquely associate with extended nuclear deterrence. And what matters to them is not the yield of the bomb or whether it's called strategic or non-strategic, but whether the United States is forward-projecting the umbrella, rather than keeping the umbrella at home. They feel a forward-projected umbrella is more credible.

COMMISSIONER WONG: Thank you.

I turn to my fellow Commissioners.

COMMISSIONER FIEDLER: Then we are done for the day.

And I want to thank you very much. This has been a vibrant day, shall I say? But we've learned a great deal.

And I really do appreciate the work that, clearly, went into the written testimony and for your participation today.

I don't have the information on our next hearing. We don't have a next hearing scheduled.

Okay. Thank you very much.

(Whereupon, the above-entitled matter went off the record at 3:06 p.m.)