

SINO-INDIAN NUCLEAR DETERRENCE: FACTORS AND DEVELOPMENTS

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EU Non-Proliferation and Disarmament Consortium internship and research completed from November 2018 to January 2019 under the supervision of Laura Rockwood, Executive Director of the Vienna Center for Disarmament and Non-Proliferation (VCDNP).

I. Introduction

India and China have been on the precipice of conflict several times in the last sixty years. Since their short-lived war in 1962, which saw a Chinese victory, there has been serious strategic competition between the two countries. Demographically, India and China host the two largest populations on earth and are two of the strongest growing economies. As strategic competitors in the nuclear domain, China has historically focused more on deterrence towards larger powers because of greater concerns about the power players in the region (the USSR and the US), which had rapidly expanding nuclear programmes. With India's nuclear tests in 1998, China now had another nuclear competitor in the region.

In the conventional military domain, both countries have undergone massive modernisation programmes. The Indian government has attributed its conventional modernisation to China's actions in the same field. In the nuclear domain, India is a young power, still growing into its role in the region as it seeks to develop a credible nuclear doctrine that would deter any sort of aggression from the surrounding powers of Pakistan and China. Conversely, China feels surrounded by nuclear umbrella states of the US, a fair-weather ally in Russia and an increasingly adversarial nuclear weapons possessor India. While China considers India a lesser threat than the US, it has taken notice of India's significant progress in the development and diversification of its nuclear deterrent.

India and China also appear to be on a path that may lead to more clashes over contested borders and strategic control of the Indian Ocean. South Asia has long been viewed as the place most likely to see the use of a nuclear weapon in war because of Pakistan and India's longstanding conflict. However, there are concerning trends in relation to nuclear deterrence between India and

China surrounding the development of nuclear triads and dual-use delivery vehicles. This paper seeks to analyze the nuclear doctrines of India and China, deterrence dynamics between states and the development of nuclear capable delivery systems in the ground-based missile, naval and air domains. This paper also seeks to characterise the triangular relationship between India, China and Pakistan, which affects stability in South Asia.

II. India's Nuclear Doctrine

India tested its first nuclear device in 1974 as a “peaceful nuclear explosion” and slowly began developing its nuclear weapons programme, culminating in a series of nuclear tests in 1998.ⁱ In 1999 India released an unofficial draft nuclear doctrine which referred to a no-first-use (NFU) policy without any caveats, punitive retaliation and credible minimum deterrence.ⁱⁱ India's official nuclear doctrine, which was publically announced in 2003, was built around three policies: no-first use; massive retaliation; and credible minimum deterrence.ⁱⁱⁱ The differences between these two nuclear postures relates to caveats in the NFU policy included in the 2003 document and the change from punitive retaliation to massive retaliation. India further relies upon its growing conventional capabilities over the use of nuclear weapons in a conflict, particularly in reference to a war with Pakistan. India operates a semi-operational nuclear triad consisting of land-based missiles, aircraft, a small number of ships capable of carrying a nuclear payload and a recently introduced a nuclear-powered ballistic missile submarine (SSBN).

The following describes in greater detail the three main pillars of India's nuclear doctrine:

1. NFU is a policy whereby a state undertakes not to use nuclear weapons in a conflict except in response to a nuclear weapon attack, and not to threaten to use nuclear weapons against non-nuclear-weapon states (NNWS). India considers the use of nuclear weapons on its own

soil, or the use of biological, chemical or nuclear weapons against its troops on foreign soil, as a first use against India. Under those circumstances, India reserves the right to strike back with nuclear weapons. India's NFU policy accomplishes several goals. First, it allows India to be one of only two nations that has a declared NFU policy (China being the first). Both nations have stated that their programmes are defensive in nature and that they strive for global disarmament. Second, it provides India with a credible means of deterrence against adversaries with nuclear arsenals, namely Pakistan and China. India's doctrine portrays nuclear weapons as defensive and political tools that would deter another nation from seeking to "bully" them with a nuclear strike.^{IV}

2. Massive retaliation is the act of responding to a nuclear strike with the majority of India's surviving nuclear arsenal. It is relevant in that it would likely be a disproportionate response to a first nuclear strike. For example, if Pakistan were to strike India with five nuclear weapons, India would respond by striking Pakistan with 100. This aspect of the doctrine may be more a matter of deterrence against first use than a practical strategy. A nuclear first strike against India would likely target India's nuclear forces as well as important conventional targets and would be intended to be overwhelming. Given the proximity of India's strategic adversaries, Pakistan and China, a first strike against India could be achieved quickly. With the rapidity of a first strike, it is unlikely that India would be able to respond effectively with an all-out second strike. However, India's nuclear forces continue to diversify, and its triad becomes stronger, particularly with SSBNs, which increases the chance of survivability of its second-strike capabilities. With this increasing survivability, massive retaliation will indeed hold greater significance.

3. Credible minimum deterrence is the doctrine of developing and keeping a nuclear force that is strong enough to deter yet does not rise to the level of the larger nuclear arsenals of the US and Russia. India's nuclear forces have steadily increased from a small number of weapons tested in 1998 to just under 150 devices within 20 years.^V With the development of its nuclear triad, India is attempting to guarantee a survivable, diversified, small force that could commit to a second strike.

III. China's nuclear doctrine

China's nuclear doctrine follows a similar, yet more clearly defined NFU policy. Historically, Chinese motivation for acquiring and developing nuclear capabilities was to deter the US and the Soviet Union.^{VI} Mao Zedong understood from experience that these actors could use nuclear weapons as leverage against China.^{VII} In the 1950s, China had adversarial contact with the US during the Korean War (from 1950-53) and during the first and second Taiwan Strait crises (in 1954-55 and 1958, respectively). The US had threatened the potential use of nuclear weapons in those conflicts, as US doctrine still saw nuclear weapons as a useable weapon in war. Initially with Soviet assistance in the 1950s, China began developing its own nuclear weapons programme. However, due to political conflict between the two states, the USSR pulled its technical experts out in 1960.^{VIII} In 1964 China tested its first nuclear weapon, becoming the fifth state to do so.^{IX}

During the Cold War, China followed a doctrine similar to "credible minimum deterrence", meaning that having a small force of nuclear weapons was a sufficient deterrent against first use. Essentially, China decided that it should maintain a small number of nuclear weapons that would constitute a survivable second strike and would be enough to deter a nuclear first strike against China. Mao decided that the People's Liberation Army (PLA) should focus on its conventional

capabilities instead of developing a large force of different nuclear weapons as the Soviet Union and the US had done.^X He famously referred to nuclear weapons as “paper tigers”, useful as political tools but not as a real military option.^{XI} However, Mao’s thoughts on nuclear weapons changed as he witnessed attempted coercions by the US in the 1950s and his desire to create a capability to deter larger nuclear powers grew.^{XII}

In the post-Cold War space, China has reaffirmed that its nuclear doctrine remains unchanged, with a focus on developing and maintaining a small survivable second-strike capability. China became a member of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in 1992. The NPT defines a NWS as “one which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967”.^{XIII} Thus, China’s test in 1964 qualified it as the fifth and final official NPT NWS.

China is working on developing a competent nuclear triad consisting of long-range bombers, ground-to-air ballistic missiles and nuclear ICBM-carrying submarines. Although China had initially focused on developing mobile launched land-based ICBMs that could hit the US, and medium range ballistic missiles to deter the USSR, it continues to develop submarines-launched ballistic missiles (SLBM).

China maintains a NFU policy, but there have been recent debates about whether this could change, especially in India, where many do not believe that China will hold to such a policy. China’s military modernization and a strong nuclear triad could theoretically change Chinese strategy to one of using nuclear weapons in a first-use capacity. If China were to develop an effective triad, it might be able to throw its military weight around and potentially threaten other NWS with first use to deter them from interfering. However, China’s major focus in its military modernization has been developing a strong conventional military with similar capabilities

surrounding asymmetric warfare, joint operations between military branches and the embracing of future technologies.

There do appear to be caveats in China's no-first-use policy, one of which relates to the targeting of critical infrastructure. For example, it is believed Chinese military planners consider that a conventional strike against critical infrastructure, such as the Three Gorges Dam, could cause devastation similar to that of a nuclear weapon. The Three Gorges Dam is a major source of power on the Yangtze River in the Hubei Province, the destruction of which would cause massive flooding in the region. This means that, were India to strike this dam conventionally to deny China a vital power source and kill or displace thousands of people, China could consider retaliation with a nuclear weapon.^{XIV} It is important to note in this context, that this does not amount to official policy, but provides insight on the thinking inside the PLA.

Another caveat appears to be consideration of the use of nuclear weapons against the US if it interferes in a conflict with Taiwan. In one particularly famous public proclamation from 2005, Major General Zhu Chenghu declared that China may have to use nuclear weapons should the US use conventional missiles against the Chinese mainland. While the Chinese government has since walked these assertions back, it again offers insight into PLA attitude toward the use of nuclear weapons in a conventional conflict.^{XV} The PLA is developing conventional capabilities to successfully invade Taiwan if the latter were to declare independence. China considers Taiwan as a "rogue state" and views the conflict as an internal matter. Any attack on Taiwan would almost certainly involve US intervention as promised by the Taiwan Relations Act of 1978.^{XVI} However, without an official statement of this caveat by the Chinese government, it remains conjecture.

IV. Sino-India Nuclear Deterrence

India and China have long been strategic competitors before either became a nuclear power. In 1962 the two sides squared off in a month-long border war that ended in China's favor. China's nuclearization was an initial driving factor for India to develop a nuclear weapon. However, after its first test, India did not seriously consider developing nuclear weapons further until the 1980s, mainly due to internal division about how India's nuclear programme should proceed and from external pressures.^{XVII}

Borders remain a major point of contention between these two states. Tensions flared recently in 2017 on the Doklam Plateau. The Doklam Plateau is a stretch of disputed territory that lies on a tri-border area shared with China, India and Bhutan. Indian soldiers, under the auspices of a shared security agreement with Bhutan, moved in to block Chinese construction of a road into the Doklam area. This led to a month-long standoff between Chinese and Indian military forces that, for brief moments, even saw violence in the form of fist fights.^{XVIII} Eventually, cooler heads prevailed, and both sides agreed to stand down. However, such a conflict could occur again. This is a microcosm of the larger geopolitical landscape between India and China. Both countries are vying for control of territorial waters, and it is India's fear that China is trying to gain advantage in the Indian Ocean. Pakistan is a traditional rival for India in these waters, but China has shown interest in expanding its reach to this area. The fear of regional powers is a push by China to secure the Strait of Malacca, an important trading lane for a large percentage of global shipping.^{XIX} Recently, India has been trying to secure vital islands near this Strait, mainly the Andaman and Nicobar islands to the west of the Strait, citing unease regarding Chinese naval bases in the

region.^{XX} Were India to use these islands as intelligence, surveillance and reconnaissance (ISR) stations, it might be able to track shipping movements of both military and civilian vessels.

On the geopolitical spectrum India believes it must reach parity with China in both conventional and nuclear capabilities. The main motivations for this, besides the threat of nuclear weapons and unresolved border crises, are growing strategic relationships in the region. India has long had concerns about the Sino-Pakistani strategic partnership, which has a long history of nuclear technology sharing with the finger pointed at China as the root cause.^{XXI} China, in turn, is distrustful of the India-US relationship, which is explicit in its intention to contain China's influence in the region. Recent events have seen the resurgence of the "Quad" with Japan and Australia joining India and the US in strategic stability discussions.^{XXII} These discussions include Chinese expansionism in the first island chain and while the "Quad" is not an official alliance it is seen by China as a force opposed to its interests. While the resurgence of the "Quad" is not an indication of a great power alliance in Asia against China, it does highlight that the common ground of four major powers in the region is centered on Chinese expansion as a major factor of destabilization in the region.

Another point of contention between India and China is military modernization, in which both have actively engaged. Starting in 2015 under the new President Xi Jinping, the PLA reformed, providing more control to the growing PLA Navy (PLAN) and PLA Air Force (PLAAF). The PLA introduced the PLA Rocket Force (PLARF), formerly the Second Artillery Group of the PLA, as a new service and added a joint operation focused grouping of the PLA called the PLA Strategic Support Force (PLASSF).^{XXIII} This reform is intended to decentralise the traditional power structure of the PLA which had historically resided mainly with the ground forces. As China has begun expanding its capabilities, it has decided to ensure that these services

have more support and work jointly together. To this end, the second aspect of Chinese military reforms is the creation of five theater commands. The Western Theater command starts at southern Tibet, extends to the Chinese border with Russia and Mongolia and comprises roughly a third of the PLA's strength. This command is responsible for operations in Central and South Asia and its jurisdiction falls upon every disputed border with India.^{XXIV} This theater holds a disproportionate amount of the PLA strength due to its geographic size, and social unrest among populations in Tibet and Xinjiang, as well as its shared borders with India.^{XXV}

V. Developments in Ground-Based Missile Forces

India currently relies on ground-based missiles as its main capability to deter China and Pakistan. Historically, India's ground-based missiles were short-range ballistic and cruise missiles that were unsophisticated and intended to meet immediate goals surrounding deterrence of Pakistan. India is now developing a plethora of different ballistic and cruise missile systems for the three major domains.^{XXVI} In the ground-based missile domain, the focus is on developing longer ranged missiles that would allow India to strike the eastern seaboard of China, which holds the majority of the country's population centers.

The Agni family of ballistic missiles is India's premier ballistic missile system. It is an increasingly sophisticated missile, with four of the series inducted, and the newest, the Agni-V, expected to enter service soon. All of these missiles have undergone testing since the beginning of January 2017, the most recent of which was an Agni-V test in December 2018.^{XXVII} The range of these missiles has increased with each series, from the 900 km Agni-I to the 5,000 km Agni-V. With the Agni-V entering service within the next year or two, India will for the first time have the ability to strike the majority of China, ensuring near parity regarding landmass covered. There are

rumors of an additional Agni system in development, the Agni-VI, the range of which is estimated to be in excess of 8,000 km. There is not much in the way of official reporting of this system so, at this time, it should be considered as a conceptual missile system. An article in *India Today* quoted a Defence Research and Development Organisation (DRDO) scientist discussing the plans for the missile system.^{xxviii} The article stated that the Agni-VI is expected to be a smaller missile that can be deployed on ground-based launchers or SSBNs. India is currently experimenting with the idea of adding multiple independently targetable reentry vehicles (MIRV) to its Agni systems, particularly with later additions like the Agni-V.^{xxix} “MIRVing” its ballistic missiles would allow for greater survivability and a greater spread of destruction. Technologically, this advancement would put India in a select club of countries that have that capability. The Agni-VI is also expected to have MIRV capabilities, as well as a maneuverable reentry vehicle, allowing for it to adjust targeting as it reenters the atmosphere.

India plans to “canisterise” the Agni-V missile system, allowing for a quicker reaction to an attack. Traditionally, India kept its nuclear warheads “de-mated” from its missile systems, a confidence-building measure which helps against accidental or misuse.^{xxx} De-mated systems take a longer time to become operational because the warhead needs to be assembled, and then put on the rocket. Canisterising limits the time needed to put the missile together, making it operational faster, though it does not rise to the immediate nuclear readiness of the US and Russia. This change reflects a rethinking of procedure but is not a clear provocation or escalation. It also indicates a significant advancement in Indian missile technology. If India decides to canisterise its missile systems across the board however, it could indicate a desire to have quicker reaction time during a crisis. It is a stepping stone to potentially putting nuclear weapons on a stand-off positioning. It is important to keep in mind that, for the time being, that this is not Indian policy. Further

developments of the Agni series of missiles include upgrading older versions of the missile to reflect advancements in technology. An upgraded Agni IP is set to replace the first Agni-I ballistic missiles.^{XXXI} Its shorter range, under 1000 km, is more of a threat to Pakistan, but if deployed in eastern India, it could also strike into western China.

The BrahMos is a two-stage hypersonic cruise missile that is regarded as one of the fastest systems in the world, reaching a speed of Mach-3.^{XXXII} Developed out of a joint venture between India and Russia started in 1998, the BrahMos finished production of longer ranged variants (greater than 300 KM) after India became a member of the Missile Technology Control Regime (MTCR) in 2016, which allowed for the sharing of sensitive technology to India by Russia.^{XXXIII} The missile was originally lauded as an anti-ship missile and India threatened to sell it to multiple Southeast Asian countries that were adversarial to China over territorial rights in the South China Sea. Pressure from China has seemingly ended much of the worry about a hypersonic fire sale, with only Vietnam seemingly still interested in purchasing the missiles.^{XXXIV}

With a range of 300-400 km the BrahMos faces issues similar to those associated with other missile systems in that it would not be much use in a ground basing. There are attempts to utilise the speed advantage of these weapons, as bunker busters for example.^{XXXV} That speed also allows it to theoretically bypass ballistic missile defences, making it a destabilizing tool should India decide to nuclearise it. At this time, India has not announced a desire to put a nuclear warhead on the BrahMos. An article in *The Diplomat* inferred that India has the technological expertise and material to do so.^{XXXVI} The missile can be fired from the ground, on a ship, from a submersible platform and now from the air. Its range is currently being extended to 800 km^{XXXVII}, so in the context of ground-based missiles, the range would allow for striking Chinese targets in western Tibet. This does not allow for India to use it in the same target area as the Agni V and VI from the

ground as they can reach most of China's eastern seaboard. However, in the conventional spectrum, this missile is beneficial in striking Chinese strategic assets in the western theater command and PLA forces in the Himalayas, which "dug in" on the Chinese side of the Doklam Plateau shortly after the stand-off last year.^{XXXVIII}

The Nirbhay is a subsonic cruise missile system with a range of 1000 km and is believed to have a nuclear mission. This missile has had several issues in its development and has not entered active service at this time. India has conducted five tests of the Nirbhay since 2013, with only two being considered successful. The last test, in November 2017, was successfully launched at the Integrated Test Range in Chandipur. According to an article in *One India*, there are rumors that the system may be postponed for induction or even cancelled outright due to its developmental challenges.^{XXXIX}

China has also focused on developing its ground-based missile forces as it is also the largest component of China's nuclear deterrent. Chinese developments have similarly centered on developing new systems and upgrading older ones. The Dong Feng (DF) series of ballistic missiles come in seven variants and three sub variants. The DF series ranges from 600 km to 13,000 km variants and yields from 200-300 kilotons to up to 5 megatons covering most areas required for China's credible minimum deterrence.^{XL} The majority of these missile systems are road or rail mobile, and a portion of the DF-5 are silo-based.^{XLI} The earliest versions of the DF, the DF 4 and DF 5 are ICBMs with ranges at 5,500 km and 13,000 km. The warheads on these missiles were 3-5 megatons and were produced in low number, current estimates are around 10 warheads each.^{XLII} As China has modernised its missile force, advances have been made in targeting and accuracy, so later additions in the DF-21, DF-26 and DF-31 have smaller yields of 200-300 kg.^{XLIII} The DF

series are China's only ground based ballistic missiles and takes on both its conventional and nuclear needs in this domain.

China's developments in the ground-based missile domain are also reflected in its desire to create effective countermeasures, to MIRV its larger missiles and to improve guidance systems. These developments relate to defeating ballistic missile defences of the US. China considers ballistic missile defences to be destabilizing forces because of the potential to disrupt China's second-strike capabilities. It is generally accepted that ballistic missile defence technology is far behind offensive missile technologies, but China considers the deployment of the Terminal High Altitude Area Defense (THAAD) systems in South Korea as possibly effecting its own deterrent.^{XLIV}

While China has the capability to strike the far side of the continental US, most of its systems are short, medium and intermediate range ballistic missiles (SRBMs, MRBMs, and IRBMs). These missiles do not exceed the range of 5500 km, which would put them in the intercontinental class, and are intended to deter threats within that range, originally the Soviet Union. In the event of a conventional conflict with India, China's SRBM/MRBMs would be within range to strike all of India. As these missiles are all dual-capable and indeed hold a conventional role, it would not be out of the realm of possibility for a mistake to be made in classifying the payload of these weapons when used in conflict. This ambiguity is clear in the Indian arsenal as well, as missiles systems are not diversified and continue to hold a dual-capable purpose.

China and India are developing even more sophisticated missiles achieving several milestones. For India, these relate to range achieved and potentially creating MIRV and MARV capable missiles to increase the deterrent effect of its ground-based missile forces. India has the potential to nuclearize two of its cruise missiles, the BrahMos and the Nirbhay, which would give

India more flexibility in its nuclear deterrent that would extend into multiple operational domains. China has as well continued to extend the range of its missiles but has scaled down the payloads as the accuracy of targeting systems has become more advanced. At this time, there is little evidence pointing to the nuclearization of its cruise missile forces. As China expands its short-range hypersonic cruise missiles, in response to India's BrahMos, it cannot be ruled out that China might decide to give a future hypersonic cruise missile system a nuclear mission in the future.

The final major development relates to an emergent technology called the hypersonic glide vehicle (HGV). The HGV is a dual-capable missile system that can travel at speeds currently incapable among modern cruise missile systems. China successfully tested its HGV in 2017, and the country appears to be among the leaders among innovations in this technology.^{XLV} Based on a small number of available sources, the nuclear implications of the use of the HGV are incredibly alarming as experts believe that these systems would effectively render missile defences, a technology already criticised for its inefficiencies, nearly obsolete.^{XLVI} India has been noted as carrying out research on these systems as well, but progress has been limited. The deployment of the HGV in the coming decade would undoubtedly destabilise relations with India and China because it would create more insecurity around the survivability of second-strike forces.

VI. Developments in the Naval Domain

Both India and China seek to develop a small number of sophisticated nuclear ballistic missile capable submarines (SSBNs). India has recently finished a sea patrol with the INS Arihant, its first SSBN that has been under development for several years.^{XLVII} The Arihant class is outfitted with the K-15 750 km submarine launched ballistic missile, the first of the "K" family of missiles.^{XLVIII} Given the distance, any use of the K-15 would need to operate in the South or East

China Seas to hit any meaningful targets inland. However, as India's SSBN fleet is in its infancy it would probably operate solely in the Indian Ocean until more advanced SSBNs are put into service. Given its range, the K-15 could only be used against targets in Pakistan until a missile with a longer range can be procured.

India's SLBM development is intriguing in its rapidity, because it has expanded from the short range 750 km K-15 to the medium range "K-4" with a of 3500 km range, putting most of China in range from the Bay of Bengal. Further developments seek to extend that range further with the K-5 at 5000 km and the K-6 at 6000 km respectively, ensuring full coverage of China.^{XLIX} These two SLBMs will not be operational for several years as the K-4 is still in the development stage.

China inducted the one and only Xia-class (Type 092) in the 1980's, which served more as a test for technology and as a stepping stone in the growth of its nuclear deterrent in the naval domain.^L It did not conduct any deterrence patrols and is not operational at this time. In 2007 China introduced the Jin-class SSBN, also called the Type 094. China currently operates four Jin-class SSBNs, but there is speculation that there may be as many as six Type 094's in service.^{LI} In 2016 the Type 094 conducted a patrol but is not believed to have conducted any patrols with live nuclear weapons on board. The common criticism of China's current SSBNs is that they are too noisy, which is a detriment to their survival. A noisier submarine is easier to track and destroy, even in deeper waters. As for the Indian submarines, while the Type 094 will serve as a progressive step towards a more advanced Chinese SSBN capability, it has served a similarly ceremonial role. For instance, the Type 094 has not been noted as serving in an active deterrence patrol for the PLA Navy (PLAN) but is ready to be utilised in case of a conflict.^{LII}

The Jou Lang 2 or JL-2 is China's submarine launched ICBM, with a range of 7,000 km. Based on the DF-31, the JL-2 provides China with a range that could strike India, small parts of the US, and Russia. According to Hans Christensen's 2018 "Nuclear Notebook," the JL-2's range is estimated because flight tests were not conducted to the full range of the missile system.^{LIII} The JL-2 are integrated with China's current SSBNs and can hold a conventional and nuclear payload. The payload of the JL-2 is the same as the DF-31 at 200-300 kilotons.^{LIV}

The Type 096 is the next generation of China's SSBN and is expected to start construction in the early 2020's.^{LV} Not much is known in open source, as the SSBN programmes of most countries are generally very secretive. However, the submarine is expected to function like the Type 092 and 094, but more efficiently. China's development of the Type 096 undoubtedly works to integrate quieter technologies which could help ensure its survivability. As the evolution of China's SSBNs continues, it is its goal to develop sophisticated submarines that provide a valued second-strike capability to deter aggressors.

The JL-3 SLBM is expected to be put into operation with the newer Type 096 and is similarly under development. *The Diplomat* in an article published 20 December 2018 noted a test of the JL-3 SLBM from a submarine used to test missiles on 24 November 2018.^{LVI} This is the first known test of this SLBM, the range of which is expected to exceed 9,000 km, allowing it to strike the continental US without having to travel farther into the Pacific. For example, from the Sea of Japan, China could launch a JL-3 that could hit most of the western seaboard from Los Angeles, California, to much of Montana.^{LVII}

India and China are operating in this domain under similar goals, the most important of which is to develop a viable SSBN deterrent that could be used in the event of a nuclear first strike against their countries. China currently has the capability to operate a small deterrent force but is

facing issues over acoustic dampening and other technological difficulties. This lull does allow China to develop its sea-based deterrent in the future, tackling key issues surrounding command and control, right to launch and the size of its patrols. India, if successful in building and integrating more successors to the Arihant and Arighant classes, would be the first nuclear weapon possessor state to conduct regular deterrence patrols in this domain. Both countries are developing longer range missiles to be able to utilise distance in the survivability of submarines. China is quite farther along in this aspect of development, but India is quickly gaining ground. With the induction of the K-4, K-5 and eventually the K-6, India would have the ability to strike China's eastern seaboard from different areas of the Indian Ocean. If the goal of India's submarine forces in the future is to patrol into the Pacific Ocean, then that range advantage would increase. China can strike India with its current JL-2 and eventually from a longer distance away with the JL-3 on its next generation SSBN, the Type-096.

Both India and China are developing their forces in the naval domain to ensure a powerful deterrent to outside attack in the conventional and nuclear spectra. While China technically has four to six Type-094 class SSBNs, it has not committed to a continuous patrol schedule. As the shelf-life of these systems is several decades China will probably operate these submarines concurrently with its newer Type-096 SSBN once it comes into service. Similarly, India is at its infancy with its SSBNs and its patrols have mainly been to show that its submarines do work as they should. The Arihant is India's first SSBN and like China's Xia-class operates as the first step towards a more developed nuclear deterrent in this domain.

VII. Developments in the Air Domain

The Indian Air Force (IAF) operates a variety of aircraft in combat roles, relying on both foreign supplied and indigenously produced systems. India's dual-capable aircraft are just as diverse and the IAF may rely on at least three different aircraft to operate its nuclear air missions in the future.^{LVIII} Currently, the two planes that have a direct nuclear mission are the British-French produced Jaguar IS/IB and the French made Mirage 2000H.^{LIX} Both aircraft are undergoing programmes to upgrade existing systems and to extend their life cycles by 10-15 years.

The Jaguar IS/IB joined the IAF in 1979 but has been plagued by technical problems in recent years as it is retired by other countries and spare parts for maintenance are harder to obtain.^{LX} The Jaguar operates as a ground-attack aircraft and has been the mainstay of the Indian Air Force's nuclear deterrent until the Mirage 2000H was procured. The IAF currently has 120 of the Jaguar IS/IB, which have an operational range of 1,600 km.^{LXI} The most recent upgrade of this aircraft is currently being conducted using retired systems and spare parts from countries that no longer use it, such as Oman, France and the UK.^{LXII} This upgrade is expected to extend its life span past 2030. The Mirage 2000H is nuclear capable and has a range of 1,800 km allowing it to strike some portions of western China. A deal made with France in 2011 is working to upgrade the 50 Mirage 2000Hs' and extend the life of these aircraft.^{LXIII}

The French made Dassault Rafale is an aircraft that, until recently, filled the role of nuclear fighter bomber in the French Air Force. India originally attempted to purchase over 100 aircraft. Current Prime Minister Naraendra Modi made a deal with France in 2015 to buy just 36 Rafales. However, the deal has faced scrutiny at home.^{LXIV} While procurement of the aircraft has stalled, if completed, the Rafale would provide India with another nuclear capable aircraft.

The Russian made Su-30 MKI is a fourth-generation multi-role fighter aircraft with an operational range of 3200 km. India, through a deal made with Russia, has the right to build its own Su-30 MKI and Hindustan Aeronautical Limited (HAL) has produced over 220 of these aircraft for the IAF.^{LXV} The Su-30 MKI's advanced capabilities, especially its longer range, have ensured that it will be the premier aircraft for long range nuclear missions. The Su-30MKI is currently being modified to carry the BrahMos air launched cruise missile. At the same time the BrahMos range is being extended to 800km. In the air domain that development would allow for longer range precision strike capabilities.

Historically, bombers with nuclear gravity bombs were the main deterrent of China's nuclear weapons programme until its ground-based missile forces on mobile missile launchers took precedence. The bomber force fell behind as China focused on developing nuclear capable submarines and ICBMs. Currently, China's PLA Air Force (PLAAF) operates one long range bomber, the H-6K, with an operational range of 4500 km and several multi-role fighter aircraft. The PLAAF is focusing on developing advanced fourth and fifth generation aircraft that can compete with the US and US allies in the region. Japan for example, has purchased several fifth generation F-35 stealth multi-role aircraft from the US recently and Taiwan has expressed interest in purchasing these aircraft. These types of developments are routed in creating stronger stealth, precision strike and ISR capabilities, as well as increasing the overall size of the air force.

Although the H-6K is a long-range bomber that does not have a clear nuclear mission, there is speculation about its capability to hold a nuclear payload. The US Department of Defense's yearly China military power report noted that China's PLAAF now has a nuclear mission focused around the H-6K and the H-20 which is currently under development.^{LXVI} The H-6K is dual-capable, in that it is not solely intended to use nuclear weapons but can carry conventional payloads

too. China's strategic use of this bomber has been to probe past the first island chain as a means of testing the resolve of US allies. In 2016, China made several escalatory maneuvers with this bomber, including flying a squadron around Taiwan, reinforcing the threat to all of Taiwan's shores, not merely just the coast facing mainland China. The H-6K is intended to strike targets like Guam, a US territory with significant strategic value in the Pacific, and has conducted regular exercises with that target in mind.

On the scale of escalation if the H-6K were to be used against India, it would be an effective deterrent. As mentioned above, the range of these bombers is roughly 4500 km which would allow for easy penetration into most of India from the western theater command in western China. The bomber has a range of capabilities in its payload including cruise missiles and possibly air launched ballistic missiles which are currently being tested. The H-20 is a new long-range bomber under development and set to be inducted into the PLAAF in the mid 2020's.^{LXVII} With a supposed range of 10,000 KM this bomber would greatly increase the operational range of China's strategic bomber forces.

In the air domain, there is a clear battle for parity, but China is more focused on reaching parity with the US than with India. Both India and China use similar systems, but there are two major caveats. One, China has had success in developing multi-role fourth generation and potentially fifth generation aircraft. Indigenous production of similar aircraft in India, besides the Su-30 MKI, has been fraught with numerous setbacks. India focuses more on dual-use fighter bomber aircraft that, in a conflict, could be active in different roles, leading to greater ambiguity on their use in a nuclear conflict. China focuses on using long range bombers that have a clearer nuclear role, capable of being used at increasingly longer ranges. Advancements in aerial refueling allow both countries to increase the operational range of their air forces.

Historically both countries relied on nuclear gravity bombs as their sole form of deterrent until ground-based missiles became the major leg of their eventual triads. As the advancement of a nuclear air power is becoming more important to both China and India, the focus has shifted to more advanced delivery vehicles. Both countries appear to be testing air launched cruise missiles that could act as dual-capable delivery vehicles. China is testing air launched ballistic missiles which are believed to be nuclear capable. While the main motive for the PLAAF in developing its long-range bomber capability is to strike the US, and reach parity with US advanced long-range bomber forces, the use of these could easily be turned to India in a conflict. China has begun using its holdings in the South China Sea as staging areas for power projection deeper into the Pacific, the same could be used to project power west. In November 2018 an H-6K was seen landing on a landing strip on one of these artificial islands. It is possible that similar power projections could become the norm.

VIII. How does Pakistan fit into this?

Pakistan, with its very different relationships with India and China, is a necessary part of any analysis of deterrence in South Asia. India believes that it is being smothered by a Sino-Pakistan alliance that seeks to limit India's power status in South Asia. India and Pakistan have been at war four times and have had a number of limited conflicts since the birth of their countries in 1947.^{LXVIII} Both countries developed nuclear weapons programmes in similar time frames and Pakistan tested quickly after India in 1998.^{LXIX} Besides a potential nuclear conflict between the Soviet Union and China during the border conflict in 1969^{LXX}, India and Pakistan are the only two nuclear weapons possessors to engage in direct conflict (in 1999 and 2001 over the Kashmir disputed area). India continues to enjoy a large conventional advantage over Pakistan, leading

Pakistan to build upon its nuclear capabilities to compensate for a much smaller conventional military.

Pakistan's nuclear doctrine is focused on full spectrum deterrence as a means of protecting from Indian invasion. This doctrine allows Pakistan to use nuclear weapons at will and has established a rough level of escalation control. For example, Pakistan has developed many tactical nuclear weapons intended for use against Indian army formations that have invaded Pakistan. This is seen as a means of blunting India's conventional "Cold Start" doctrine which establishes a rapid reaction force to strike against Pakistan's conventional forces in the event of a small-scale conflict (such as the Kargil war in 1999).^{LXXI}

Pakistan does not have a NFU policy as it sees as paramount its survival tied to deterrence against India at all levels of escalation.^{LXXII} Throughout the successive wars between the two nations, India has been able to use its considerable conventional advantage and pushed into Pakistan with relative ease. Pakistan sees nuclear weapons as necessary to blunt the conventional forces of an Indian invasion.^{LXXIII}

Pakistan has been developing longer range missiles and a submarine capability to reach parity with Indian second-strike capabilities.^{LXXIV} Pakistan seems to believe that a tactical nuclear weapon strike against Indian troops in Pakistani territory would be an acceptable level of escalation and a lack of a NFU in the face of an enemy with increasingly powerful conventional advantage may put Pakistan in a "use it or lose it" scenario. However, India's nuclear doctrine clearly states as a caveat to its NFU policy that a chemical, biological or nuclear attack on Indian soldiers in foreign lands would necessitate a retaliatory strike, and in accordance with massive retaliation doctrine, it could see the deaths of millions of Pakistanis in response. Given that this would lead

to Pakistan striking back with its surviving forces, South Asia has long been feared as the place most likely to see a nuclear conflict since the Cuban Missile Crisis.

China and Pakistan have a mutually beneficial relationship, which is considered by India as a destabilizing force in South Asia. China provided technical support to Pakistan's nuclear programme and continues to provide support in the way of conventional arms. A major concern for India is a two-front war against China and Pakistan, for which members of the military have declared they are preparing. Historically speaking, China has acted more as an interlocutor in Indian-Pakistani conflicts and has generally stayed out of joining Pakistan in any wars against India. That does not mean that a two-front war is out of the realm of possibility but China's stance of non-intervention in other states' affairs may preserve the status quo.

One factor that could change the overall alliance structure is China's desire to build naval bases in South Asia. China has planned on creating a naval base in Pakistan, which, if completed would be the second in the region after the opening of the naval base in Djibouti. India views these naval bases as destabilizing because they increase China's naval reach westward, past the first string of islands in the South and East China Seas. If China decides to build a naval base in Pakistan, it would clearly increase China's presence in the region, putting Chinese troops to the west of India. Were India and Pakistan to enter into another conflict, as is likely given their tumultuous history, Chinese forces could be in the crossfire. Any attack on Chinese forces would be a clear provocation and cause an international incident. If China is to develop a military base or station soldiers and personnel in Pakistan, it would be necessary for India and China to have dialogues surrounding targeting, so an escalation is avoided.

IX. Conclusion

The nuclear deterrence dynamics between India and China are becoming more important as both countries modernise their nuclear forces and the delivery vehicles that carry them. In the ground-based missile forces, air and naval domains there are clear developments in sophisticated nuclear capable delivery vehicles.

China and India seek to be responsible nuclear actors and have developed NFU policies, promising not to use their nuclear weapons unless first attacked by a nuclear weapon or to coerce non-nuclear weapons states with their nuclear forces. However, both countries have clear and unclear caveats to this policy which could see one or both change their respective stances in time. There is also constant conversation among strategists around the usefulness of a NFU policy in both countries. Only time will tell if they can successfully mold the discussion into a direct change. The maneuverings and posturing of other nuclear possessing states like Pakistan and the also pose serious risks to the stability of NFU policy in both countries. It is also possible that if one changes its policy, the other country may follow.

China and India seek to develop their nuclear triads for similar reasons: to ensure a survivable second-strike capability. Both countries reaffirm their desire to maintain a smaller quantity of nuclear weapons to ensure credible minimum deterrence. Both India and China have been noted as increasing their nuclear arsenals by a small degree in the past five years as part of their respective modernization programmes.^{LXXV} However as both sides continue to modernise their forces there is no sure way to know if the status quo will remain. Advances in missile defences and diversified weapons systems could create a desire among these states to increase their nuclear stockpiles to meet demands. As it stands, China has not released information on the number of

nuclear weapons it has produced, and estimates have ranged from the low hundreds to the low thousands. China's desire not to share that information is a tactic of ambiguity and another measure of protection of its nuclear forces. However, with a nuclear triad nearly operational, it would be beneficial, as a non-proliferation measure, for China to declare its nuclear stockpile.

The postures of these two nations would seemingly allow for strictly conventional deterrence, but the reality is that neither country believes the other is serious about its NFU pledge. India's development of a triad and longer-range missiles is clearly intended to create a second-strike capability against China, whose vast arsenal of SRBM, MRBM, and IRBMs has the capacity to strike India. While China has been more focused on larger nuclear competitors, it is putting more emphasis on both conventional and nuclear deterrence into perspective with India. The creation of the western theater command brings together different elements of the PLA military branches as a joint operating force to conduct operations relating to the neighboring countries on its periphery, mainly South and Central Asia.

With continued border conflicts and strategic competition, another Doklam Plateau-style crisis could occur with a significant risk of escalation. The level of escalation given a conventional conflict using dual-capable delivery systems could rise substantially as neither side may know which is being used against them. The ambiguity of these systems is the most destabilizing factor surrounding them. Both countries' forces have missiles that are intended to hold both conventional and nuclear payloads. The lack of diversification among these forces could lead to a miscalculation in a conflict. The air domain is equally daunting because long range bombers or fighter aircraft could be mistaken for carrying a nuclear payload. Both countries can easily reach each other with advances in air launched cruise missile and ballistic missiles under development. The naval dimension is more clearly defined as both countries are moving to SSBNs which have a clearly

defined nuclear mission. However, if these assets were tracked and targeted in a conflict, that could also count as escalation as it would be an attack on nuclear forces. If for instance India were to destroy a Chinese SSBN conventionally, that would constitute attacking Chinese nuclear forces, which would deny a valuable second-strike capability. The fallout of that could see China responding with a nuclear second strike.

Both sides have made inroads in conversations to benefit strategic stability, especially after the Doklam Plateau incident last summer. In order to avoid accidents or unintended escalation, India and China need to engage in bilateral and trilateral talks to ensure that they understand each other in the context of nuclear deterrence. Pakistan, India and China have participated in a trilateral discussion about non-proliferation and arms control in South Asia. This is an important step, but more should be done to ensure that escalation does not occur on the nuclear spectrum. India, in the context of a developed nuclear deterrent, is working towards reaching parity with China's nuclear forces. How China responds to India's diversifying triad will determine how South Asian deterrence dynamics are shaped in the coming decades.

^I Nuclear Threat Initiative. India. April, 2017. <https://www.nti.org/learn/countries/india/>

^{II} Arms Control Association. India's Draft Nuclear Doctrine. July 1, 1999. https://www.armscontrol.org/act/1999_07-08/ffja99

^{III} Ministry of External Affairs, Government of India. The Cabinet Committee on Security Reviews operationalization of India's Nuclear Doctrine. January 4, 2003. https://mea.gov.in/press-releases.htm?dtl/20131/The_Cabinet_Committee_on_Security_Reviews_perationalization_of_Indias_Nuclear_Doctrine+Report+of+National+Security+Advisory+Board+on+Indian+Nuclear+Doctrine

^{IV} Vivek Prahladan. Hawks and Doves: China's First Nuclear Test and Indian Nuclear Thought. Wilson Center. September 25, 2017. <https://www.wilsoncenter.org/blog-post/hawks-and-doves-chinas-first-nuclear-test-and-indian-nuclear-thought>

^V SIPRI for the Media, "Modernization of nuclear weapons continues; number of peacekeepers declines: New SIPRI Yearbook out now". June 18, 2018. Stockholm International Peace Research Institute. <https://www.sipri.org/media/press-release/2018/modernization-nuclear-weapons-continues-number-peacekeepers-declines-new-sipri-yearbook-out-now>

^{VI} Li Bin, and Tong Zhao, editors. "Understanding Chinese Nuclear Thinking". Carnegie Endowment for International Peace, 2016. carnegieendowment.org/2016/10/28/understanding-chinese-nuclear-thinking-pub-64975.

^{VII} Li, Bin, and Tong Zhao, editors. "Understanding Chinese Nuclear Thinking". Carnegie Endowment for International Peace, 2016. carnegieendowment.org/2016/10/28/understanding-chinese-nuclear-thinking-pub-64975.

-
- ^{viii} Michael S. Gerson. "The Sino-Soviet Border Conflict: Deterrence, Escalation and the Threat of Nuclear War in 1969". Center for Naval Analyses, November 2010. https://www.cna.org/cna_files/pdf/d0022974.a2.pdf
- ^{ix} NTI Learn: China. January 2019. Nuclear Threat Initiative. <https://www.nti.org/learn/countries/china/>
- ^x Li Bin, and Tong Zhao, editors. "Understanding Chinese Nuclear Thinking". Carnegie Endowment for International Peace, 2016, carnegieendowment.org/2016/10/28/understanding-chinese-nuclear-thinking-pub-64975.
- ^{xi} Li Bin, and Tong Zhao, editors. "Understanding Chinese Nuclear Thinking". Carnegie Endowment for International Peace, 2016, carnegieendowment.org/2016/10/28/understanding-chinese-nuclear-thinking-pub-64975.
- ^{xii} Li Bin, and Tong Zhao, editors. "Understanding Chinese Nuclear Thinking". Carnegie Endowment for International Peace, 2016, carnegieendowment.org/2016/10/28/understanding-chinese-nuclear-thinking-pub-64975.
- ^{xiii} Treaty on the Non-Proliferation of Nuclear Weapons (NPT)
<https://www.un.org/disarmament/wmd/nuclear/npt/text>
- ^{xiv} Eric Heginbotham et al. "China's Evolving Nuclear Deterrent: Major Drivers and Issues for the United States". 2017. Rand Corporation. https://www.rand.org/pubs/research_reports/RR1628.html (Page 131)
- ^{xv} Stephanie Lieggi. "Going Beyond the Stir: The Strategic Realities of China's No-First-Use Policy". January 1, 2005. Nuclear Threat Initiative. <https://www.nti.org/analysis/articles/realities-chinas-no-first-use-policy/>
- ^{xvi} Taiwan Relations Act. January 1, 1979. American Institute in Taiwan. <https://www.ait.org.tw/our-relationship/policy-history/key-u-s-foreign-policy-documents-region/taiwan-relations-act/>
- ^{xvii} NTI Learn: Indian Nuclear Program. August 2016. Nuclear Threat Initiative.
<https://www.nti.org/learn/countries/india/nuclear/>
- ^{xviii} Nicola Smith "India-China border brawl: Superpowers throw stones at each other as tensions heighten". August 20, 2017. The Telegraph. <https://www.telegraph.co.uk/news/2017/08/20/india-china-border-brawl-superpowers-throw-stones-tensions-heighten/>
- ^{xix} Krishnadev Calamur, "High Traffic, High Risk in the Strait of Malacca". August 8, 2017. The Atlantic. <https://www.theatlantic.com/international/archive/2017/08/strait-of-malacca-uss-john-mccain/537471/>
- ^{xx} Darshana Baruah, "The Andaman and Nicobar Islands: India's Eastern Anchor in a Changing Indo-Pacific". March 21, 2018, Carnegie India. <https://carnegieindia.org/2018/03/21/andaman-and-nicobar-islands-india-s-eastern-anchor-in-changing-indo-pacific-pub-75855>
- ^{xxi} Siddharth Ramana, "China-Pakistan Nuclear Alliance". August 2011, Institute of Peace and Conflict Studies. http://www.ipcs.org/issue_briefs/issue_brief_pdf/SR109.pdf
- ^{xxii} One US official stated the Quad was not a forum for "military issues" but a place to discuss common ground. <https://www.scmp.com/news/china/diplomacy/article/2174027/united-states-wont-give-china-taiwan-or-south-china-sea>
- ^{xxiii} Adam Ni, Bates Gill, "China's New Missile Force: New Ambitions, New Challenges (Part 1)". August 10, 2018, China Brief Volume: 18, Issue: 14. The Jamestown Foundation. <https://jamestown.org/program/chinas-new-missile-force-new-ambitions-new-challenges-part-1/>
- ^{xxiv} Kevin McCauley, "Snapshot: China's Western Theater Command". January 13, 2017 China Brief Volume: 17 Issue: 1. The Jamestown Foundation. <https://jamestown.org/program/snapshot-chinas-western-theater-command/>
- ^{xxv} Kevin McCauley, "Snapshot: China's Western Theater Command". January 13, 2017 China Brief Volume: 17 Issue: 1. The Jamestown Foundation. <https://jamestown.org/program/snapshot-chinas-western-theater-command/>
- ^{xxvi} Jonathon McLaughlin, "India's Expanding Missile Force". January 2, 2019. Wisconsin Project. <https://www.wisconsinproject.org/indias-expanding-missile-force/>
- ^{xxvii} Jonathon McLaughlin, "India's Expanding Missile Force". January 2, 2019. Wisconsin Project. <https://www.wisconsinproject.org/indias-expanding-missile-force/>
- ^{xxviii} India Today Web Desk, "All you need to know about the 'fire'-istic series of missiles, the Agni Series". March 4, 2018. India Today. <https://www.indiatoday.in/education-today/gk-current-affairs/story/all-you-need-to-know-about-the-fire-istic-series-of-missiles-the-agni-series-1181506-2018-03-04>
- ^{xxix} Gurmeet Kanwal, "India's Nuclear Force Structure 2025" June 30, 2016. Carnegie Endowment for International Peace. <https://carnegieendowment.org/2016/06/30/india-s-nuclear-force-structure-2025-pub-63988>
- ^{xxx} Gurmeet Kanwal, "India's Nuclear Force Structure 2025" June 30, 2016. Carnegie Endowment for International Peace. <https://carnegieendowment.org/2016/06/30/india-s-nuclear-force-structure-2025-pub-63988>

-
- ^{XXXI} “India’s Strategic Forces Command Successfully Tests The Agni-I SRBM”. February 6, 2018. Delhi Defence Review. <http://delhifencereview.com/2018/02/06/indias-strategic-forces-command-successfully-tests-the-agni-i-srbm/>
- ^{XXXII} Brahmos Supersonic Cruise Missile Information sheet. Brahmos Aerospace. <http://www.brahmos.com/content.php?id=10&sid=10>
- ^{XXXIII} Dipanjan Roy Chaudhury, Manu Pubby. “MTCR benefit: India, Russia to develop 600-km range cruise missiles that can cover entire Pakistan” July 14, 2018, The Economic Times. India Times. [//economictimes.indiatimes.com/articleshow/54926916.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppsthttps://economictimes.indiatimes.com/news/defence/mtcr-benefit-india-russia-to-develop-600-km-range-cruise-missiles-that-can-cover-entire-pakistan/articleshow/54926916.cms](http://economictimes.indiatimes.com/articleshow/54926916.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppsthttps://economictimes.indiatimes.com/news/defence/mtcr-benefit-india-russia-to-develop-600-km-range-cruise-missiles-that-can-cover-entire-pakistan/articleshow/54926916.cms)
- ^{XXXIV} News reports in late 2018-early 2019 have shown a resurgence of interest by Indonesia to purchase these missiles as well. <https://www.hindustantimes.com/india-news/india-exploring-sale-of-brahmos-cruise-missile-to-indonesia/story-fA9b5D1Ap27XbQcPQA5BhJ.html>
- ^{XXXV} Ankit Panda. “A First: India Successfully Tests BrahMos Supersonic Land-Attack Cruise Missile” April 24, 2017. The Diplomat. <https://thediplomat.com/2017/04/a-first-india-successfully-tests-brahmos-supersonic-land-attack-cruise-missile/>
- ^{XXXVI} Joy Mitra. “Will India Nuclearize the BrahMos Supersonic Cruise Missile?” July 12, 2018. The Diplomat. <https://thediplomat.com/2018/07/will-india-nuclearize-the-brahmos-supersonic-cruise-missile/>
- ^{XXXVII} Joy Mitra. “Will India Nuclearize the BrahMos Supersonic Cruise Missile?” July 12, 2018. The Diplomat. <https://thediplomat.com/2018/07/will-india-nuclearize-the-brahmos-supersonic-cruise-missile/>
- ^{XXXVIII} “1,600 Chinese troops still hold position near Doklam faceoff site”. December 17, 2017. Hindustan Times. <https://www.hindustantimes.com/india-news/1-600-chinese-troops-still-hold-position-near-doklam-faceoff-site/story-voTcOlfvwwRJ48c3mMoG1O.html>
- ^{XXXIX} Vikas Sv. “What Ails Ingenuously Developed Cruise Missile Nirbhay”. October 29, 2018. One India. <https://www.oneindia.com/india/what-ails-ingenuously-developed-cruise-missile-nirbhay-2799738.html>
- ^{XL} Hans M. Kristensen & Robert S. Norris (2018) Chinese nuclear forces, 2018, Bulletin of the Atomic Scientists, 74:4, 289-295, DOI: 10.1080/00963402.2018.1486620
- ^{XL1} Hans M. Kristensen & Robert S. Norris (2018) Chinese nuclear forces, 2018, Bulletin of the Atomic Scientists, 74:4, 289-295, DOI: 10.1080/00963402.2018.1486620
- ^{XLII} Hans M. Kristensen & Robert S. Norris (2018) Chinese nuclear forces, 2018, Bulletin of the Atomic Scientists, 74:4, 289-295, DOI: 10.1080/00963402.2018.1486620
- ^{XLIII} Hans M. Kristensen & Robert S. Norris (2018) Chinese nuclear forces, 2018, Bulletin of the Atomic Scientists, 74:4, 289-295, DOI: 10.1080/00963402.2018.1486620
- ^{XLIV} Swaine, Michael D. “Chinese Views on South Korea’s Deployment of Terminal High Altitude Area Defense (THAAD).” Carnegie Endowment for International Peace, 2 Feb. 2017, carnegieendowment.org/2017/02/02/chinese-views-on-south-korea-s-deployment-of-terminal-high-altitude-area-defense-thaad-pub-67891.
- ^{XLV} Ankit Panda, “Introducing the DF-17: China’s Newly Tested Ballistic Missile Armed With a Hypersonic Glide Vehicle”. December 28, 2017. The Diplomat. <https://thediplomat.com/2017/12/introducing-the-df-17-chinas-newly-tested-ballistic-missile-armed-with-a-hypersonic-glide-vehicle/>
- ^{XLVI} David M. Norton. “The Future of Hypersonic Technology”. October 20, 2016. Rand Corporation. <https://www.rand.org/blog/2016/10/the-future-of-hypersonic-weapons.html>
- ^{XLVII} Franz Stefan Gady, “Indian Navy Boomer Completes ‘First Deterrent Patrol’”. November 6, 2018. The Diplomat. <https://thediplomat.com/2018/11/indian-navy-boomer-completes-first-deterrent-patrol/>
- ^{XLVIII} Hans M. Kristensen & Matt Korda (2018) Indian nuclear forces, 2018, Bulletin of the Atomic Scientists, 74:6, 361-366, DOI: 10.1080/00963402.2018.1533162
- ^{XLIX} Franz-Stefan Gady “India Launches Second Ballistic Missile Sub”. December 13, 2017. The Diplomat. <https://thediplomat.com/2017/12/india-launches-second-ballistic-missile-sub/>
- ^L Tong Zhao, “Tides of Change: China’s Nuclear Ballistic Missile Submarines and Strategic Stability”. October 24, 2018. Carnegie-Tsinghua Center for Global Policy. <https://carnegietsinghua.org/2018/10/24/tides-of-change-china-s-nuclear-ballistic-missile-submarines-and-strategic-stability-pub-77490>

-
- ^{LI} Ankit Panda, "China Conducts First Test of New JL-3 Submarine Launched Ballistic Missile". December 20, 2018. The Diplomat. <https://thediplomat.com/2018/12/china-conducts-first-test-of-new-jl-3-submarine-launched-ballistic-missile/>
- ^{LII} Tong Zhao, "Tides of Change: China's Nuclear Ballistic Missile Submarines and Strategic Stability". October 24, 2018. Carnegie-Tsinghua Center for Global Policy. <https://carnegietsinghua.org/2018/10/24/tides-of-change-china-s-nuclear-ballistic-missile-submarines-and-strategic-stability-pub-77490>
- ^{LIII} Hans M. Kristensen & Robert S. Norris (2018) Chinese nuclear forces, 2018, Bulletin of the Atomic Scientists, 74:4, 289-295, DOI: 10.1080/00963402.2018.1486620
- ^{LIV} Hans M. Kristensen & Robert S. Norris (2018) Chinese nuclear forces, 2018, Bulletin of the Atomic Scientists, 74:4, 289-295, DOI: 10.1080/00963402.2018.1486620
- ^{LV} Tong Zhao, "Tides of Change: China's Nuclear Ballistic Missile Submarines and Strategic Stability". October 24, 2018. Carnegie-Tsinghua Center for Global Policy. <https://carnegietsinghua.org/2018/10/24/tides-of-change-china-s-nuclear-ballistic-missile-submarines-and-strategic-stability-pub-77490>
- ^{LVI} Ankit Panda, "China Conducts First Test of New JL-3 Submarine Launched Ballistic Missile". December 20, 2018. The Diplomat. <https://thediplomat.com/2018/12/china-conducts-first-test-of-new-jl-3-submarine-launched-ballistic-missile/>
- ^{LVII} For the purpose of this example, the range test was conducted using Google Earth, off of the western side of Japan.
- ^{LVIII} Gurmeet Kanwal, "India's Nuclear Force Structure 2025" June 30, 2016. Carnegie Endowment for International Peace. <https://carnegieendowment.org/2016/06/30/india-s-nuclear-force-structure-2025-pub-63988>
- ^{LIX} Hans M. Kristensen & Matt Korda (2018) Indian nuclear forces, 2018, Bulletin of the Atomic Scientists, 74:6, 361-366, DOI: 10.1080/00963402.2018.1533162
- ^{LX} Rahul Bedi, "IAF to Acquire Jaguar Airframes and Spares from Overseas". July 23, 2018. Jane's Defence Weekly. <https://www.janes.com/article/81970/iaf-to-acquire-jaguar-airframes-and-spare-from-overseas>
- ^{LXI} Hans M. Kristensen & Matt Korda (2018) Indian nuclear forces, 2018, Bulletin of the Atomic Scientists, 74:6, 361-366, DOI: 10.1080/00963402.2018.1533162
- ^{LXII} Rahul Bedi, "IAF to Acquire Jaguar Airframes and Spares from Overseas". July 23, 2018. Jane's Defence Weekly. <https://www.janes.com/article/81970/iaf-to-acquire-jaguar-airframes-and-spare-from-overseas>
- ^{LXIII} Hans M. Kristensen & Matt Korda (2018) Indian nuclear forces, 2018, Bulletin of the Atomic Scientists, 74:6, 361-366, DOI: 10.1080/00963402.2018.1533162
- ^{LXIV} "What Is Rafale Deal Controversy? All You Need To Know" February 09, 2018. NDTV/ALL India <https://www.ndtv.com/india-news/what-is-rafale-deal-controversy-all-you-need-to-know-1810706>
- ^{LXV} Ajit Kumar Dubey, "IAF not Keen on Getting More Sukhoi Fighter Jets". June 13 2018. <https://www.indiatoday.in/mail-today/story/iaf-not-keen-on-getting-more-sukhoi-fighter-jets-1258923-2018-06-13>
- ^{LXVI} Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2018. May 16, 2018. <https://media.defense.gov/2018/Aug/16/2001955282/-1/-1/1/2018-CHINA-MILITARY-POWER-REPORT.PDF>.
- ^{LXVII} Kristin Huang. "Why the new H-20 subsonic stealth bomber could be a game changer for China" October 21, 2018. South China Morning Post. <https://www.scmp.com/news/china/military/article/2169472/why-new-h-20-subsonic-stealth-bomber-could-be-game-changer-china>
- ^{LXVIII} Council on Foreign Relations "Global Conflict Tracker: Conflict Between India and Pakistan". <https://www.cfr.org/interactives/global-conflict-tracker#!/conflict/conflict-between-india-and-pakistan>
- ^{LXIX} Michael Krepon, "Looking Back: the 1998 Indian and Pakistani Nuclear Tests". June 2008. Arms Control Association. https://www.armscontrol.org/act/2008_05/lookingback
- ^{LXX} Robert Farley, "How the Soviet Union and China Almost Started World War III" February 9, 2016. The National Interest. <https://nationalinterest.org/feature/how-the-soviet-union-china-almost-started-world-war-iii-15152>
- ^{LXXI} Walter C. Ladwig III. "A Cold Start for Hot Wars? The Indian Army's New Limited War Doctrine." Quarterly Journal: International Security, vol. 32. no. 3. (Winter 2007/08): 158-190
- ^{LXXII} Sadia Tasleem, "Pakistan's Nuclear Use Doctrine". June 30, 2016. Carnegie Endowment for International Peace. <https://carnegieendowment.org/2016/06/30/pakistan-s-nuclear-use-doctrine-pub-63913>
- ^{LXXIII} Sadia Tasleem, "Pakistan's Nuclear Use Doctrine". June 30, 2016. Carnegie Endowment for International Peace. <https://carnegieendowment.org/2016/06/30/pakistan-s-nuclear-use-doctrine-pub-63913>

^{LXXIV} The submarine-based missile forces are launched from diesel electric submarines instead of SSBNs. Hans M. Kristensen, Robert S. Norris & Julia Diamond (2018) Pakistani nuclear forces, 2018, *Bulletin of the Atomic Scientists*, 74:5, 348-358, DOI: 10.1080/00963402.2018.1507796

^{LXXV} Hans M. Christensen. "Global Nuclear Weapons Modernization Remains Priority" July 3, 2017. Stockholm International Peace Research Institute. <https://www.sipri.org/media/press-release/2017/global-nuclear-weapons-modernization-remains-priority>