India's Space-based ISR Capabilities and Regional Deterrence

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Abstract

India is expeditiously enhancing its space-based Intelligence, Surveillance and Reconnaissance (ISR) capabilities. The presence of Indian military assets in space is a subject of debate in relation to the Chinese space program, eliciting concerns from Pakistan regarding the trajectory of its nuclear deterrence. Pakistan's acquisition of nuclear weapons was motivated by the aim to dissuade its significantly larger and more powerful adversary, India, from infringing upon its territorial sovereignty. The nuclear deterrence strategy of Pakistan is founded on the principles of the Perfect Deterrence Theory, a departure from the Classical Deterrence Theory which was prevalent in analyzing the deterrence dynamics between the United States and the Soviet Union during the Cold War era. The research delves into the repercussions of India's space-based ISR capabilities on the nuclear deterrence and strategic stance of Pakistan. The expansion of India's military space program, coupled with its substantial focus and resources allocated to supersonic cruise missiles and ballistic missile defense systems, signals India's efforts to bolster its First Strike capability vis-à-vis Pakistan's key strategic assets and installations. The advancements will have a significant influence on deterrence stability in South Asia by raising the probability of a nuclear escalation in upcoming times. The advancements are poised to have a significant influence on the maintenance of deterrence stability in the South Asian region, given their potential to raise the probability of a nuclear escalation in subsequent times.

Key Words: Nuclear Deterrence, ISR, India's space program

Introduction

The Indian space program is widely acknowledged for its significant ambitions and rapid expansion at an international level. India has evolved into a spacefaring nation capable of influencing the competition among major global powers in space activities. The achievements of India in space have been notably shaped by its collaborations with various space agencies worldwide, particularly NASA. This cooperation highlights India's focus on socio-economic progress, techno-nationalism, and political objectives. The program has continuously broadened its scope to involve the development and utilization of space assets for military purposes, partly influenced by China's advancements in space capabilities. The intention of the Indian Army to diversify its space program, as highlighted by General Deepak Kapoor in 2008, marks a strategic shift in response to regional and global geopolitical dynamics.

Over time, significant progress has been observed in the military capabilities of the Indian Space program. India has effectively engineered indigenous space technologies tailored for military applications, including anti-satellite (ASAT) weaponry, ballistic missiles, and missile defense systems. The collaboration with NASA has not only enhanced the civilian dimension of India's space endeavors

but has also strengthened its military prowess. India has leveraged dual-purpose satellites for various functions like navigation, mapping, communications, and earth observation, alongside their military-specific functions. The bolstering of Intelligence, Surveillance, and Reconnaissance (ISR) capacities through space-based assets has provided India with a strategic advantage over Pakistan, impacting the deterrence equilibrium in the region, already strained due to the ongoing conflict over Jammu and Kashmir.

This research aims to evaluate the implications of India's current and projected Intelligence, Surveillance, and Reconnaissance (ISR) capabilities in space on Pakistan's nuclear deterrence strategy. The initial section scrutinizes India's space-based ISR infrastructure and the strategies employed to reinforce its dominance in space. The study analyzes the evolution of Pakistan's nuclear deterrence doctrine, suggesting a closer alignment with the Perfect Deterrent Theory (PDT) rather than the Classical Deterrence Theory (CDT). Finally, the investigation delves into the potential ramifications of India's space capabilities on the dynamics of nuclear escalation in South Asia, particularly significant given India's articulated First Strike policy aimed at breaking the strategic deadlock with Pakistan and potentially escalating nuclear tensions.

India’s ISR capabilities in space

India has made remarkable strides in advancing its capabilities in space research, particularly in the realm of Intelligence, Surveillance, and Reconnaissance (ISR) over the years. The Indian Space Research Organization (ISRO) has achieved notable progress since its inaugural space mission in 1975. ISRO has accomplished a significant milestone by launching 129 satellites from India and an additional 342 spacecraft from 36 different nations into orbit. Presently, India operates a fleet of 53 satellites, categorized based on distinct requirements for tasks such as navigation, communication, and remote sensing. The data relayed by these satellites plays a crucial role in fostering socio-economic development, a longstanding goal in India's space exploration endeavors. Nonetheless, it was after the Kargil war that India's focus on enhancing its military space capabilities became more pronounced. The conflict experienced by India underscored the urgent need for enhanced monitoring capabilities in high-altitude regions to prevent similar intrusions. Consequently, the commencement of the Technology Experiment Satellite (TES) in 2001 marked India's foray into satellite technologies with military applications, enriching the comprehension of ground scenarios. The Indian government expeditiously recognized the significance of space in the nation's endeavors to modernize its armed forces. In 2007,

Pranab Mukherji, the Minister of External Affairs, emphasized the critical importance of leveraging space assets to augment the efficiency of offensive and defensive maneuvers, while also thwarting adversaries from exploiting these resources. India's strategic pivot culminated in the successful anti-satellite (ASAT) missile test in March 2019, positioning the country among the select few possessing confirmed ASAT capabilities. Nonetheless, this article scrutinizes India's Intelligence, Surveillance, and Reconnaissance (ISR) capabilities subsequent to the launch of its inaugural reconnaissance satellite in 2001. India has devised an intricate strategy entailing the deployment of a cluster of satellites encircling the Earth to fulfill diverse objectives aligned with its ambitious space pursuits. This comprehensive scheme entails positioning four advanced communication satellites in Geosynchronous Orbit (GSO) to furnish Command, Control, Communication, and Computers (C4) functionalities. Additionally, a constellation of 12 satellites outfitted with Electrooptical (EO) and Synthetic Aperture Radar (SAR) technologies will be stationed in a Sun-synchronous orbit (SSO) to execute Intelligence, Surveillance, and Reconnaissance (ISR) missions. Furthermore, three specialized satellites will cater to Electronic Intelligence (ELINT) operations. The blueprint also encompasses the establishment of satellite constellations in Low Earth Orbit (LEO) aimed at delivering military internet services and bolstering Intelligence, Surveillance, and Reconnaissance (ISR) capabilities during crises. India aspires to attain complete autonomy in navigation by deploying a satellite constellation in Geosynchronous and Geostationary orbits, complemented by the expansion of the Indian Regional Navigation Satellite System (IRNSS) through an additional 24 satellites in Medium Earth Orbit (MEO). Presently, India boasts the most extensive satellite network for remote sensing globally, alongside one of the largest communication infrastructures, exemplified by the IRS satellite series and INSAT series, respectively. While remote sensing satellites primarily serve civilian purposes such as urban planning and resource management, they also have the potential to furnish detailed images of surveilled terrains, rendering them valuable for military reconnaissance objectives. Consequently, any remote sensing satellites launched by India post-2000 are classified as dual-use assets, capable of catering to both civilian and military requirements. The significance of the CARTOSAT and RISAT series satellites deployed by ISRO lies in their capability to generate high-resolution images across various geographical and spectral spectrums.

The CARTOSAT series, which commenced in 2005, comprises civilian remote sensing satellites. Additionally, there exists a distinct military satellite known as CARTOSAT-2A. ISRO has progressively enhanced its capability to effectively deploy a significant number of domestic and international satellites over time, alongside notable advancements in quality and specifications. For instance, the spatial resolution of the Bhaskar-I satellite, launched in 1979, was 1 kilometer. This resolution was upgraded to 6 meters with the launch of the Indian Remote Sensing satellite (IRS-1C) in 1995. The orbital altitude

designated for the Technology Experiment Satellite (TES) stands at 1.

The CARTOSAT-2 satellite, launched in 2007, is situated in a Sun-Synchronous orbit at a distance of 630 kilometers, providing a spatial resolution of 0.8 meters over a swath of 9.6 kilometers. Subsequently, CARTOSAT-2B, launched in 2008, was equipped with enhanced capabilities enabling stereoscopic image capture through orbital track maneuvering. These CARTOSAT satellites serve both civilian and military purposes effectively.

The primary objective of the RISAT (Radio Imaging Satellite) series is to primarily cater to military requirements by showcasing superior performance in various weather conditions and even at night. The Synthetic Aperture Radar (SAR) technology, operational in all weather and lighting conditions, is also utilized for civilian applications. However, the associated financial costs make exclusive civilian use economically unfeasible. Collaborating with the Israeli Aerospace Industries (IAI), ISRO developed the RISAT-2 using IAI's TechSAR design, following delays in India's RISAT-I project. Subsequently, RISAT-2 was launched in 2009.

RISAT-I was launched by ISRO in 2012 but was officially declared non-operational in 2018 for reasons undisclosed. In 2019, ISRO initiated the launch process for RISAT-2B and RISAT-2BR1 satellites. Apart from its all-weather imaging capabilities, RISAT-2B's X-band SAR technology offers additional insights into various aspects of objects, such as their dimensions, movements, and velocity changes. This supplementary data, when combined with inputs from other sources like optical satellites, enriches the situational awareness on the ground. While Indian remote sensing specialists suggest RISAT-2B could aid in submarine detection, the efficacy of Radio Imaging Satellites for anti-submarine warfare remains uncertain. Nevertheless, continuous sea monitoring in all weather conditions, SAR satellite imagery utilization, and advancements in AI technology hint at the potential for precise submarine detection in the future.

India's space doctrine involves leveraging space assets for cross-border communication interception and employing specialized intelligence satellites for electromagnetic signal surveillance. The upcoming CCI-SAT, tailored for communication intelligence gathering, aims at intercepting cross-border communications to bolster espionage activities, particularly during crises. Initially slated for a 2020 launch, the satellite is presently under development. The EMSAT, an Electronic Intelligence Satellite, boasts the 'Kautilya' electronic warfare system for adversary radar detection and precise location identification.

India's space strategy stands out among emerging spacefaring nations due to its pragmatic utilization of operational capabilities and strategic advancement in space programs to address defensive and offensive requirements. This strategic outlook underscores India's meticulous and strategic long-term planning, particularly

in response to escalating Chinese military ventures in space. However, these counter capabilities are not solely directed towards China. The strained relations and intricate strategic equilibrium between India and Pakistan are highly likely to influence the strategic dynamics between these two nations possessing nuclear capabilities.

Tenets of Pakistan's nuclear deterrence

Since their establishment in 1947, India and Pakistan have encountered a significant and insurmountable disparity in terms of geographical location and resources. Consequently, Pakistan became deeply apprehensive about obtaining nuclear weapons following India's 'Peaceful Nuclear Explosion (PNE)' in 1974. In the aftermath of a prolonged period of clandestine scientific exploration, marked by numerous changes in government, the responsibility of responding to the Indian nuclear tests conducted on May 11th and 13th, 1998 in Pokhran, was entrusted to the then Prime Minister Nawaz Sharif. Pakistan successfully carried out nuclear tests in Chagai on May 28th and 30th, 1998. After showcasing their capacity to inflict substantial harm on each other, it was imperative to establish guidelines for engagement, commonly referred to as 'doctrines,' to delineate the boundaries of possible utilization. The existing body of literature on this subject has primarily concentrated on the strategic competitive dynamics during the Cold War era between the Soviet Union and the United States of America. The Classical Deterrence Theory has played a pivotal role in elucidating why the Cold War did not escalate into an overt military conflict. This concept posits that maintaining a state of equilibrium and equivalence in military strength leads to the maintenance of peace. When both parties acknowledge that the other possesses the necessary capability to respond with greater force in the event of an initial attack, they are more inclined to avoid escalating the situation, particularly concerning nuclear armaments. Nevertheless, in line with the tenets of the Classical Deterrence Theory, nations that have recently acquired nuclear weapons are more prone to engaging in nuclear standoffs. This is attributed to the fact that the presence of imbalance is connected to a heightened likelihood of conflict. The possession of nuclear arsenals has averted a major clash between India and Pakistan. Moreover, the regional context in South Asia differs from that of the superpowers during the Cold War. Thus, the process of nuclearization in South Asia constituted an innovative endeavor to explore novel theoretical dimensions of nuclear deterrence that transcended the realms of Europe and North America. The deterrence dynamics in South Asia are distinctive and cannot be replicated in any other bilateral or multilateral deterrence scenarios globally.

India's nuclear policy is dual-focused, with a specific focus on its neighboring nations, China and Pakistan, due to historical border disputes and conflicts. Given India's extensive territory and significantly advanced military strength, it is not surprising that India was prompt in drafting the Draft Nuclear Doctrine (DND) soon after

demonstrating its nuclear capabilities in August 1999, primarily to signal China. Therefore, the inclusion of a No First Use policy in India's nuclear strategy can be seen in the context of India's strategic rivalry with China, which holds greater territorial and military power compared to India.

In contrast, Pakistan has consistently emphasized that its nuclear policy is primarily directed towards India, as India is Pakistan's sole neighboring country with which it has engaged in multiple armed conflicts since gaining independence. Pakistan has consistently cast doubt on India's declaration of No First Use (NFU) and has opted not to reciprocate India's proposal for a mutual NFU policy. This stance places Pakistan at a strategic disadvantage, contradicting its fundamental goal of developing nuclear capabilities. Pakistan's nuclear program was launched in response to India's Peaceful Nuclear Explosion (PNE), perceived as a direct threat to its survival. Pakistani authorities have consistently highlighted that their main objective was not to seek prestige, regional dominance, or membership in the exclusive nuclear powers circle. Instead, their primary aim was to prevent a direct confrontation with India, given the enduring conflict over Jammu and Kashmir.

Moreover, Pakistan has deliberately maintained strategic ambiguity by refraining from openly outlining its nuclear policy, a tactic aimed at enhancing its deterrent capabilities. Contrary to common beliefs, Pakistan has purposefully opted not to disclose its nuclear doctrine. This strategic ambiguity is utilized by Pakistan to reinforce its deterrence approach. Pakistan promptly established its nuclear doctrine following successful tests, preceding India's Draft Nuclear Doctrine of 1999, despite initial delays in its formulation in comparison to its weapons program.

Pakistan has consistently adhered to a doctrine termed as "Credible Minimum Deterrence" (CMD), initially known as "Minimum nuclear deterrence." The descriptor 'credible' was later appended following enhancements in Pakistan's strategic delivery capabilities. Command, Control, and Communication (CMD) encompass the continual advancement and integration of approaches to signal to potential adversaries the grave consequences they would face if they attempt to alter the current status quo. Owing to Pakistan's limited economic resources vis-à-vis India's vast conventional weaponry, achieving parity is unfeasible. Thus, embracing a Command and Control (CMD) strategy emerges as the most pragmatic resolution within the framework of South Asian deterrence. This strategy aligns with the Perfect Deterrence Theory (PDT), underscoring the necessity of maintaining a specific quantity of nuclear arms to effectively deter foes, rather than amassing a large stockpile of such weaponry. PDT challenges the notions of power equilibrium and excess capacity, offering a nuanced evaluation of Pakistan's nuclear deterrence policy in the context of India. Responding to the 2001 Parliament attacks, India strategically deployed its military personnel close to the Pakistan border. Pakistan's deliberate approach in mobilizing its Strike Corps, spanning over a month, allowed ample time to fortify border defenses,

thus thwarting India's coercion or intrusion efforts. India resorted to the Cold Start doctrine to address the sluggish deployment of its extensive strike corps, leading to considerable delays and wastage of valuable time. This doctrine, focusing on a limited, non-nuclear confrontation with Pakistan, involves the convergence of various corps like infantry and armor.

Integrated Battle Groups (IBGs) are cohesive military entities amalgamating multiple combat components such as infantry, artillery, and armor into a unified operational unit. The Cold Start strategy aims to counter Pakistan's sub-conventional incursions on Indian soil by emphasizing surprise elements and utilizing sophisticated Electronic Warfare capabilities like Samyukta. This tactic entails swift incursions into Pakistan's territory before the establishment of robust defenses. In 2017, the Cold Start doctrine, previously refuted by India, was officially acknowledged by the then Army Chief Gen. Bipin Rawat.

Pakistan countered India's Cold Start doctrine by instituting Cross-domain deterrence (CDD) and introducing Full Spectrum Deterrence (FSD) incorporating Tactical Nuclear Weapons (TNWs). Cross-domain deterrence employs the threat of harm in one domain to dissuade acts of aggression or attempts to alter the status quo in another domain through military means. Notably, this strategy signifies an escalation of conflict to a higher level.

India is contemplating an elevation of the standoff with Pakistan from a sub-conventional level to a conventional one through a limited incursion into Pakistani territory in response to a terrorist attack. This action reflects a desire to escalate the intensity of the conflict. Conversely, Pakistan has formulated a plan to manage such escalations by employing Tactical Nuclear Weapons (TNWs), representing the utmost level of warfare - the nuclear stage. The country's preparedness to utilize weaponry is evidenced by the deployment of the Hatf IX 'Nasar' short-range ballistic missile, possessing a yield between 0.5 to 5 kilotons. India's adoption of alternative punitive measures, alongside the Cold Start Doctrine (CSD), following incidents like Pulwama, attributed to Pakistan, underscores the effectiveness of Pakistan's Full Spectrum Deterrence strategy. General Qamar Bajwa, the Chief of the Pakistan Army, has explicitly stated that the deployment of the NASR has undermined India's Cold Start Doctrine, indicating Pakistan's successful neutralization of the operational implications of this doctrine without resorting to a large-scale nuclear confrontation.

After India's achievement in developing a nuclear submarine program through the induction of Arihant, Pakistan countered by establishing the Naval Strategic Forces Command headquarters in 2012 to bolster its maritime deterrent capabilities. This strategic shift marked the initiation of Pakistan's efforts to establish a sea-based deterrent. In 2017, Pakistan conducted a successful test of the Babur III submarine-launched cruise missile, a naval variant of the Babur II ground-launched cruise missile (GLCM). The Inter-Services Public Relations

(ISPR), the media arm of the Pakistan Army, lauded this test as a significant scientific milestone enhancing Pakistan's strategic standing in the region. For a stable nuclear dyad, both adversaries must acknowledge their vulnerability to each other's land-based nuclear arsenals. India's establishment of a dependable nuclear triad incorporating the SSBN program has prompted Pakistan to emulate this approach to uphold the credibility of its nuclear deterrence and achieve equilibrium in the region.

Pakistan's Faisalabad (FSD) military posture encompasses a total of eight ballistic missiles, comprising two variants of ground-launched Babur cruise missiles, a sea-launched cruise missile, and two types of multirole aircraft capable of carrying nuclear-capable missiles. In alignment with the concept of Minimum Credible Deterrence, Pakistan has continuously enhanced the specifications and efficacy of its weapons delivery systems. Lacking a nuclear-powered submarine, essential for completing its triad, Pakistan announced in 2012 its intention to construct SSBNs. The endeavor of constructing and maintaining SSBNs is an exceptionally ambitious venture

due to the substantial infrastructure, technological, and financial requirements involved. Given the absence of these critical components, it can be inferred that Pakistan is not currently prepared to acquire an SSBN in the near future, underscoring its reliance on existing systems and technologies for deterrence.

Impact of India’s space-based ISR capabilities on Pakistan’s nuclear deterrence

During the Cold War era, there existed a divergence of opinions regarding whether the concept of massive retaliation in itself was sufficient to dissuade an adversary from instigating the first nuclear attack. The advancement of technology was perceived as a catalyst in upholding the fluidity of nuclear deterrence, rather than permitting it to stagnate. Presently, hypersonic missiles, characterized by their capability to evade detection through unconventional flight trajectories, ballistic missile defense (BMD) systems for intercepting incoming missiles, and real-time satellite surveillance are deemed as indispensable and pivotal components of a robust nuclear arsenal. India is currently endeavoring to enhance its initial frameworks, with a specific emphasis on fortifying its space-based Intelligence, Surveillance, and Reconnaissance (ISR) capabilities, given their interconnectedness with the aforementioned offensive and defensive mechanisms. However, a nation's proficiency in military strategies can serve as a significant indicator of its intentions, which may occasionally veer from its explicitly declared standpoint.

There is compelling evidence to suggest that India is augmenting its capability to potentially execute a preemptive strike against Pakistan's nuclear arsenal, aiming to significantly diminish its capacity for retaliation.

In its electoral manifesto of 2014, the incumbent Bhartiya Janata Party (BJP) pledged to reassess and modernize India's nuclear strategy in alignment with contemporary requirements. Insiders involved in formulating the manifesto purportedly confirmed that the No-First-Use (NFU) policy of India would undergo scrutiny as part of this vaguely defined electoral commitment. Nevertheless, there have been no advancements in this sphere.

India's nuclear doctrine, encompassing the No First Use (NFU) policy, has remained unaltered following the tenure of two BJP administrations. Nonetheless, Indian authorities have portrayed the existing policy as adaptable enough, as articulated by former National Security Advisor Shivshankar Menon, to potentially initiate a preemptive strike against Pakistan's nuclear arsenal. The proposition of executing such a strike is intricate, given the operational and strategic obstacles linked with its execution. Additionally, it will necessitate several years for India to cultivate adequate confidence in its overall capacity, theoretically at least, to engage in such an endeavor. Nonetheless, according to India's strategic assessment, undertaking this course of action is imperative to dissuade Pakistan from resorting to unconventional warfare tactics. The establishment of the strike corps in 2001, alongside the formulation of the Cold Start doctrine, underscores the acknowledgment of this reality. However, the non-implementation of the Cold Start doctrine subsequent to the incidents in Mumbai, Pathankot, and Uri, which India attributes to Pakistan, underscores the persistent importance of nuclear deterrence vis-à-vis Pakistan. Indian security analysts contend that Pakistan has leveraged its nuclear armament to uphold its involvement in Kashmir, as the specter of a nuclear conflict discourages any substantial conventional retaliation against Pakistan. India posits that its inherent military superiority over Pakistan has been nullified since the latter acquired nuclear capabilities.

The aggregation of military power capable of initiating an attack, along with the supporting narrative, aligns with the notion that India is driven to broaden its future options. India's strategic decision to execute this maneuver underscores its aspiration for enhanced adaptability and security. Tactical nuclear weapons, commonly referred to as TNWs, constitute a pivotal element of the overarching deterrent strategy, contributing significantly to strategic calculations. When assessing Pakistan's leadership, it is crucial to acknowledge that despite India's potential to overcome Cold Start doctrine limitations, the reluctance to employ it stems from the threat of a limited nuclear strike, underscoring the intricate nature of strategic decision-making in the region. Upholding its policy, India would likely respond with a substantial nuclear reprisal, reciprocated by Pakistan, leading to a catastrophic nuclear scenario in South Asia, showcasing the immense destructive potential of a nuclear conflict in the region. Pakistan's effectiveness in nuclear deterrence hinges on the acknowledgment of its territorial integrity and the avoidance of limited incursions advocated by the Cold Start doctrine, underscoring the necessity of maintaining power equilibrium and deterrence dynamics. Pakistan's strategic position has exhibited resilience thus far, with

deterrence enduring amidst these assumptions; however, a shift in the regional security landscape could occur if India persists in bolstering its capabilities and signaling intentions for a preemptive strike, hinting at a potential shift in the security dynamics.

Accurate intelligence regarding the adversary's strategic assets is fundamental for counterforce targeting, underscoring the significance of intelligence in shaping military strategies. The ensuing steps aim to incapacitate a significant number of nuclear warheads through targeted strikes, aiming to reduce retaliatory capabilities significantly, emphasizing the importance of precision and efficacy in military operations. Nevertheless, due to the immense challenge of completely neutralizing the entire nuclear arsenal and incapacitating the adversary, an early warning system is vital to detect and counter any retaliatory strikes from remaining nuclear weapons, highlighting the formidable hurdles in achieving decisive outcomes in nuclear conflicts. Space-based intelligence, surveillance, and reconnaissance (ISR) capabilities play a crucial role in obtaining accurate information on nuclear assets and executing precise attacks, as well as intercepting incoming nuclear missiles, underscoring the critical role of advanced technology in modern warfare. Data obtained from space is complemented by ground and airborne resources such as UAVs, accentuating the multifaceted nature of contemporary military operations across various domains.

India holds a substantial qualitative and quantitative edge owing to its array of remote sensing and intelligence satellites, either currently operational or planned for deployment into space. This network empowers India to efficiently supervise the movements of strategic troops, showcasing its growing prowess in space-based surveillance. The Cold Start doctrine's focus on seizing specific territory in Pakistan's Punjab province carries significant strategic implications for regional security. In scenarios of conflict escalation, the deployment of Tactical Nuclear Weapons (TNWs) might be anticipated in a coordinated fashion along international borders within a particular area. India's continuous monitoring of this vicinity furnishes the essential information for a successful strike on Nasr batteries in case of a confrontation, underscoring the pivotal role of intelligence in shaping military strategies. Indian authorities are confident that satellite imagery has confirmed the presence of Pakistan's TNWs in the garrisons near the international frontier with India, highlighting the importance of technological advancements in intelligence gathering. The possession of first-strike capable delivery systems like BrahMos could prompt India to contemplate a preemptive strike on Pakistan's TNWs if it opts to break the strategic stalemate and partake in a limited conventional conflict, thereby emphasizing the intricate nexus between technological progress and strategic decision-making in the region.

Executing a successful preemptive strike against Tactical Nuclear Weapons (TNWs) would transfer the onus of escalating the conflict from India to Pakistan. If Pakistan opts for de-escalation, India would effectively regain

the strategic advantage it has sought since the dynamics of nuclear deterrence shifted in 1998. Conversely, in the event of Pakistan choosing escalation and launching a series of nuclear missiles, India is formulating a multi-layered Ballistic Missile Defense (BMD) system to shield its major urban centers. The Geostationary satellites of India hold promise as a crucial asset for early warning functions, notwithstanding certain constraints. The proximity of both nations geographically could significantly constrain the response time. Satellite-based infrared sensors possess the capability to detect the launch of an incoming missile before its trajectory is relayed to the designated radar of the Ballistic Missile Defense (BMD) system. Hence, satellites play a crucial role in India's strategic pursuits.

Calculations will be conducted if Pakistan opts for initiating a counter-value strike subsequent to a preemptive attack. Pakistan currently possesses diesel-electric submarines with the necessity of frequent resurfacing, specifically concerning naval capabilities. In contrast to SSBNs, these submarines are more susceptible to detection via satellite surveillance. Deterrence is a fluid concept shaped by the adversary's capacities and subject to continual evolution. Moreover, the concept of reciprocal vulnerability plays a pivotal role in upholding deterrence stability. A noticeable disparity exists in the space programs of India and Pakistan, mirroring the prevailing imbalance between the two nations. Consequently, Pakistan's space-based Intelligence, Surveillance, and Reconnaissance (ISR) capabilities do not provide continuous monitoring of Indian strategic assets. Pakistan's nuclear strategy and strategic stance do not predominantly emphasize counterforce actions or preemptive strikes. Consequently, India does not face an equivalent level of vulnerability necessary to discourage such actions. India's establishment of a fleet of space assets serving both civilian and military purposes, in conjunction with a robust defense system against ballistic missiles and sophisticated means of deploying nuclear-capable supersonic cruise missiles, contradicts the principles of No First Use (NFU) and minimum credible deterrence. India's progress in the space domain and deepening alliances with nations like France, Israel, and the USA will result in ongoing surveillance of Pakistan's launch sites and delivery systems. This progress amplifies India's confidence in executing a preemptive strike on these facilities to dissuade any retaliatory measures by Pakistan during heightened tensions. Due to constraints in technology and capacity, Pakistan may encounter a dilemma where they must either deploy their resources or risk losing them. The deterrence response is primarily influenced by capabilities rather than articulated intentions or objectives. Given Pakistan's skepticism regarding India's commitment to a No First Use (NFU) policy, the potential consequences could be substantial. India's strategic advancements, encompassing space-based ISR capabilities, supersonic missiles, and ballistic missile defense, will exert a significant impact on the strategic equilibrium in South Asia.

Conclusion

The Indian space program surpasses that of Pakistan in terms of capacity and envisioned objectives. India's current space assets and aspirations showcase the efficient utilization of space as a force multiplier to enhance offensive and defensive capabilities. Pakistan has effectively deterred India from engaging in major conflicts, such as those in 1948, 1965, and 1971, underscoring the effectiveness of nuclear deterrence. India perceives Pakistan's nuclear parity as a hindrance, impeding India's ability to apply pressure on its opponent. The looming risk of a nuclear conflict has rendered traditional benefits obsolete. India's employment of a vast array of satellites in space enables the initiation of a preemptive strike against Pakistan's critical assets, aimed at undermining its resolve or nuclear capabilities. India's professed doctrine of refraining from initiating a first strike with nuclear weapons is contradicted by its actions, which involve preparing for preemptive strikes on Pakistan's important installations and deploying Ballistic Missile Defense (BMD) shields in major urban centers. Satellites are crucial for surveillance, intelligence gathering, and monitoring Pakistan's nuclear capabilities. They also play a pivotal role in early warning mechanisms and missile defense. This situation creates instability with regards to preemptive strikes, compelling Pakistan to review its nuclear threshold in light of the 'use it or lose it' dilemma, thereby increasing the probability of a nuclear conflict in South Asia.

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