TAKSHASHILA INSTITUTION

China's Nuclear Ambiguity and its Implications for India

Kartik Bommakanti and Suyash Desai

TAKSHASHILA DISCUSSION DOCUMENT 2021 - 01

V1.0, 07 April 2021

Executive Summary

China's evolving security dynamics with the United States have compelled it to rethink its nuclear strategy to achieve effective deterrence. It is aiming to modernise its nuclear arsenal and increase its nuclear ambiguity through conventional-nuclear entanglement. Ambiguity will increase the risks of mischaracterisation and can have a destabilising impact on the Indo-Pacific region. This paper highlights two areas where India ought to be most concerned: the size of China's increasing nuclear warhead stockpile, and its evolving nuclear posture that involves a growing number of dual-capable missiles. In response, India will not only have to consider a shift in its posture, but also supplement its current arsenal with non-nuclear strategic capabilities such as cyber, electronic and space weapons for establishing credible deterrence.

Attribution: Kartik Bommakanti and Suyash Desai, "China's Nuclear Ambiguity and its impact on India," *Takshashila Discussion Document 2021-01*, April 07, 2021, The Takshashila Institution.

I. Introduction

China's nuclear strategy has largely remained unchanged since it exploded its first nuclear device in 1964:[1] it is based on achieving deterrence through assured retaliation. A crucial requirement for assured retaliation is the survivability of one's arsenal following the first strike by an adversary, whether conventional or nuclear.[2] However, its current security dynamics with the United States (US) are compelling China to rethink its operational capabilities to achieve effective deterrence. Beijing's challenges are compounded by the US' Conventional Prompt Global Strike (CPGS) system and Ballistic Missile Defence (BMD) capabilities.[a,3] China expert Lora Salmaan argues that "Chinese analysts view CPGS as part of a larger US effort to achieve 'absolute security', with BMD as the shield and CPGS as the sword - such that Washington is able to act pre-emptively."[4] This combination of the CPGS and BMD is arguably one of the key drivers for China's aggressive attempts to modernise its nuclear arsenal and increase its nuclear ambiguity through conventional-nuclear entanglement.

Analyst David C. Logan, meanwhile, argues that conventional-nuclear entanglement can be said to be in practice when the following conditions are met:

- Both conventional and nuclear systems are located in the same geographic area;
- The same institutions and systems control them;
- They are subject to similar employment practices;
- They rely on similar delivery systems.[5]

Such entanglement enables a State to deter potential aggressors by creating uncertainty and increasing nuclear escalation risks. At the same time, however, it also increases the

[a] The CPGS allows the US to attack high-value targets or fleeting targets at the start of or during a conflict, while the BMD enables interception of an incoming missile.

danger of an accidental nuclear exchange due to mistaken assumptions.[6] Miscalculations could lead to an inadvertent escalation and limited nuclear use.[7]

In China's case, conventional-nuclear entanglement is just one component of ambiguity. Others include the ambiguity related to China's No-First Use (NFU) nuclear doctrine, newer capabilities, opacity pertaining to the number of nuclear warheads,[8] the probable change of posture to launch-on-warning (LOW)[9] and possible development of tactical nuclear weapons.[10] Although these developments are primarily aimed at avoiding nuclear coercion, enabling a second strike and limiting the US' options in case Beijing launches an offensive to reunify with Taiwan. Such developments can also have a destabilising impact on the region. For instance, the expansion of China's nuclear warheads or greater co-mingling of conventional and nuclear forces is likely to impact India's strategic calculations.

This paper explores China's increasing nuclear ambiguity and its impact on India. The first section discusses the differences between the Chinese and Western scholarly community's understanding of essential concepts like 'deterrence', 'coercion', and 'ambiguity'. The second reviews the development of China's nuclear forces and strategy. The third outlines the factors that create ambiguity and examines the role of ambiguity in shaping China's nuclear posture and trajectory. The paper closes with an analysis of the implications of China's nuclear ambiguity for India.

II. Chinese Doctrinal Concepts: Deterrence, Coercion, and Ambiguity

Chinese understanding of the doctrinal concepts of 'deterrence', 'coercion' and 'ambiguity', differs from that of the Western scholarly community. American political theorist Michael J. Mazarr defines 'deterrence' as an act of discouraging states from taking unwanted actions,[11] a type of coercive behaviour that threatens an adversary with punitive measures and deters it from its intended course of action. A related notion is what Thomas C. Schelling calls 'compellence',[12] or a threat to force the rival state to take action that it does not want to take.[13] Li Bin, a Chinese scholar on nuclear issues, explains the difference between the two terms: in 'deterrence', the use of coercive behaviour is to *maintain* the status quo; in 'compellence', it is to *change* it.[14] He also argues that the distinction is based on their probability of success, as compelling a rival state to do something is more difficult than deterring it from doing something.[15]

Although Chinese theorists borrow these concepts, they view them differently. Li Bin argues that Chinese theorists, rather than viewing these concepts in isolation, pay attention to the process of conflict escalation as various issues in a conflict are interrelated.[16] Indeed, some Chinese scholars suggest that deterrence and compellence are indistinguishable and can be understood using Thomas Schelling's broader conceptualisation of 'coercion'.[17] They use the term *weishe,* which is often translated in English as 'deterrence' by official Chinese sources;[18] and they do not use the term *weibi*, which means compellence.[19] "So when Chinese scholars use the term 'nuclear deterrence,' it includes the idea of nuclear compellence, which makes their use of the term

'nuclear deterrence' equivalent to the term 'nuclear coercion' as it is used by the US scholars," explains Li.[20] Similar explanations can be inferred from the 2001 *Science of Military Strategy* (SMS),[21] an important volume on Chinese strategy, and *Intimidation Warfare,*[22] a definitive anthology by Lt Gen Zhao Xijun, former Second Artillery Corps' deputy commander from 1996-2003.[23] The 2001 SMS elaborates on the two basic roles of strategic deterrence: to dissuade the opponent from doing something through deterrence, and to persuade the opponent what ought to be done through deterrence. Both demand the opponent to heed the deterrer's will.[24] Similarly, as Chase and Erickson highlight, Gen. Zhao in his volume notes that there are many examples of countries using *weishe* to prevent other countries from taking certain actions and compelling other countries to submit to their demands.[25] Despite these select texts, Chinese strategists maintain that China's nuclear strategy is defensive in nature and primarily focuses on deterrence (and not compellence), counter-nuclear monopoly, blackmail and threat, and retaliatory nuclear strike, as detailed in the 1987 SMS, the PLA's first comprehensive text on military strategy after 1949.[26] In principle, as M Taylor Fravel argues, it is consistent with China's long-held military strategy of active defence.[27]

Even as these concepts might intuitively be straightforward, either deliberate or unintentional ambiguity complicates them. Ambiguity intensifies the security dilemma, raises tensions, and increases the likelihood of conflict.[28] Robert Jervis argues, "The spiralling effect of intense dilemmas increases the probability of pre-emptive and preventive war, especially when the fulcrum of balance is shifted."[29] Furthermore, uncertainty fuels brinkmanship that could lead to a nuclear crisis.[30] There is also the possibility of "lower-level nuclear escalation" by some states that have broader objectives.[31] David C. Logan highlights that in a conflict with lower-level violence, the party with a relatively inferior military would be willing to use autonomous risk, identifying the introduction of nuclear weapons as a development that would enhance

the shared risks in a limited war.[32] Such behaviour, however, still poses "a threat that leaves something to chance"—manipulating the risks of unintended escalation and accidental war to compel their adversaries.[33] Barry Posen also describes the factors for unintentional escalation despite States' shared desire to avoid nuclear exchange:[34] Security dilemma, institutional dynamics of military organisation, and the fog of war.[35]

The 2004 *Science of Second Artillery Campaigns* (SSAC), written only for the Chinese security establishment, creates ambiguity—intentionally or not. Although the SSAC's first edition in 1996 clearly states the service strategy as "emphasise deterrence, effective counter attack" (*zhongzai weishe, youxiao fanji*),[36] the ambiguity stems from the SSAC's 2004 edition which contains suggestions implying the role of nuclear weapons in a conventional conflict.[37] The contention is with China's mixing of nuclear and conventional deterrence during crises that could weaken the firebreak between the conventional and nuclear war. Furthermore, there are key passages in the SSAC that imply scrapping of the NFU and threatening nuclear attack to deter conventional attacks against the mainland.[38] Thomas J. Christensen argues that China's NFU is clouded with parenthetical additions on the blurring of firebreak between conventional and nuclear warfare, resulting in ambiguities.[39]

The ambiguity gets compounded by understanding entanglement in China's conventional-nuclear forces and the military-technical dimensions for the co-mingling, as studied by Caitlin Talmadge.[40] She identifies geographical, operational and technological entanglements and highlights both Schelling and Posen's intentional and unintentional escalation risks in Chinese deterrence calculations.[41] Another such example of ambiguity is from the 2013 SMS,[42] which cautions that escalation could lead to a nuclear clash "if China fails to adopt the correct degree of deterrent threat."[43] Although most Chinese scholars focus on will and display of capability to deter the

enemy, some maintain ambiguity on the use of force to influence future deterrence calculations.

Nevertheless, Chinese strategists view nuclear deterrence as fundamental to national security and give it policy priority.[44] President Xi Jinping, too, in his speech at the upgrading ceremony of the Chinese missile force in 2015, called nuclear deterrence "a fundamental force for our country's strategic deterrent, a strategic pillar for our country's great power status, and an important cornerstone in protecting our national security."[45]

III. China's Missile Force: Formation and Evolution

This section traces the formation and evolution of China's missile force.

1. China's Missile Force

The Second Artillery Corps (SAC), the predecessor of the current People's Liberation Army Rocket Force (PLA RF), was created in 1966, just two years after the People's Republic of China (PRC) conducted its first successful nuclear test at Lop Nor, Xinjiang.[46] At the time of its formation and in subsequent decades until 2016, it was an independent branch functioning as a service, directly under the Central Military Commission's (CMC) control.[47] Since its formation, it has been responsible for China's conventional and nuclear-armed missiles. Fravel notes that the formation of the SAC was an example of China's civilian leadership's dominance over nuclear strategy decision-making.[48] He notes that Premier Zhou Enlai, as a member of the Politburo Standing Committee and Central Special Commission chair, summoned Zhang Aiping, the first PLA Navy (PLAN) commander, to create a unit for China's missile force in May 1965.[49] The unit was supposed to be called the rocket artillery force (internally) and Second Artillery (externally); however, Zhou insisted on proceeding with Second Artillery to maintain the newly-formed unit's secrecy.[50] Soon after its formation, it got caught up in the politics of the Cultural Revolution.

Although the SAC was formed in the 1960s, its operational principles were finalised only in the early 1980s, after Deng Xiaoping, then CMC Chairman, met the Central Committee and CMC leaders to discuss force development.[51] There was also a striking change in the force's character since 1985 as it developed long-range nuclear missile capabilities and invested in a powerful conventional arm.[52]

2. Force Development

China successfully tested the medium-range Dong-Feng-2 (DF) in 1964, followed by a test with a nuclear warhead in 1966.[53] More importantly, following the successful test of DF-2, it also rolled out a plan *(banian sidan)* in 1965 to develop four missiles in eight years capable of deterring regional and extra-regional forces.[b,54] Despite testing, China could not deploy most of them until the late 1980s and early 1990s.

There were two significant limitations with this set of ballistic missiles. First, the process of erecting, fuelling and firing these missiles would take hours, making them vulnerable to a first strike.[55] Two, the gigantic size, especially of DF-4s and DF-5s, restricted their mobility, thus compelling them to be silo-based and making them relatively easy targets for the US and the Soviet Union.[56] A shift happened in 1985, when the State Council and CMC reorganised China's ballistic missile programme[57] to reduce the redundancies and vulnerabilities associated with the country's first-generation missiles.[58] The reform emphasised on developing second-generation missiles, which would be solid-fuelled, nuclear-armed, road/rail-mobile and could be fired more quickly.[59]

Although research on two-stage, solid-fuelled ballistic missiles started in 1967, the first DF-21 class missile, which was inspired by the submarine-launched JL-1 variant, was not tested until 1985.[60] Further testing continued throughout the early 1990s, and the DF-21 was finally commissioned in 2000.[61] After commissioning, it gradually replaced the DF-3 missiles from the SAF's inventory.[62] Currently, the DF-21A variant is China's two-stage, solid-fuelled, road-mobile, regional deterrent nuclear missile with a range of about 2,150 km.[63] It covers China's primary and secondary strategic directions like Taiwan, the South China Sea and major cities in north India, including New Delhi. Out of the four DF-21

[b] These were DF-2, DF-3, DF-4 and DF-5 capable of striking Japan, the Philippines, Guam and the Continental US, respectively. They were all liquid-fuelled, silo-based ballistic missiles.

variants, the DF-21D, sometimes also dubbed the "carrier-killer," is designed to attack ships at sea.[c][64]

Similarly, China started working on the DF-31/JL-2 class solid-fuelled, three-staged, road-mobile ICBM in the mid-1980s but did not conduct the first test until 1999.[65] The missile was finally deployed with the SAC in 2006.[66] The DF-31 clocks 7,200 km, while the DF-31A—an upgraded variant was commissioned in 2007—can cover 11,200 km.[67] The former can reach targets in Guam, India and Russia, while the latter can cover the entire continental United States. Kristensen and Korda estimate that China deploys about 24 DF-31A ICBMs in four brigades.[68]

The PLA also displayed its latest ICBM, the DF-41, during the 2019 National Day parade.[69] Authoritative Chinese sources claim that this missile can deploy as many as ten warheads.[70] PLA observers, however, argue that the number is more close to three warheads along with having additional capabilities like decoys and penetration aid.[71] Currently, the range for this ICBM is not known, but the rhetoric from China indicates that it can reach any part of the continental US. The DF-41 is expected to replace the silo-based DF-5s in the future and could be launched from silos, railcars and transporter erector launchers (TELs).[72] Recent reports suggest that China has constructed at least 16 smaller silos in the training area, located east of the city of Jilantai in the Inner Mongolia province.[73] These silos are smaller in size than the existing DF-5 silos.[74] The DOD claims that these silos are probably used to develop a concept of operations for silo basing for the DF-41.[75] Additional silos also mean that China is concerned with the vulnerability of its arsenal to a pre-emptive strike. But as the 2020 DOD report asserts, the silos at Jilantai

[c] Its capabilities are still being tested. A recent report highlighted that the DF-21D had successfully managed to hit a moving target during drills in the South China Sea. But Western scholars have expressed serious reservations about this claim.

provide further evidence about China's move to keep at least a portion of its force on a LOW posture.[76] Meanwhile, China has also retained the silo-based DF-5 ICBMs and made them capable of carrying multiple warheads, with each missile capable of carrying up to five.[77]

China is also deploying the DF-26 intermediate-range road-mobile dual-use missile in large numbers.[d,78] The 2019 US Department of Defense (DoD) *China Military Power report* claims that the PLA has around 80 DF-26 missiles,[79] while Kristen and Korda estimate that around 70 are currently deployed with the PLA RF.[80] Some Chinese analysts claim that like the DF-21D, the DF-26's improved control surface and guidance systems enable China to target moving objects at sea.[81] Moreover, its dual-use capability makes it an important addition to China's nuclear missile inventory. Put simply, multiple variants of the DF-21, DF-31, DF-41, DF-5 and DF-26 together form the core of China's land-based nuclear missile force.

Table 1. China's Land-based Ballistic Missiles

Missile	Class	Range (km)	Type
DF-4	IRBM/ICBM	5,500	Liquid-fueled
DF-5A/DF-5B	ICBM	13,000	Liquid-fueled
DF-21	MRBM	2,150	Solid-fueled
DF-26	IRBM	4,000	Solid-fueled
DF-31	ICBM	7,200	Solid-fueled
DF-31A	ICBM	11,200	Solid-fueled
DF31 AG	ICBM	11,200	Solid-fueled
DF-41	ICBM	Unknown	Solid-fueled

Sources: China Power Team, 2019.[82] Missile Defense Project, 2020.[83] Hans Kristensen and Matt Korda, "Chinese Nuclear Forces, 2019."[84]

China's sea-based nuclear deterrent system is still under development. It currently operates four Jin-class ballistic missile nuclear submarines, which are based in a naval base

[d] The missile was first displayed during the 2016 military parade.

near Yulin on Hainan Island.[85] Another two Jin-class vessels are under construction.[86] It is also reportedly focusing on building third-generation (Type 096) SSBNs, which would be quieter, stealthier and faster.[87] However, China's past experiments with the SSBNs have failed as its first-generation, the Type 092 or Xia-class, submarine, which was commissioned in 1987, failed to complete a single deterrent patrol.[88] Each Jin-class submarine can carry up to 12 JL-2 submarine-launched ballistic missiles.[89] The JL-2s can clock up to 7,200 km, which enables China to target India, Russia, Guam, Hawaii and Alaska, but not the continental US if it uses the South China Sea as a naval bastion.

China's air-leg is the most under-developed of the nuclear triad. The 2018 DoD *China Military Power* report confirms that the PLA AF was reassigned with the nuclear mission.[90] One of the H-6 aircraft variants and the latest H-20 bombers will most likely have nuclear missions in the future. The report also says that China was likely to soon deploy nuclear-capable, air-launched, two-stage, solid-fuel ballistic missiles and is working on air-launched cruise missiles with dual functions.[91]

While China has increased its nuclear arsenal survivability by shifting from liquid-fueled, silo-based missiles to solid-fueled, mobile ballistic missiles and developing a nuclear triad, it has also focused on development and deployment of its conventional arsenal. Its conventional missile inventory includes Short-range Ballistic Missiles (SRBMs), Medium-range Ballistic Missiles (MRBMs), Intermediate-range Ballistic Missiles (IRBMs), Intercontinental Ballistic Missiles (ICBMs), Cruise Missiles and Hypersonic Glide Vehicle (HGV)[92] (See Table 2).

Table 2. China's Conventional Missiles

Missile	Class	Range (km)
YJ-18	Cruise Missile	220-540
DF-17	HGV	1,800-2500
DF-12	SRBM	420
DF-11	SRBM	280-300
DF-16	SRBM	80-1000
DF-15	SRBM	600
HN-3	Cruise Missile	3000
HN-2	Cruise Missile	1400-1800
HN-1	Cruise Missile	50-650

Source: *Missile Defense Project," Missiles of China,"* Missile Threat, June 14, 2018.[93]

IV. China's Nuclear Ambiguity: Its Role and Costs

China's nuclear strategy has largely remained unchanged since 1964 when it first exploded its nuclear device. But the complete official explanation of its nuclear strategy only appeared in the 2006 defence white paper, which claimed that China pursues a "self-defensive nuclear strategy."[94] This nuclear strategy has two pillars: 1) Deter other countries from threatening China with nuclear coercion and blackmail; and 2) Retaliate if attacked with nuclear weapons.[95] China has repeated this stand, with an emphasis on its NFU pledge, over several white papers issued after 2006.[96] The 2008 defence white paper, for instance, claims that China's nuclear force will not target any country in peacetime but it would place its forces on alert if China comes under a nuclear threat. Furthermore, it would "resolutely counterattack against the enemy" with nuclear weapons if attacked with them in the first place.[97] It also claimed that China would not use nuclear weapons against a non-nuclear-weapon state or in a nuclear-weapon-free zone.[98]

However, Western scholars and policymakers are sceptical of China's declared NFU. For instance, the 2019 DOD report on China's military power highlights "ambiguities in China's NFU conditions,"[99] while the 2018 *Nuclear Posture Review* examines the situations in which China might conclude "that it could secure an advantage through the limited use of its theatre nuclear capabilities."[100] Some Chinese scholars have also questioned the country's stated NFU policy, arguing that "China's adherence to unconditional no first use might embolden its enemies, which may then use their advanced conventional weapons to attack and defeat China."[101] To avoid such a situation, these scholars suggest, China should adjust its policy to a conditional NFU.[102] Other analysts, meanwhile, have

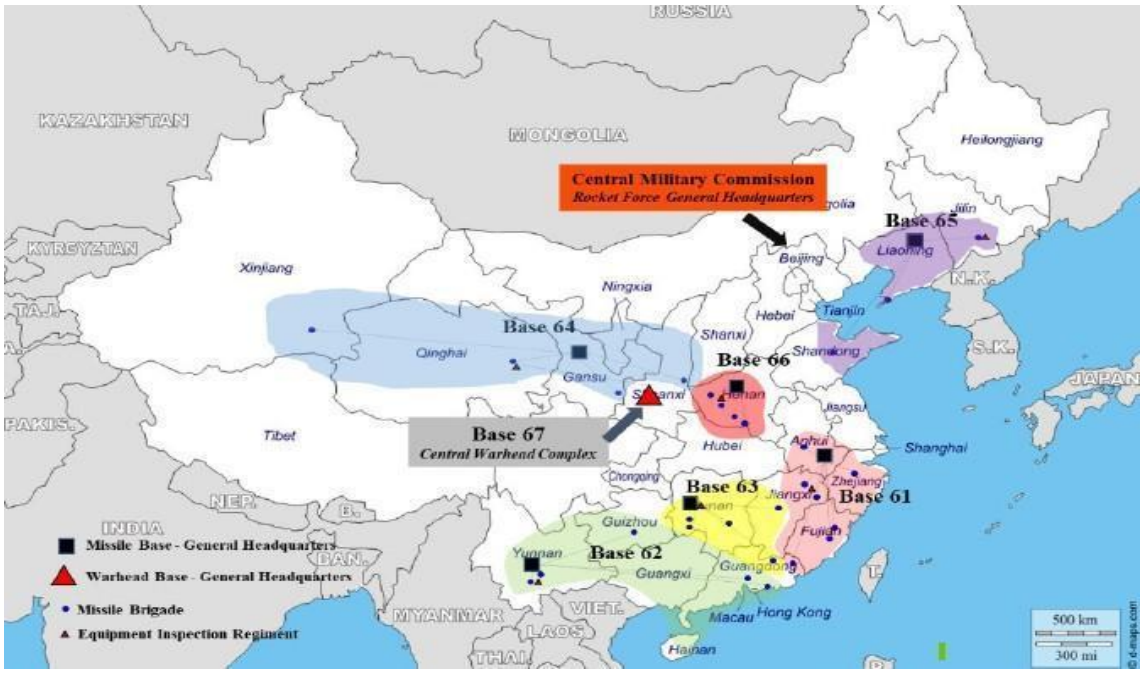
also argued that China should abandon its NFU under two specific conditions: if imminent defeat in a conventional war threatens core interests, such as national survival; and if during a conventional conflict, it is deemed necessary to use nuclear deterrence to constrain the other party's actions against China's core targets, including its nuclear facilities.[103]

These scholars argue that China must learn from Russia and the US and consider using nuclear weapons first for deterrence, contend with the US' rise, and defend China's sovereignty and territorial integrity.[104] Moreover, select Chinese military texts like the SSAC, as discussed earlier, have also called for the scrapping of the NFU and discuss the importance of deterring the enemy through uncertainty about China's response against conventional attacks:[105] "The objective is to hide the truth and show the false, to create wrong enemy decisions and to impede the enemy's reconnaissance and strikes."[106] China engages in such behaviour to establish deterrence through the uncertainty of response. Moreover, ambiguity, concealment, deception, and increasing mobility also help protect its arsenal and reduce vulnerability to the first strike.[107] But such behaviour may still raise the risk of nuclear escalation by increasing the likelihood of miscommunication or miscalculation.[108]

Besides nuclear doctrine, China's nuclear ambiguity, as Caitlin Talmadge highlights, also stems from its operational procedures, nuclear command and control systems and newer capabilities.[109] The PLA RF has six bases numbered 61-66 (previously numbered 51-56 under the SAF before Xi's military reforms).[110] Each base has three to five missile brigades. Except base 61, located in Huangshan City, Anhui Province and directed towards Taiwan, every base has a mix of conventional and nuclear missile brigades.[111] Like China's other forces, its authority runs through base, brigades, battalions, companies and platoons. But as Cunningham and Fravel have investigated, these bases do not appear to be intermingled at the launch-brigade level.[112] Unlike the US and Russia, China's nuclear

warheads are not mated with the delivery systems but stored separately in Base 67 (former base 22) in Baoji, Shanxi.[113] During high-alert, these warheads from Base 67 are coupled with the delivery systems and dispersed across the country's interior to ensure survivability, deterrence and effective second strike.[114] Here is where operational ambiguity arises—although nuclear and conventional brigades within the same base are garrisoned separately, the geographies for mobile launch brigades may overlap.[115] This overlapping of operational geographies along with the PLA RF's camouflage and deception techniques may create doubt with the adversary fearing misinterpretation, thus deterring its conventional military action.[116]

Figure 1. PLA RF Bases and Brigades



Source: Ken Allen et al., "PLA Aerospace Power: A Primer on Trends in China's Air, *p. 47*.[117]

Entanglement in China's command and control line is also responsible for China's nuclear ambiguity to a certain extent. *The Science of Campaigns*, an authoritative text by the PLA National Defense University, highlights an overlap in China's nuclear and conventional command and control structures at the base-level.[118] Therefore, China's nuclear force might be at risk during a conventional conflict, as an enemy strike can threaten its nuclear command and control structure resulting in an inadvertent

escalation. But as Cunningham and Fravel underline, China's 'skip-echelon' command system enables the PLA RF Headquarters to directly communicate with missile brigades, battalions, and even companies.[119] This separation thus reduces the escalation risks related to China's command and control overlap. However, little is known in the public domain about China's command and control entanglement, but some scholars analyse it as not deliberate but more as a cost-cutting measure.

Similarly, China's ambiguous missile strategy has led to the creation of its dual-use missile systems like the variants of the DF-26, the DF-21 and the DF-17 hypersonic glide vehicle.[120] The DF-21 has two different identifiable variants for nuclear and conventional use, but the DF-26 is believed to be a dual-use system capable of launching nuclear and conventional warheads.[e][121] The PLA's rationale for pursuing dual-use missile technology, as P.W. Singer and Ma Xiu analyse, appears to be a combination of cost-saving strategy and improving strategic deterrence via strategic ambiguity.[122] Put simply, an adversary might reconsider before hitting conventional units as it could lead to escalation if they turn out to be nuclear brigades. At the same time, Hans Kristensen underlines the risk associated with such a strategy: "If China were to fire a conventionally armed dual-use missile, but the target country was unable to differentiate whether its payload was nuclear or conventional, it may incorrectly assume it is under nuclear attack and respond with an in-kind strike back against China."[123]

Finally, the 2020 DoD China Military Power report estimates that China's nuclear arsenal could double in the next five years from "low hundreds" to "several hundred."[124] Scholars within and outside China are also discussing a possible alteration in the PRC's nuclear posture to 'launch on warning'.[125] The 2020 DoD China Military Power report also

[e] Little is known publicly about the DF-17 hypersonic glide vehicle. As David C. Logan details, it is relatively simple to identify visual features, associated launchers and support elements that distinguish between China's conventional and nuclear variants. But the fog of war and China's deception techniques increase the complexities and create ambiguity.

highlights China's quest for tactical nuclear weapons.[126] If these changes were to be carried out, it would increase ambiguity, intended or unintended, within China's nuclear force development, posture and strategy. Although some degree of ambiguity works in China's favour, it could also increase the risk of mischaracterisation and lead to unforeseen consequences, and have a destabilising impact on the Indo-Pacific region.

China's efforts to maintain ambiguity will be crucial in shaping its nuclear posture and are largely about minimising costs for itself while raising its rivals'. Secrecy and opacity undergird ambiguity, covering two specific areas: the composition and disposition of nuclear forces; and the patterns and dynamics of escalation in the pre-launch and post-launch phases.

Second, apart from the structure of its nuclear forces, the co-location of Chinese nuclear and conventional forces has triggered trepidation about China's nuclear posture. In exploring all these facets this each sub-section looks at the larger contours about the debate surrounding China's ambiguous nuclear posture. Does China actually see nuclear ambiguity to be a burden or a serious cost?

1. Ambiguity in Structure and Composition of Chinese Nuclear Forces

The divide in the debate about the importance the PRC places on ambiguity is between two groups. One claims that the PRC is expanding the size of its arsenal surreptitiously through an extensive underground network and that its arsenal is significantly larger than what it admits.[127] Consequently, this school observes that China has to be more transparent regarding its nuclear stockpile and should be drawn into an arms control arrangement with the US and Russia.[128] Thus, Chinese opacity fosters scope for miscalculation and escalation, increasing the costs to China, because of the overlap

between the PRC's conventional and nuclear forces. Further, it is likely to lead to intensified competition.

A contrary paradigm finds little evidence that China is expanding its arsenal significantly to match those of Russia and the US. These analysts contest the others' claims for three reasons. First, they contend that the increase in the size of the PRC's nuclear arsenal is likely to be modest even if the diversity of the arsenal, particularly in delivery systems, is varied and sophisticated.[129] Second, they maintain that China has invested heavily in non-nuclear strategic capabilities to reduce its dependence on nuclear weapons and their commingling with conventional weapons.[130] These capabilities cover cyber weapons, electronic warfare capabilities and space weapons, including kinetic and non-kinetic weapons systems directed at space-borne targets.[131] Third, basing strategy exclusively on nuclear weapons comes at a significant cost as it intensifies competition with the US and Russia. China sees an expansive arsenal also inviting higher financial burdens.[132]

If anything, China has considered both minimum and limited nuclear postures, and chosen the latter because it ensures survivability of their arsenal by introducing a diverse range of delivery systems. It increases the mobility of delivery systems, enables intra-war deterrence, and conveys that the deterring state is ready to initiate nuclear strikes.[133] A purely minimum deterrent posture is vulnerable to decapitation by a pre-emptive nuclear first strike and counter-value targeting, which undergirds minimum deterrence. That apart, a purely minimum deterrent posture is unlikely to prevent escalation. Therefore, according to China, a shift towards a limited deterrent posture becomes a necessity. This is also likely to be effective both in deterring adversaries and in initiating tactical and strategic strikes.[134,135] Under a limited deterrent posture, if the enemy perceives China's capabilities as weak, deterrence will break down, and intrawar deterrence will fail too, if

the state cannot continue to fight.[136] Intrawar deterrence[f] can come about only through compellent actions during the course of a war.[137] As a consequence, flexibility, structure and composition are crucial to understanding the shifts in China's posture away from merely warding off nuclear blackmail to limited warfighting. As early as in the 1990s, the development of space weapons has been a crucial element in China's commitment to match the US and Russia. The Chinese side views this as the "fourth leg in any nuclear capabilities".[138] Lacking the strength of advanced nuclear weapons states, the PRC has worked to bridge the chasm with the more advanced spacefaring powers to the point that it comes close to matching them today.[139] China has kinetic and non-kinetic weapons. The PRC in recent years has extended space-led investments to electronic warfare and cyber network attack capabilities in a quest to dominate the entire electromagnetic spectrum (EMS).[140] Dominating the EMS will be crucial to the PRC's success in seizing the initiative from the enemy by disrupting the enemy's Command, Control, Communications and Intelligence (C_3I) and degrading the enemy's warfighting capabilities.[141] The purpose would be to target the adversary's space assets by establishing spectrum dominance through a disruption of satellite uplinks and downlinks connected to the nuclear chain of command.[142] Humans or decision-makers will be a prime target of deception and their communications will be subject to disruption with nuclear commanders.[143]

2. The Importance of Survivability

A PLA Senior Colonel Bo Zhou once scoffed at the idea of China being part of a tripartite with the US and Russia, observing: "For such an agreement to work, either the US and Russia would need to bring their nuclear arsenals down to China's level, or China would need to increase the size of its arsenal drastically. Neither scenario is realistic."[144]

[f] The concept of intrawar deterrence is a process through which explicit and tacit bargaining occurs, which sets clear limits or fetters against the adversary that additional thresholds or "redlines" have not be crossed and not be breached in an ongoing conflict.

Consequently, Zhou Bo has argued, since 90 percent of the world's nuclear arsenal remains in the American and Russian inventories, Washington and Moscow cannot expect the PRC to join negotiations to cap an expansion of its nuclear arsenal (as Washington and Moscow are attempting to do with theirs).[145] For critics of China, however, this amounts to duplicity in that they believe Beijing has secreted away a substantial number of warheads in a network of underground tunnels, concealing its arsenal without being subjected to the constraints that Russia and the US are bound.[146] Indeed, the US DoD in its 2019 report assessed that China maintains a fairly substantial network of underground facilities.[147] For China, the purpose and intention behind the creation of this vast underground network is to ensure survivability of deeply buried underground nuclear assets and neutralise the "penetrating blast effects" of the adversary's conventional and nuclear munitions against its "miniscule" nuclear capabilities.[148] As China pursues an NFU policy and has to contend with US missile defence capabilities that could neutralise its retaliatory missile strikes following a first strike especially by the US, underground missile storage facilities assume greater significance for survivability.[g]

Nevertheless, the ambiguity that the PRC seeks to preserve as part of its nuclear posture also boils down to the numbers of warheads in its inventory. Secrecy surrounding the quantitative nuclear balance is closely tied to ambiguity. Revealing precise numbers of warheads can bring China under pressure to expand the size of its arsenal. In addition, revealing too much information to the PRC's adversaries could render its nuclear arsenal too vulnerable. Possessing significantly fewer warheads, Beijing sees little to no incentive to participate in tripartite arms control negotiations that involve Russia and the US, let alone consummate an agreement. For Americans strategic experts, as long as China

[g] Establishing the veracity of the size of the Chinese nuclear arsenal is a fraught exercise, because of the PRC's lack of transparency.

pursues an ambiguous nuclear posture without revealing the full size and the disposition of its forces, unintended escalation at least vertically is a possibility.[149] China may not want inadvertent escalation, albeit the concern does not weigh heavily as it does in American and Western strategic discourse nor is it explicitly stated as a problem. The Chinese purpose is to sow uncertainty in the adversary without revealing too much about their own capabilities.

3. Ambiguity through Commingling: Inadvertent and Deliberate Escalation

Beyond numbers of nuclear warheads in China's stockpile, their strategists neither share concerns about inadvertent or deliberate escalation nor do they believe commingling conventional and nuclear forces would lead to escalation; at the least, they do not appreciate the risks to the same extent as Western or foreign strategists do.[150] After all, if the risk of inadvertent escalation was so acute in Chinese perceptions, why commingle nuclear and conventional missile forces at all? Indeed, traditional Chinese strategic and military thought has not considered inadvertent escalation to be part of crisis management. If anything, tactics according to Chinese strategic tradition had to be honed to confuse the adversary and generate uncertainty while retaining certainty over the disposition and capacities of one's own force.[151] Thus, ambiguity had to be exploited instead of being viewed as a potential source of escalation.[152] One pathway that enables ambiguity and sows uncertainty in an adversary is through the entanglement of conventional and nuclear forces. It is also the pathway through which escalation risks may increase.

There are three forms of entanglement—geographic, operational, and technological. Geographic entanglement involves a state co-locating nuclear and conventional forces within the same geographic area. This co-location of nuclear and conventional forces

could be garrisoned in their peacetime areas and also in crisis and wartime.[153] They may have limited mobility within their geographic zones. Operational entanglement involves the commingling of nuclear and conventional forces which are under identical institutional and organisational practices and share the same doctrine at the operational level.[154] They could be packed with the same personnel and subordinated to identical command and control structures. They may also share identical logistical and maintenance infrastructure. Technological entanglement involves dual capable weapons systems in that delivery capabilities such as conventional and nuclear missile systems may be not distinguishable.[155] All three dimensions may also overlap: technological entanglement which covers dual capable systems may increase the temptation on the part of the state that deploys them to generate greater organisational cooperation and efficiency by subordinating them to all military units and same logistical and maintenance systems and personnel. Among these, geographic entanglement presents the greatest challenge, because it raises the likelihood of nuclear forces being inadvertently targeted.[156]

The greater the level of entanglement of nuclear and conventional forces, the higher the possibility of escalation; but high levels of entanglement could also sow caution and generate uncertainty for state wanting to execute a first strike. These contradictory positions are at the core of many challenges facing China and its adversaries. There is no denying that there is greater level of entanglement between Chinese conventional and nuclear forces. Until the early 1990s the level of entanglement between Chinese conventional and nuclear forces was low.[157] With the advent of military reforms in 2015 under Xi Jinping entanglement has increased. This is especially true, if not across all the dimensions listed above, with geographic entanglement.[158] Military exercises geared for mobile operations are believed to be conducted far from their garrisons and launch brigades are increasingly using and deploying dual capable systems. This, the PLA Rocket

Force (PLARF) has done largely to ensure "concealment, camouflage and deception".[159] The PLARF's attempt at sowing confusion in the adversary and using it as a stratagem also risks escalation in that a potential adversary in a real military crisis may fail to distinguish between conventional and nuclear delivery systems of PLARF forces.

As noted earlier, China sees merit in coupling nuclear and conventional forces because it fosters deterrence, sowing uncertainty and thereby inducing caution in a potential adversary. The Western conception of obviating inadvertent escalation by revealing capabilities and intention is alien to China's conception about the composition and structure of its nuclear forces. As Chinese analysts, Tong Zhao and Li Bin observed: "Inadvertent escalation has not been a traditional focus of Chinese thinking about security. Ancient Chinese military thinking did not touch on inadvertent escalation or crisis management. During China's revolutionary years under Mao Zedong, China's security policy emphasized the importance of tactics to confuse the enemy by creating the utmost uncertainty in its mind. The purpose was to keep the enemy from understanding China's own capabilities and true objectives, while understanding China's own capabilities and true objectives, while understanding the enemy's capabilities and intentions as much as possible."[160]

On the other hand, especially since the end of the Cold War, the structure and composition of US' nuclear forces tends to be more transparent, whereas its declaratory policy tends to be more ambiguous.[161] The reverse is true for China. Moreover, China escalating to nuclear use is less likely during a conventional conflict. Its commingling of nuclear and conventional missiles is geared to complicating nuclear first use especially by the US. This implies that ambiguity and uncertainty are still privileged, but not to same extent as they were in the past. Apart from the sea-leg of its nuclear deterrent, today the credibility of China's nuclear deterrent is inextricably tied to the survivability of the Chinese arsenal such as the silo-based solid fuelled DF-41 as well as mobile missile

systems like the DF-26. The PRC's improved retaliatory capabilities covering tactical, theatre and strategic missiles, co-mingling of conventional and nuclear forces, a slightly flexible NFU and the acquisition of missile defence do suggest a shift. This is consistent with what Alistair Iain Johnston flagged in the mid-1990s that the PRC's strategists were considering a posture towards "limited deterrence" that involves escalation control.[162] Thus, under "limited deterrence" a greater operational role for nuclear weapons is envisioned and moves away from China's earlier posture of "minimum deterrence". Yet it does not go as far as "maximum deterrence" that involves the elaborate counterforce warfighting doctrines and postures of the US and the Russian Federation, or the erstwhile Soviet Union.[163]

Further, China has had no real experience with nuclear crises like the Soviet Union and the US in the form of the Cuban Missile Crisis of 1962.[164] This is plausibly one important rationale for why China sees little merit in yielding to demands for transparency. While the importance of a nuclear crisis should not be overstated,[h] it teaches certain lessons as well. Indeed, a careful reading of the first decade and half after the onset of the Cold War shows that it was highly stressed due to the frequency of crises between the US and the Soviet Union. Crisis over Berlin and Cuba involved the Soviet Union and the US, but there were none as intense as these after 1960s in the subsequent decades between the two superpowers.[165] To be sure, two of the crisis during this period involved the PRC—over Korea and the Taiwan Straits, both in the 1950s—but they were between a non-nuclear PRC and nuclear-armed US.[166] Nevertheless, the absence of experience in nuclear crises means that China does not see why ambiguity and uncertainty should be the source of miscalculation and inadvertent escalation. It is reasonable to infer and partly explains why China sees its posture of ambiguity as an asset and not a burden or cost. Even if there

[h] We are grateful to an anonymous reviewer for raising this point.

is a cost, it is bearable to the extent that it is the inevitable price that China has shown a willingness to pay.

Beyond strategically exploiting ambiguity, Chinese strategists reject or at least contest the notion that there is any significant evidence to suggest that the PRC is actually commingling its forces. Nuclear secrecy is in part a crucial limiting factor in assuming that China combines nuclear and conventional forces, and thus commingling cannot be considered a "deliberate strategy".[167] Instead, according to Chinese strategic affairs experts, commingling of nuclear and conventional missile forces is possibly a direct result of logistical and organisational necessities.[168]

Moreover, they also reject or contest the claim that Beijing seeks to shield its conventional forces with its nuclear forces. Although the underground network could also help conceal a large stockpile of nuclear weapons, Chinese analysts contend that expanding the size of the country's arsenal is a less costly way of ensuring survivability, rather than building an extensive underground tunnel to preserve only a handful of nuclear weapons.[169] Western policymakers and strategists, specifically in the US, see China's extensive underground network of tunnels as an effort to conceal a larger nuclear arsenal than it publicises. This view gives the PRC a greater range of options to execute nuclear strikes and nuclear missions.[170] Yet China does not see the same vast underground tunnel network as a cover for the clandestine expansion of its nuclear stockpile, and contends that underground concealment enables the survival of their small arsenal, making it more resilient to preemptive nuclear attacks.[171]

Irrespective of whether China's ambiguous nuclear posture is borne out of a pre-planned strategy as opposed to organisational and logistical imperatives or even due to factors borne out of Chinese strategic culture, the underlying challenge of ambiguity remains inescapable. In a time of war or a crisis, any potential adversary of the PRC (including

India) would need to weigh the costs of striking Chinese military targets. By fusing conventional and nuclear capabilities, the PRC is able to influence the risk and cost calculus of potential enemies, thereby preventing them from striking first despite India pursuing an NFU. Further, for an adversary like India, it would be irrelevant whether the source of ambiguity was deliberate or borne out of organisational and logistical imperatives. Since decisions have to be made in real-time in crisis, Indian decision-makers operating within finite time limits, which a crisis imposes are unlikely to dwell on whether source was either deliberate or borne out of logistical and organisational factors. Indeed, the claim by Chinese experts that the country's nuclear force ambiguity is a product of organisational and logistical requirements may itself be an obfuscation for reinforcing ambiguity as a deliberate strategy.

4. Ambiguity and NFU

Beyond the opacity surrounding the quantitative strength and the escalation risks created by the commingling of the Chinese arsenal, there are larger problems associated with China's NFU policy, which some critics deem mere "fiction", because Beijing lacks sufficient Ballistic Missile Early Warning Radars and satellites detection capabilities.[172] For China's critics, the NFU simply serves as cover for an expansionist nuclear weapons programme.[173] China's missile defence capabilities are another contributory factor in fostering ambiguity. They are closely tied to the NFU as they generate uncertainty in the adversary's nuclear strategy by sowing more caution in a quest to render the PRC's "limited" nuclear capability more survivable. China's commitment to NFU is hailed by Chinese strategists as sincere,[174] but it is not watertight. In private, Chinese strategists do aver that if Chinese nuclear forces were struck with conventional weapons, retaliation could occur with nuclear weapons.[175] This slight relaxation of NFU is increasingly being debated internally in the PRC due to the US pursuit of conventional prompt strike and integrated missile defences.[176] India too, is not entirely certain about China's NFU pledge.

After all, it has little to say about nuclear weapons used on its territories, especially those claimed by China such as Arunachal Pradesh and other areas on the contentious Sino-Indian boundary.[177] China has been silent on using nuclear weapons on its own soil. A 1995 version of the PRC NFU pledge is considered applicable only to Non-Proliferation Treaty (NPT) signatories and member states of Nuclear Weapons Free Zones (NWFZ).[178] India falls in neither. Missile defences also give the PRC a fairly potent and assured second-strike capability, which is the basis of nuclear deterrence. Just as China evinces concerns about US missile defence systems, China's adversaries too have concerns about its missile defence capabilities. China fields two specific missile defence systems, including HQ-19 missile defence systems, which could be used for intercepting incoming ballistic missiles.[179] China is also strengthening its mid-course interception capabilities.[180] Missile defences lend an additional layer of capability to ensure the survival of the PRC's "limited" nuclear forces. They also generate uncertainty in the adversary. As long as a few missiles are survivable through a clandestine underground network and dispersion is coupled with missile defence, the PRC deduces that it need not pursue a significant warhead expansion.

5. A Challenge in Wartime

While China sees benefit in maintaining ambiguity, there are challenges in sustaining an ambiguous posture during wartime or military-stand-offs. In peacetime at least, it is widely recognised that China's current nuclear posture would not be an impediment because the PLARF and its predecessor, the SAC, kept warheads and their delivery capabilities de-mated. Identifying conventional missile forces would be less of a challenge. However, in wartime or in the lead-up to a significant military crisis, this relaxed nuclear posture could come under stress as the PLARF preparing its forces will be compelled to commingle conventional and nuclear missiles.[181] If the distances are shorter at around 200 kilometres, the possibility of misidentification is likely to be lower.

However, trans-theatre movement of missiles could lead to "mischaracterisation" between conventional and nuclear-tipped forces, because they have to traverse vast distances. These mobile missile forces are likely to become more entangled, making their precise identification problematic for China's adversaries.[182] Moreover, there could be differences between conventional and nuclear support groups, which could lead to errors in identification that are likely to be more pronounced during a crisis. China in wartime may seek to deliberately obscure the deployment of nuclear and conventional missiles both to ensure the survivability of its missile forces and deceive the adversary.[183] Indeed, the SSAC calls for feints and deception through disinformation,[184] moving missiles at night or military assets during poor weather. Missile attacks against an enemy's Intelligence, Surveillance and Reconnaissance (ISR) capacities would be an additional source of escalation borne out of ambiguity and could be mischaracterised.[185] As one astute observer noted, "Confusion" augments uncertainty and caution in an adversary and is at the heart of nuclear leverage (deterrence and compellence), but at the same time, it can also be the source of potential military miscalculation.[186] Beijing, on balance appears to place a premium on confusion to which ambiguity and uncertainty are central as opposed to the miscalculation that confusion and ambiguity may produce.

Given the fervent responses of Chinese strategists regarding what they deem erroneous or misleading claims about the PRC's nuclear posture advanced by their counterparts in the US, it is evident that China sees no real cost in sustaining an "ambiguous" nuclear posture in the way Western strategists assume the PRC is incurring or likely to incur. Whichever way one looks at ambiguity—whether in the form of inadvertent escalation, NFU or a surreptitious expansion of China's nuclear stockpile—the PRC has mastered the use of ambiguity to maintain a cost-effective nuclear posture.

Table 3. Status of World Nuclear Forces Inventory, 2020

Country	Total Inventory
Russia	6257
United States	5500
France	290
China	350
United Kingdom	195
Israel	90
Pakistan	165
India	160
North Korea	40
Total	**13,047**

Source: Hans M. Kristensen and Matt Korda, "Status of World Nuclear Forces, 2021".[187]

Indeed, even the most charitable Western analysis of China's nuclear posture does concede that the PRC is increasing the strength of its nuclear weapons stockpile, however limited.[188] Neither Russia nor the US can prove this, however, and they also face the challenge of enlisting China in arms control negotiations. A clandestine Chinese expansion, even if it does not match the warheads in the inventory of the US and Russia, represents a challenge to states that have smaller arsenals than the PRC. If India is to credibly threaten China, the current size will not suffice particularly in the face of expanding Chinese and Pakistani arsenals and if it is to meet the India's own doctrinal requirement of "Massive Retaliation" following a first strike by any one India's primary opponents. Even assuming India migrates to the more limited "punitive response" option as opposed to massive retaliation,[189] a larger arsenal will still be necessary. As Caitlin Talmadge observed: "Credibly threatening to destroy, say, 25 percent of an opponent's industrial base and kill half its population usually requires more than a stray surviving warhead, especially if the opponent is believed to have the ability to limit damage, for example, through missile defences."[190] China is testing and deploying a missile defence

system of its own and accumulating a larger nuclear stockpile. Even if India cannot destroy half of China's population, it must be at least in a position to credibly threaten 33 percent of its population as well as take out a sizeable 20 percent of China's industrial base. The current size of the Indian arsenal will not be sufficient for a "punitive response", let alone meet the test of "massive retaliation", as it has to contend with both a growing Chinese arsenal and its increasing survivability.

V. Implications for India

What China's nuclear ambiguity means for India is different from that for other nuclear powers such as the US and Russia. While Washington views Beijing as duplicitous, pursuing covert expansion of its nuclear capabilities, Moscow remains concerned and at best prefers that Beijing join multilateral arms control agreements that involve the US and Russia. Efforts have failed in getting Beijing to agree to join a trilateral agreement that limits the scope of its arsenal. Beijing's contention is that it has too small an arsenal to merit entering an arms control agreement. However, absent any fetters, the PRC is free to pursue a quantitatively larger arsenal as well as a qualitatively better nuclear capability.

It is possible that China, whose arsenal is growing, will demonstrate greater readiness to join arms control when it feels it has a reasonable level of nuclear insurance vis-à-vis the US, Russia and to an extent, India, following the accumulation of a larger arsenal. While this remains speculative, India still faces a choice about the size and scope of its arsenal. Facing two nuclear-armed states in China and Pakistan, India has the daunting task of ensuring the survival of its arsenal following a first strike. The problems facing New Delhi are not simply one of deterring China. India faces the twin burden of a China whose nuclear stockpile is larger than India's, and a China whose nuclear forces are qualitatively superior and geared to survive a first strike and retaliate. Since India follows an NFU and an assured retaliation strategy, the survivability of its nuclear forces is crucial.

Historically, India has treated nuclear weapons as instruments of deterrence to ward off nuclear blackmail and retaliate in case of first use by an adversary.[191] Consequently, New Delhi has chosen a conservative approach with regards to the size and scope of its arsenal, concluding that a limited arsenal is sufficient to deter China and Pakistan.[192] There is limited analysis on Sino-Indian escalation dynamics as well as how it extends to the

triangular competition between India, Pakistan and China, with the exception of a comprehensive analysis by Yogesh Joshi and Frank O'Donnell.[193] Their analysis shows how inadvertent and accidental escalation between India and Pakistan, and India and China, could result due to decisions taken at the operational military level.[194] Their study provided recommendations about the importance of initiating a strategic dialogue with China and Pakistan to offset miscalculation and limit competition.[195] This analysis has shown how ambiguity also drives China's nuclear force posture. Ambiguity can also enable cost-effective nuclear posture and indeed be integral to China's nuclear strategy.

At one level, the Indian and Chinese approaches to nuclear weapons are similar. New Delhi, too, pursues an assured retaliation strategy and an NFU. This fosters stability in the Sino-Indian nuclear dyad. Indeed, the weaker power in the dyad, India, has yet to accumulate tactical nuclear weapons for asymmetric escalation that a weaker Pakistan has done against India. Neither has China conversely pursued acquisition of tactical nuclear nor an asymmetrical escalation posture.[196] Although this could change in the future, these factors contribute to current stability. That said, the dyadic nuclear stability induced by the NFU and assured retaliation is likely to come under stress with the PRC responding to America's conventional global strike and missile defence,[197] which is likely to prompt Beijing to adopt a more alert nuclear posture. A shift toward the latter posture could also become the basis for a pre-emptive first strike against a weaker nuclear foe such as India.

Some analysts may contest the need for a larger Indian arsenal.[198] This claim is driven by the assertion that small arsenals are sufficient to deter large arsenals.[199] This becomes contestable in the context of China's growing nuclear arsenal. Making the most modest estimates that China's warhead expansion will not match the warhead numbers of the US and Russia, it would still far exceed India's inventory. American strategic affairs expert David C. Logan, who subscribes to conservative estimates about the size of the Chinese arsenal, conceded in late 2017 that the PRC possessed 260 nuclear warheads as

against India's current arsenal of 160 weapons as shown in Table 3.[200] What is worse, a "collusive threat" between China and Pakistan will mean that even if India matches current Chinese warhead strength, it might still be insufficient.[201]

As Table 3 shows, the existing Chinese arsenal is more than twice the size of India's and growing at a faster rate. To be sure, not all of China's nuclear warheads are mated to their delivery systems; a few are stored separately.[202] That apart, China's current expansion betrays the notion that small arsenals in fact serve a deterrent role. The question is not simply of deterrence; it is equally about what if deterrence fails. China simply cannot allow the numerical strength of its nuclear arsenal to fall below a certain threshold.

The evolution of India's nuclear capabilities, at least since the mid-2000s if not in the aftermath of the 1998 nuclear tests, suggests that it is increasingly assigning an operational role for its nuclear capabilities.[203] There has been greater planning and military institutionalisation since the mid-2000s.[204] The Kargil conflict revealed to India's leadership the weaknesses in the country's capacity to mobilise its nuclear forces. The continued growth of its delivery capabilities—ranging from land-based missiles to a sea-based missile system—belies claims that India sees nuclear weapons as pure deterrents and mere political instruments.

While in the past, the number of nuclear warheads were not an immediate or urgent concern, the continued growth of China's nuclear arsenal will invite pressures on India. Viewed purely from a dyadic perspective, ambiguity about the size of their arsenals has served China and India well. However, when paired to Pakistan's growing arsenal and the PRC's current expansionist trajectory, as shown in Table 3, the augmentation of the number of warheads in India's nuclear warhead inventory should merit serious consideration.

Furthermore, qualitative improvements in China's nuclear capability in the forms of Multiple Independent Reentry Vehicles (MIRVs), mobile solid-fueled ballistic missiles and a growing fleet of nuclear capable ballistic missile submarines (SSBNs) should prompt Indian decision-makers to improve India's delivery capabilities. Despite improvements since the 1998 nuclear tests, secrecy and inefficiencies have also plagued India's emerging arsenal.[205] The assembly of warheads and delivery systems took far longer in practice following the outbreak of the Kargil war than what bureaucratic and scientific planners had assumed before the conflict. In the subsequent India-Pakistan crisis of 2001-2002, Indian decision-makers became acutely aware of India's vulnerability to a stand-off nuclear attack for which they had no credible and effective means to retaliate.[206] These crises made clear that India had to institutionalise "...operational readiness, deployment and use."[207] Evidence lately also suggests that India is expected to develop and expand its nuclear submarine fleet in the coming years implying it is moving towards the adoption of limited nuclear warfighting capabilities.[208]

Specifically, accepting demands to conclude a Fissile Material Cut-off Treaty (FMCT) would still be conditional on the qualitative improvements in India's cyber, electronic warfare and space warfare capabilities. The PRC has invested in the latter subset of capabilities to reduce reliance on a bigger nuclear arsenal. Thus while India has to determine what the size of its nuclear arsenal is likely to be, nothing definitive can be made at this stage.

Beyond the expanding nuclear arsenal of the PRC taking place under the cloak of ambiguity, the Chinese nuclear posture also reflects ambiguity. Increasing evidence suggests that China is commingling at least a number of conventional and nuclear tipped missiles. In addition, China has pursued a deliberately opaque approach in the way it deploys its nuclear and conventional missile forces. Take for instance, the DF-26 ballistic missile, which is widely recognised as a tactical and theatre-level nuclear weapon. It is a

dual capable missile that allows China to maintain flexibility. However, the price of this "flexibility", which involves co-mingling conventional and nuclear capable missiles, as discussed earlier, increases the risk of "pre-launch ambiguity" in pre-crisis or peacetime and "inadvertent escalation" particularly during a crisis. The DF-26, which is an Intermediate Range Ballistic Missile (IRBM), is widely recognised to be a dual capable trans-theater missile, which at minimum is geared for assured retaliation.[209] It is quite possible that more dual capable missiles will be deployed by China.

There are two areas where New Delhi ought to be most concerned –China's increasing nuclear warhead stockpile, and its evolving nuclear posture that involves a growing number of dual capable missiles. At a minimum, even if India forsakes a posture that replicates China's (which mingles conventional and nuclear forces), it still faces the challenge of exceeding the number of warheads China has in its arsenal. Some analysts suggest that India is unlikely to exceed 300 nuclear weapons.[210] Others, particularly analysts within India advocating a robust thermonuclear force, have concluded a "400-plus" arsenal should enable India to come close to qualitatively matching the PRC's nuclear arsenal.[211] Whether these numbers still hold today is unclear. As of today, the Chinese stockpile as shown in Table 3 indicates it is more than twice the size of the Indian arsenal and is expected to grow further. Even if the future and projected growth is modest, China is likely to possess a significantly larger stockpile than what India is producing. Either way, India may have to consider shifts in its posture: it may entail in part mimicking China, integrating more numerically robust and longer range ballistic missiles for conventional missions, a MIRVed missile force, and SSBNs.

New Delhi will also need to supplement its existing and evolving arsenal with non-nuclear strategic capabilities such as cyber, electronic and space weapons and make every effort to neutralise Chinese investments across the Electromagnetic Spectrum (EMS) to reduce if not outright offset dependence on a larger arsenal. Either way, New Delhi

confronts trade-offs. China has shown how it is willing to sow uncertainty in their opponent to shield their arsenal from an American first strike through investments in non-nuclear capabilities that target the eyes and ears of the US with the establishment of the People's Liberation Army Strategic Support Force (PLASSF). Beijing has significantly bolstered its conventional precision strike capabilities. If India decides against a larger arsenal that potentially matches China's, the latter's use of dispersion, mobility, concealment and co-location of conventional and nuclear tipped missiles is something India may have to emulate and pursue more vigorously. New Delhi will have to exploit ambiguity to deter its opponent, just as Beijing does. The former Indian Army Chief General K. Sundarji laid out the importance of exploiting ambiguity: "The doctrine of uncertainty or ambiguity is intended to keep your potential adversaries unsure of the situation. It certainly does not mean keeping your own policymakers unsure."[212] This statement was made in the context of Indian decision-makers' propensity to wallow in uncertainty and their failure to respond decisively to the challenge posed by the emergence of Pakistani nuclear capabilities that would neutralise Indian conventional superiority. Still, the centrality of uncertainty applies as much in the Sino-Indian nuclear dyad.

Finally, fully operationalising the Indian arsenal has pitfalls.[213] It has potential to adversely affect stability in the conflict dyad between India and Pakistan,[214] even if the Indian expansion is geared primarily to matching China's quantitative capabilities. Indian decision-makers and strategists will have to weigh the extent to which any potential expansion will have on each of the conflict dyads in which India is locked. That apart, if pressure builds up from the international community for a Fissile Material Cut-off Treaty (FMCT), the cumulative pressures of the latter, coupled with the growth of the Chinese and Pakistani arsenals, will make it harder for New Delhi to avoid an expansion of its own arsenal.

VI. Conclusion

This paper has mapped out the importance of ambiguity for China's nuclear capabilities and posture, allowing it for many years to preserve a limited arsenal. Its ambiguity has come under strain in recent years. Pressures from the US to participate in arms control is likely compelling China to expand their warhead numbers. America's unrelenting pursuit of missile defence and global conventional prompt strike have weighed heavily on the evolution of the structure and composition of China's nuclear forces, and will continue to do so. Beijing has not formally abandoned its effort to use ambiguity for a build-up.

Overall, the growth of China's nuclear arsenal is at best incremental. It sees value in keeping things ambiguous, and it does not see risks of ambiguity for escalation reaching the point of being unmanageable and prohibitive. Further, China can continue to build up its capability, albeit modestly, without being encumbered by arms control or bring more transparency to its nuclear posture.

India, too, has decisions to take. The key questions are whether India will replicate the Chinese approach or pursue a glacial approach where it will settle for roughly 300-400 weapons, and if New Delhi's decision-makers will peg Indian warheads to the low hundreds—in which case the problems related to stability and size will be as much of a problem. However, ambiguity for its own sake without any significant or reasonable augmentation of its arsenal will trap New Delhi between the worst of two worlds. First, New Delhi may come under pressure to join the FMCT when it is least desirable or inopportune to do so. Second, it may preserve opacity for its own sake only to discover that China has significantly increased the size of its nuclear stockpile, regardless of China's nuclear posture—this could place the survivability of India's puny arsenal at risk. Either way, China's pursuit of ambiguity forces decisions on India. Assuming that India

settles for a smaller arsenal than China's existing or projected stockpile, investments will have to be made in other capabilities such as space, cyber, and electronic warfare, limited missile defence and improved delivery capabilities to maintain credible nuclear deterrence.

(This paper is the result of a research collaboration between Observer Research Foundation and the Takshashila Institution. The authors are grateful to Harsh Pant and Manoj Kewalramani, without whom this research would not have been possible. For helpful comments, the authors thank Prakash Menon, Akshay Ranade, Aditya Ramanathan, Uttara Sahasrabuddhe, and the anonymous reviewers.)

About the Authors

Kartik Bommakanti is a Fellow with the Strategic Studies Programme at Observer Research Foundation, New Delhi, India. He specialises in space military issues and his research is primarily centred on the Indo-Pacific region. He also works on emerging technologies as well as nuclear, conventional and sub-conventional coercion, particularly in the context of the Indian subcontinent and the role of great powers in the subcontinent's strategic dynamics. He has published in peer reviewed journals. (Twitter: @KartikBommakanı).

Suyash Desai is a research analyst working on China's defence and foreign policies at The Takshashila Institution, Bangalore, India. He also works on India's defence and foreign policies and publishes a weekly newsletter called The PLA Insight. His degrees are from Jawaharlal Nehru University (M Phil, International Organisations), Mumbai University (Masters, Political Science) and Indian School of International Law (Diploma, International Law). (Twitter: @suyash_desai).

End Notes

[1] M Taylor Fravel, *Active Defense: China's Military Strategy Since 1949,* (New Jersey: Princeton University Press, 2019), pp. 236.

[2] Fiona S. Cunningham and M Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and US-China Strategic Stability," *International Security* 40, no 2 (2015). https://www.belfercenter.org/sites/default/files/files/publication/ISEC_a_00215-Cunningham_proof3.pdf

[3] 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

[4] 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"

[5] 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): 2. https://www.tandfonline.com/doi/full/10.1080/01402390.2020.1844671

[6] P.W. Singer and Ma Xiu, "China's Ambiguous Missile Strategy is Risky," *Popular Science,* May 11, 2020. https://www.popsci.com/story/blog-network/eastern-arsenal/china-nuclear-conventional-missiles/

[7] Thomas G. Mahnken and Gillian Evans, "Ambiguity, Risk and, Limited Great Power Conflict," *Strategic Studies Quarterly* 13, no. 4 (2019): 58. https://www.airuniversity.af.edu/Portals/10/SSQ/documents/Volume-13_Issue-4/Mahnken.pdf.

[8] Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2020 (Washington, DC: OSD, 2020), p. 55. https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF

[9] Shou Xiaosong, *Science of Military Strategy 2013*, (Beijing: Academy of Military Science Press, 2013).

[10] Annual Report to Congress, 2020, p. 88.

[11] Michael J. Mazarr, "Understanding Deterrence," (Santa Monica: RAND Corporation, 2018), https://www.rand.org/pubs/perspectives/PE295.html

[12] Thomas C. Shelling, *Arms and Influence* (New Haven: Yale University Press, 1966), pp. 92-125.

[13] Thomas C. Shelling, *Arms and Influence*, pp. 92-125.

[14] Li Bin, "Difference Between Chinese and U.S. Nuclear Thinking and Their Origins," in *Understanding Chinese Nuclear Thinking,* ed. Li Bin and Tong Zhao (Washington, DC: Carnegie Endowment for International Peace, 2016), 3-18. https://carnegieendowment.org/files/ChineseNuclearThinking_Final.pdf

[15] Bin, "Difference Between Chinese and U.S. Nuclear Thinking and Their Origins," 3-18.

[16] Bin, "Difference Between Chinese and U.S. Nuclear Thinking and Their Origins," 3-18.

[17] Argued by Michael S. Chase and Andrew S. Erickson, "The Conventional Missile Capabilities of China's Second Artillery Force: Cornerstone of Deterrence and Warfighting," *Asian Security* 8, no 2 (2012), 115-137. https://www.tandfonline.com/doi/abs/10.1080/14799855.2012.686253

[18] Michael S. Chase and Andrew S. Erickson, "The Conventional Missile Capabilities of China's Second Artillery Force: Cornerstone of Deterrence and Warfighting," 115-137.

[19] Bin, "Difference Between Chinese and U.S. Nuclear Thinking and Their Origins," 3-18.

[20] Bin, "Difference Between Chinese and U.S. Nuclear Thinking and Their Origins," 3-18..

[21] Peng Guangqian and Yao Youzhi, eds., *The Science of Military Strategy* (Beijing: Military Science Press, 2005), pp. 217–221.

[22] Zhao Xijun, *Intimidation Warfare: A Comprehensive Discussion of Missile Deterrence,* (Beijing: National Defense University Press, 2005), p. 178.

[23] Michael S. Chase and Andrew S. Erickson, "The Conventional Missile Capabilities of China's Second Artillery Force," 115-137.

[24] Michael S. Chase and Andrew S. Erickson, "The Conventional Missile Capabilities of China's Second Artillery Force," 118. Peng Guangqian and Yao Youzhi, eds., *The Science of Military Strategy*, pp. 217–221.
[25] Michael S. Chase and Andrew S. Erickson, "The Conventional Missile Capabilities of China's Second Artillery Force," 118. Zhao Xijun, *Intimidation Warfare: A Comprehensive Discussion of Missile Deterrence,* (Beijing: National Defense University Press, 2005), p. 178.
[26] Fravel, *Active Defense*, p 242.
[27] Fravel, *Active Defense*, 236.
[28] Thomas G. Mahnken and Gillian Evans, "Ambiguity, Risk and, Limited Great Power Conflict," 57-77.
[29] Robert Jervis, "Cooperation under the Security Dilemma," *World Politics* 30, no. 2 (1978): 167–214. https://www.cambridge.org/core/journals/world-politics/article/cooperation-under-the-security-dilemma/C8907431CCEFEFE762BFCA32F091C526. Mahnken and Evans, "Ambiguity, Risk and, Limited Great Power Conflict."
[30] Thomas C. Shelling, *Arms and Influence* (New Haven: Yale University Press, 1966), pp. 35-91.
[31] Thomas C. Shelling, *The Strategy of Conflict* (Cambridge, Massachusetts: Harvard University Press, 1960), pp. 187-204.
[32] David C. Logan, "Are they reading Schelling in Beijing?" Thomas C. Shelling, *The Strategy of Conflict*, 187-204.
[33] Thomas C. Shelling, *The Strategy of Conflict,* pp. 187-204. Thomas G. Mahnken and Gillian Evans, "Ambiguity, Risk and, Limited Great Power Conflict," 57-77.
[34] Barry R. Posen, *Inadvertent Escalation: Conventional War and Nuclear Escalation* (Ithaca, NY: Cornell University Press, 2013), pp 13-23, from David C. Logan, "Are they reading Schelling in Beijing?"
[35] Posen, *Inadvertent Escalation: Conventional War and Nuclear Escalation,* pp 13-23. Logan, "Are they reading Schelling in Beijing?"
[36] M Taylor Fravel, *Active Defense*, p 242.
[37]Thomas J. Christensen, "The Meaning of the Nuclear Evolution: China's Strategic Modernization and US-China Security Relations," *Journal of Strategic Studies* 35, no 4 (2012), 447-487. https://www.tandfonline.com/doi/abs/10.1080/01402390.2012.714710. Fiona S. Cunningham and M Taylor Fravel, "Assuring Assured Retaliation," 97.
[38] Thomas J. Christensen, "The Meaning of the Nuclear Evolution," 447-487. Zhao Xijun, *Intimidation Warfare.*
[39] Christensen, "The Meaning of the Nuclear Evolution," 447-487.
[40] 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 (2017), 50-92. https://www.mitpressjournals.org/doi/abs/10.1162/ISEC_a_00274#.WP-7sWkrK70. David C. Logan, "Are they reading Schelling in Beijing?"
[41] Caitlin Talmadge, "Would China Go Nuclear?" 50-92.
[42] Shou Xiaosong, *The Science of Military Strategy*.
[43] Eric Heginbotham et al. "China's Evolving Nuclear Deterrent: Major Drivers and Issues for the United States," RAND Corporation, 2017. https://www.rand.org/pubs/research_reports/RR1628.html; Shou Xiaosong, *Science of Military Strategy.*
[44] Heginbotham et al. "China's Evolving Nuclear Deterrent."
[45] David C. Logan, "Making Sense of China's Missile Force," in *Chairman Xi Remakes the PLA: Assessing Chinese Military Reforms,* ed. Phillip C. Saunders et al. (Washington, DC: NDU Press, 2019), 410. https://ndupress.ndu.edu/Publications/Books/Chairman-Xi-Remakes-the-PLA/
[46] M Taylor Fravel, "The story of how China tested its first nuclear bomb & called it 'Miss Qiu'," *ThePrint,* May 4, 2019. https://theprint.in/pageturner/excerpt/the-story-of-how-china-tested-its-first-nuclear-bomb-called-it-miss-qiu/230975/
[47] Fravel, *Active Defense*, pp. 260.
[48] Fravel, *Active Defense*, pp. 258.
[49] Fravel, *Active Defense*, pp. 258.
[50] Fravel, *Active Defense*, pp. 259.

[51] Fravel, *Active Defense*, pp. 261.
[52] Anthony H. Cordesman, "The PLA Rocket Force: Evolving Beyond the Second Artillery Corps (SAC) and Nuclear Dimension," *Center for Strategic and International Studies*, 2016, pp. 14. https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/161013_China_Missile_Forces_AHC.pdf
[53] Jeffrey Lewis, *China's Missile Forces*, (London: The International Institute for Strategic Studies, 2014), p. 101
[54] Logan, "Making Sense of China's Missile Force," pp. 396
[55] Wu Riqiang, "Certainty of Uncertainty: Nuclear Strategy with Chinese Characteristics," *Journal of Strategic Studies* 36, no 4 (2013), 579-614.
[56] Wisconsin Project on Nuclear Arms Control, "China's Rocket and Missile," January 1, 2005. https://www.wisconsinproject.org/chinas-rockets-and-missiles/
[57] Lewis, *China's Missile Forces,* pp.107.
[58] Paul H.B. Godwin, "Potential Chinese Responses to US Ballistic Missile Defense," *Stimson Centre,* no 43. https://www.files.ethz.ch/isn/93682/Report43.pdf
[59] Hans M. Kristensen and Matt Korda, "Chinese Nuclear Forces, 2019," *Bulletin of the Atomic Scientists* 75, no 4 (2019), 171-178.
[60] Jeffrey Lewis, *China's Missile Forces,* p.107.
[61] Annual Report to Congress: The Military Power of the People's Republic of China 2005 (Washington, DC: OSD, 2005), www.globalsecurity.org/military/library/report/2005/d20050719china.pdf.
[62] David Logan, "Making Sense of China's Missile Force," p. 398.
[63] MissileThreat, "DF-21 (Dong Feng-21 / CSS-5)," https://missilethreat.csis.org/missile/df-21/
[64] MissileThreat, "DF-21 (Dong Feng-21 / CSS-5)".
[65] David Logan, "Making Sense of China's Missile Force," pp. 399. Shirley A. Kan, China: Ballistic and Cruise Missiles, 97-391 F (Washington, DC: Congressional Research Service, 2000), 14–15.
[66] MissileThreat, "DF-31 (Dong Feng-31 / CSS-10)," https://missilethreat.csis.org/missile/df-31/
[67] MissileThreat, "DF-31 (Dong Feng-31 / CSS-10)."
[68] Kristensen and Korda, "Chinese Nuclear Forces, 2019," 171-178.
[69] Suyash Desai, "China's National Day Grand Military Parade," *The Takshashila PLA Insight: Special Issue*, October 1, 2019. https://mailchi.mp/498f5153380c/special-issue-70-years-of-prc-chinas-national-day-military-parade?e=823aa80e84
[70] Yang Sheng and Liu Xuanzun, "China debuts most advanced ICBM DF-41 at parade," *The Global Times*, October 1, 2019. https://www.globaltimes.cn/content/1165931.shtml
[71] Hans M. Kristensen and Matt Korda, "Chinese Nuclear Forces, 2019," 171-178.
[72] Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2019 (Washington, DC: OSD, 2019), p. 45. https://media.defense.gov/2019/May/02/2002127082/-1/-1/1/2019_CHINA_MILITARY_POWER_REPORT.pdf
[73] Hans Kristensen, "China's Expanding Missile Training Area: More Silos, Tunnels and Support Facilities," *Federation of American Scientists,* February 14, 2021. https://fas.org/blogs/security/2021/02/plarf-jilantai-expansion/#:~:text=The%20training%20area%2C%20located%20east,launchers%20and%20their%20support%20vehicles.
[74] Annual Report to Congress, 2020, p. 89.
[75] Kristensen, "China's Expanding Missile Training Area: More Silos, Tunnels and Support Facilities."
[76] Annual Report to Congress, 2020, p. 90.
[77] Kristensen, "China's Expanding Missile Training Area: More Silos, Tunnels and Support Facilities."
[78] Ankit Panda, "China Announces Commissioning of DF-26 Intermediate-Range Ballistic Missile Brigade," *The Diplomat*, April 17, 2018. https://thediplomat.com/2018/04/china-announces-commissioning-of-df-26-intermediate-range-ballistic-missile-brigade/
[79] Annual Report to Congress, 2019, p.117.
[80] Kristensen and Korda, "China's Nuclear Forces, 2019," 171-178.

[81] Kristin Huang, "China's 'Aircraft-carrier Killer' Missiles Successfully Hit Target Ship in South China Sea, PLA Insider Reveals," *The South China Morning Post,* November 14, 2020, https://www.scmp.com/news/china/military/article/3109809/chinas-aircraft-carrier-killer-missiles-successfully-hit-target

[82] China Power Team, "How is China Modernizing its Nuclear Forces?" *China Power*, December 10, 2019. Updated October 28, 2020. Accessed November 28, 2020. https://chinapower.csis.org/china-nuclear-weapons/.

[83] Missile Defense Project, "Missiles of China," Missile Threat, *Center for Strategic and International Studies*, June 14, 2018, last modified July 16, 2020. https://missilethreat.csis.org/country/china/.

[84] Kristensen and Korda, "Chinese Nuclear Forces, 2019", 171-178.

[85] China Power Team, "Does China Have an Effective Sea-based Nuclear Deterrent?" *China Power*, December 28, 2015, Updated August 26, 2020. https://chinapower.csis.org/ssbn/

[86] Adam Ni, "The Future of China's Nuclear-powered Ballistic Missile Submarine Force," *Australian Strategic Policy Institute,* May 8, 2020. https://www.aspistrategist.org.au/the-future-of-chinas-nuclear-powered-ballistic-missile-submarine-force/

[87] Sarah Zheng, "China has Expanded the Shipyard Where its Nuclear Submarines are Built, Satellite Imagery Shows," *The South China Morning Post*, October 15, 2020. https://www.scmp.com/news/china/military/article/3105699/china-has-expanded-shipyard-where-its-nuclear-submarines-are

[88] Tong Zhao, "China's Sea-Based Nuclear Deterrent," *Carnegie-Tsinghua Center for Global Policy*, June 30, 2016. https://carnegietsinghua.org/2016/06/30/china-s-sea-based-nuclear-deterrent-pub-63909

[89] China Power Team, "Does China Have an Effective Sea-based Nuclear Deterrent?" *China Power*.

[90] Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2018 (Washington, DC: OSD, 2018), pp. 75. https://media.defense.gov/2018/Aug/16/2001955282/-1/-1/1/2018-CHINA-MILITARY-POWER-REPORT.PDF

[91] Ankit Panda, "Revealed: China's Nuclear-Capable Air-Launched Ballistic Missile," *The Diplomat,* April 10. 2018. https://thediplomat.com/2018/04/revealed-chinas-nuclear-capable-air-launched-ballistic-missile/

[92] China Power Team, "How Are China's Land-based Conventional Missile Forces Evolving?" *China Power*, September 21, 2020. Updated November 17, 2020. https://chinapower.csis.org/conventional-missiles/

[93] *Missile Defense Project, "Missiles of China," Missile Threat, Center for Strategic and International Studies, June 14, 2018, last modified July 16, 2020. https://missilethreat.csis.org/country/china/.*

[94] Information Office of the State Council of the People's Republic of China, China's National Defense in 2006 (Beijing: Foreign Languages Press, 2006), pp. 9-10.

[95] China's National Defence in 2006, pp.9-10.

[96] Fravel, *Active Defense*, pp. 243.

[97] Fravel, *Active Defense*, pp. 243. Information Office of the State Council of the People's Republic of China, China's National Defense in 2006 (Beijing: Foreign Languages Press, 2008). http://eng.mod.gov.cn/publications/2017-04/11/content_4778231.htm

[98] Hui Zhang, "China's Perspective on a Nuclear Free World," *Washington Quarterly* 33, no 2 (2010): 139-155. https://www.belfercenter.org/sites/default/files/legacy/files/10apr_Zhang.pdf

[99] Annual Report to Congress: 2019, p. 65.

[100] Nuclear Posture Review 2018 (Washington, DC: OSD, 2018), p. 32. https://dod.defense.gov/News/SpecialReports/2018NuclearPostureReview.aspx

[101] Xu Weidi, "China's Security Environment and the Role of Nuclear Weapons," in *Understanding Chinese Nuclear Thinking,* ed. Li Bin and Tong Zhao (Washington, DC: Carnegie Endowment for International Peace, 2016), 38. https://carnegieendowment.org/files/ChineseNuclearThinking_Final.pdf

[102] Xu Weidi, "China's Security Environment and the Role of Nuclear Weapons," 38.

[103] Pan Zhenqiang, "China's No First Use of Nuclear Weapons," in *Understanding Chinese Nuclear Thinking,* ed. Li Bin and Tong Zhao (Washington, DC: Carnegie Endowment for International Peace, 2016), 70-71. https://carnegieendowment.org/files/ChineseNuclearThinking_Final.pdf

[104] Pan Zhenqiang, "China's No First Use of Nuclear Weapons," 70-71.

[105] David C. Logan, "Are they reading Schelling in Beijing?" 39. Also, check Yu Jixun, (ed.), The Science of Second Artillery Campaigns (Beijing: PLA Press 2004). Thomas J. Christensen, "The Meaning of the Nuclear Evolution," 447-487.

[106] Yu Jixun, The Science of Second Artillery Campaigns, 225 from David C. Logan, "Are they reading Schelling in Beijing?" 39.

[107] Vipin Narang, *Nuclear Strategy in the Modern Era: Regional Powers and International Conflict,* (New Jersey: Princeton University Press, 2014).

[108] Caitlin Talmadge, "Beijing's Nuclear Option: Why a US-China War could Spiral Out of Control," *Foreign Affairs* 97, no 6 (2018), 44-50

[109] Caitlin Talmadge, "Would China Go Nuclear?" 50-92.

[110] Mark A. Stokes, "China Nuclear Warhead Storage and Handling System," *Project 2049 Institute*, March 12, 2010, p. 7. https://project2049.net/wp-content/uploads/2018/05/chinas_nuclear_warhead_storage_and_handling_system.pdf. Hans M. Kristensen and Matt Korda, "Chinese Nuclear Forces, 2019," 171-178.

[111] Ken Allen et al., "PLA Aerospace Power: A Primer on Trends in China's Air, Space and Missile Force: 2nd Edition," *China Aerospace Studies Institute*, pp. 47. https://www.airuniversity.af.edu/Portals/10/CASI/Books/Primer_2nd_Edition_Web_2019-07-30.pdf?ver=2019-08-05-102017-503

[112] Fiona S. Cunningham and M Taylor Fravel, "Assuring Assured Retaliation," 42-44.

[113] David Logan, "Making Sense of China's Missile Force," pp. 401. Fiona Cunningham, "Managing US-China Nuclear Risks: A Guide for Australia," *United States Studies Centre and Pacific Forum*. https://www.ussc.edu.au/analysis/managing-us-china-nuclear-risks-a-guide-for-australia#an-increasingly-complex-nuclear-relationship

[114] David Logan, "Making Sense of China's Missile Force," pp. 418.

[115] Logan, "Are they reading Schelling in Beijing?" 19.

[116] Logan, "Are they reading Schelling in Beijing?" 22.

[117] Ken Allen et al., "PLA Aerospace Power: A Primer on Trends in China's Air, Space and Missile Force: 2nd Edition," *China Aerospace Studies Institute, p. 47.* *https://www.airuniversity.af.edu/Portals/10/CASI/Books/Primer_2nd_Edition_Web_2019-07-30.pdf?ver=2019-08-05-102017-503*

[118] David C. Logan, "Are they reading Schelling in Beijing?" 25. Also, check Zhang Yuliang (ed.), The Science of Campaigns (Beijing, National Defense University Press 2006), 618.

[119] Fiona Cunningham, "Nuclear Command, Control, and Communications Systems of the People's Republic of China," *NAPSNet Special Reports*, July 18, 2019, https://nautilus.org/napsnet/napsnet-special-reports/nuclear-command-control-and-communications-systems-of-the-peoples-republic-of-china/. Cunningham and Fravel, 'Assuring Assured Retaliation', 42–45. David C. Logan, "Are they reading Schelling in Beijing?" 26.

[120] James M. Acton, "Is It A Nuke? Pre-Launch Ambiguity and Inadvertent Escalation", *Carnegie Endowment For International Peace*, Washington D.C., 2020, pp. 21.

[121] David C. Logan, "Are they reading Schelling in Beijing?" 27.

[122] P.W. Singer and Ma Xiu, "China's Ambiguous Missile Strategy is Risky," *Popular Science*, May 11, 2020. https://www.popsci.com/story/blog-network/eastern-arsenal/china-nuclear-conventional-missiles/#:~:text=The%20PLA's%20rationale%20for%20pursuing,on%20its%20conventional%20missile%20force.

[123] P.W. Singer and Ma Xiu, "China's Ambiguous Missile Strategy is Risky,"

[124] Annual Report to Congress, 2020, pp. 55.

[125] Shou Xiaosong, *Science of Military Strategy 2013.*
[126] Annual Report to Congress, 2020, pp. 88.
[127] Mark Helprin, "Treat China As the Nuclear Superpower It Is", *Wall Street Journal,* November 13, 2019, https://www.wsj.com/articles/treat-china-as-the-nuclear-superpower-it-is-11573686026, Peter Huessy and Bradley A. Thayer, "China's nuclear developments reflect its growing ambition", *The Hill,* November 7, 2019, https://thehill.com/opinion/national-security/468972-chinas-nuclear-developments-reflect-its-growing-ambition
[128] ibid
[129] David Logan, "The Dangerous Myths About China's Nuclear Weapons", *War on the Rocks*, September 18, 2020, https://warontherocks.com/2020/09/the-dangerous-myths-about-chinas-nuclear-weapons/
[130] Fiona S. Cunningham and M. Taylor Fravel, "Dangerous Confidence? Chinese Views on Nuclear Escalation", *International Security* 44, No. 2 (2019), 93-94.
[131] Fiona S. Cunningham and M. Taylor Fravel, "Dangerous Confidence? Chinese Views on Nuclear Escalation", 93-94.
[132] David Logan, "The Dangerous Myths About China's Nuclear Weapons."
[133] Alastair Iain Johnston, "China's New "Old Thinking": The Concept Limited Deterrence", *International Security* 20, No. 3 (1995-1996), 15-21
[134] Zhou Xijun, ed., "Coercive Deterrence Warfare: A Comprehensive Deterrence on Missile Deterrence", (Beijing: National Defense University Press, May 2005), p. 78.
[135] Johnston, "China's New "Old Thinking": The Concept Limited Deterrence," 19.
[136] Johnston, "China's New "Old Thinking": The Concept Limited Deterrence," 16-17.
[137] Johnston, "China's New "Old Thinking": The Concept Limited Deterrence", 16-17.
[138] Thomas C. Shelling, *The Strategy of Conflict, pp. 23-24.*
[139] Franz-Stefan Gady, "US Admiral Warns of China's and Russia's Growing Space Weapons Arsenal", *TheDiplomat,* January 26, 2016, https://thediplomat.com/2016/01/us-admiral-warns-of-chinas-and-russias-growing-space-weapons-arsenal/
[140] Marcus Clay, "To Rule the Invisible Battlefield: The Electromagnetic Spectrum and Chinese Military Power", *War On The Rocks,* January 22, 2021, https://warontherocks.com/2021/01/to-rule-the-invisible-battlefield-the-electromagnetic-spectrum-and-chinese-military-power/
[141] Clay, To Rule the Invisible Battlefield: The Electromagnetic Spectrum and Chinese Military Power". See also Dean Cheng, "Getting to Where the PLA Needs to Be", Testimony before the US-China Economic and Security Review Commission, June 20, 2019, pp. 10-11, https://www.uscc.gov/sites/default/files/Cheng_USCC%20Testimony_FINAL.pdf
[142] Clay, To Rule the Invisible Battlefield: The Electromagnetic Spectrum and Chinese Military Power".
[143] Clay, To Rule the Invisible Battlefield: The Electromagnetic Spectrum and Chinese Military Power".
[144] Zhou Bo, "It's Absurd for China to Disarm", *Wall Street Journal,* July 31, 2019, https://www.wsj.com/articles/its-absurd-to-ask-china-to-disarm-11564613664
[145] Bo, "It's Absurd for China to Disarm"
[146] Helprin, "Treat China As the Nuclear Superpower It Is".
[147] Annual Report to Congress 2019, pp. 67.
[148] Annual Report to Congress 2019, pp. 67.
[149] Thomas Mahnken and Gillian Evans, "Ambiguity, Risk, and Limited Great Power Conflict", 67.
[150] Tong Zhao and Li Bin, "The Under Appreciated Risks of Entanglement: A Chinese Perspective", in James Acton (ed.), *Russian and Chinese Perspectives on Non-Nuclear Weapons and Nuclear Risks,* Carnegie Endowment for International Peace, Washington D.C., 2017, pp. 50-52, https://carnegieendowment.org/files/Entanglement_interior_FNL.pdf
[151] Tong Zhao and Li Bin, "The Under Appreciated Risks of Entanglement: A Chinese Perspective," pp. 49.
[152] Tong Zhao and Li Bin, "The Under Appreciated Risks of Entanglement: A Chinese Perspective" pp. 49.
[153] David C. Logan, "Are they reading Schelling in Beijing?", pp. 6-8

[154] Logan, "Are they reading Schelling in Beijing?".
[155] Logan, "Are they reading Schelling in Beijing?".
[156] Logan, "Are they reading Schelling in Beijing?" pp. 10-11.
[157] Logan, "Are they reading Schelling in Beijing?", pp. 20-23.
[158] Logan, "Are they reading Schelling in Beijing?", pp. 20-23.
[159] Logan, "Are they reading Schelling in Beijing?", pp. 20-23.
[160] Tong Zhao and Li Bin, "The Under Appreciated Risks of Entanglement: A Chinese Perspective", p. 49. Unlike the Chinese see how Westerners see the importance of limiting the possibilities through transparency the possibilities of escalation, Nicholas Zarimpas, "Introduction", in *Transparency in Nuclear Warheads and Materials: The Political and Technical Dimensions,* Nicholas Zarimpas (ed.), Stockholm International Peace Research Institute (SIPRI), (London: Oxford University Press, 2003), pp. 1-11.
[161] Thomas Mahnken and Gillian Evans, "Ambiguity, Risk, and Limited Great Power Conflict", *Strategic Studies Quarterly*, Vol 13, No. 4, Winter 2019, p. 66.
[162] Johnston, "China's New "Old Thinking": The Concept Limited Deterrence," p. 7.
[163] Johnston, "China's New "Old Thinking": The Concept Limited Deterrence," p. 12.
[164] Zhao and Bin, "The Under Appreciated Risks of Entanglement: A Chinese Perspective"
[165] See Richard K. Betts, *Nuclear Blackmail and Nuclear Balance,* (Brookings Institution Press: Washington D.C., 1987), pp. 181.
[166] Betts, *Nuclear Blackmail and Nuclear Balance,* pp.22-79.
[167] Zhao and Bin, "The Under Appreciated Risks of Entanglement: A Chinese Perspective"
[168] Zhao and Bin, "The Under Appreciated Risks of Entanglement: A Chinese Perspective"
[169] Tong Zhao, "Deterrence Meets Great Wall", *The Diplomat,* November 9, 2011, https://thediplomat.com/2011/11/deterrence-meets-great-wall/
[170] James R. Holmes, "China's Underground Great Wall", *The Diplomat,* August 20, 2011, https://thediplomat.com/2011/08/chinas-underground-great-wall/
[171] Zhao, "Deterrence Meets Great Wall."
[172] Peter Pry, "China's "no first use" nuclear fiction", *The Hill,* June 24, 2020, https://thehill.com/opinion/international/502503-chinas-no-first-use-nuclear-fiction
[173] Peter Pry, "China's "no first use" nuclear fiction."
[174] Tong Zhao and Li Bin, "The Under Appreciated Risks of Entanglement: A Chinese Perspective", p. 64.
[175] Mahnken and Evans, "Ambiguity, Risk, and Limited Great Power Conflict", p. 66.
[176] Mahnken and Evans, "Ambiguity, Risk, and Limited Great Power Conflict", p. 66.
[177] Yogesh Joshi and Frank O'Donnell, *India In Nuclear Asia: Evolution of Regional Forces, Perceptions, and Policies,* (Orient BlackSwan: Hyderabad, 2018), p. 121.
[178] Joshi and O'Donnell, *India In Nuclear Asia.*
[179] Lin Bin, "What China's Missile Intercept Test Means", February 4, 2013, https://carnegieendowment.org/2013/02/04/what-china-s-missile-intercept-test-means-pub-50833 Jim Garamone, "Missile Defense Becomes Part of Power Competition", *DOD News,* July 28, 2020, https://www.defense.gov/Explore/News/Article/Article/2291331/missile-defense-becomes-part-of-great-power-competition/.
[180] Liu Zen, "China declares success in latest anti-missile intercept test", *South China Morning Post,* February 5, 2021, https://www.scmp.com/news/china/military/article/3120636/china-declares-success-latest-anti-missile-intercept-test
[181] James M. Acton, "Is It A Nuke? Pre-Launch Ambiguity and Inadvertent Escalation", pp. 31-32
[182] Li Bin, "Tracking Chinese Strategic Mobile Missiles", *Science & Global Security* 15, No. 1 (2007), 10-11.
[183] Li Bin, "Tracking Chinese Strategic Mobile Missiles", 10-11.
[184] Yu Jixun, (ed.), The Science of Second Artillery Campaigns (Beijing: PLA Press, 2004), pp. 388.
[185] Acton, "Is It A Nuke? Pre-Launch Ambiguity and Inadvertent Escalation", pp. 31-32
[186] Betts, *Nuclear Blackmail and Nuclear Balance,* p. 211

[187] Hans M. Kristensen and Matt Korda, "Status of World Nuclear Forces", (Updated September 2020), Federation of American Scientists, https://fas.org/issues/nuclear-weapons/status-world-nuclear-forces/

[188] Logan, "The Dangerous Myths About China's Nuclear Weapons".

[189] Joshi and O'Donnell, *India in Nuclear Asia,* pp. 235

[190] Caitlin Talmadge, "Would China Go Nuclear: Assessing the Risk of Chinese Nuclear Escalation in a Conventional War with the United States", *International Security,* Vol. 41, No. 4, Spring 2017, pp. 61-62.

[191] Ashley J. Tellis, "A Troubled Transition: Emerging Nuclear Forces in India and Pakistan," Hoover Institution, Fall Series, Issue 919, https://www.hoover.org/research/troubled-transition-emerging-nuclear-forces-india-and-pakistan

[192] Ashley J. Tellis, "A Troubled Transition: Emerging Nuclear Forces in India and Pakistan."

[193] Joshi and O'Donnell, *India In Nuclear Asia,* pp. 1-9 and pp. 236-237.

[194] Joshi and O'Donnell, *India In Nuclear Asia,* pp. 1-9 and pp. 236-237.

[195] Joshi and O'Donnell, *India In Nuclear Asia,* pp. 236-237.

[196] Vipin Narang, "Posturing for Peace: Pakistan's Nuclear Postures and South Asian Stability', *International Security* 34, No. 3 (2009-2010), p. 45.

[197] David Logan, "Hard Constraints On China's Nuclear Force", *War On The Rocks,* November 8 2017, https://warontherocks.com/2017/11/china-nuclear-weapons-breakout/

[198] Rajesh Basrur, "The India-China Nuclear Dynamic: India's Options", *ORF Issue Brief No. 430,* December 2020, Observer Research Foundation, p. 5.

[199] See Rajesh M. Basrur, Michael D. Cohen and Ward Wilson, "Do Small Arsenals Deter?" *International Security* 32, No. 3, (2007-2008), pp. 202-214.

[200] David C. Logan, "Hard constraints on a Chinese nuclear breakout", *The Nonproliferation Review*. 24, Issue 1-2, Special Section: Nuclear Asia, 2017, p. 13.

[201] Gurmeet Kanwal, "India's Nuclear Force Structure", *Regional Insight,* Carnegie Endowment for International Peace, June 30, 2016, https://carnegieendowment.org/2016/06/30/india-s-nuclear-force-structure-2025-pub-63988

[202] Hans M. Kristensen and Matt Korda, World Nuclear Forces, *Federation of American Nuclear Scientists,* 2020, https://fas.org/issues/nuclear-weapons/status-world-nuclear-forces/

[203] Gaurav Kampani, "India: The Challenges of Nuclear Challenges Operationalization and Strategic Stability", in Ashley J. Tellis, Abraham M. Denmark and Travis Tanner (eds.), *Strategic Asia 2013-14: Asia in the Second Nuclear Age,* (Seattle: WA, 2013), pp. 99-128

[204] Gaurav Kampani, "India: The Challenges of Nuclear Challenges Operationalization and Strategic Stability," pp. 99-128.

[205] Gaurav Kampani, "Is The Nuclear Tiger Changing Its Stripes?" *The Nonproliferation Review* 21, Nos. 3-4 (2014), 384-87.

[206] Kampani, "Is The Nuclear Tiger Changing Its Stripes?" 388-389.

[207] Kampani, "Is The Nuclear Tiger Changing Its Stripes?" 388-389.

[208] Rajat Pandit, "Project to build N-Powered attack subs set to get CCS nod", *Times of India,* 31 March, 2021, https://timesofindia.indiatimes.com/india/project-to-build-n-powered-attack-subs-set-to-get-ccs-nod/articleshow/81770216.cms

[209] Austin Long, "Myths or Moving Targets? Continuity and Change in China's Nuclear Forces", Commentary, *War on The Rocks,* December 4, 2020, https://warontherocks.com/2020/12/myths-or-moving-targets-continuity-and-change-in-chinas-nuclear-forces/. Even those who claim China seeks a modest arsenal concede that the DF-26 IRBM is dual capable missile, see David C. Logan, "Are they reading Schelling in Beijing?" 27.

[210] 300 weapons are based on the American expert Ashley J. Tellis' assessment in Tellis, "A Troubled Transition: Emerging Nuclear Forces in India and Pakistan".

[211] Bharat Karnad, "India First", *Seminar,* 2002, https://www.india-seminar.com/2002/519/519%20bharat%20karnad.htm

[212] General K. Sundarji, *Blind Men of Hindoostan: Indo-Pak Nuclear War*, (New Delhi: Soma Books Ltd., 1994).

[213] Kampani, "India: The Challenges of Nuclear Challenges Operationalization and Strategic Stability", pp. 99-128

[214] Kampani, "India: The Challenges of Nuclear Challenges Operationalization and Strategic Stability," pp. 99-128.