

MISSILE SYSTEMS MODERNIZATION DRIVERS AND STRATEGIC STABILITY RIDDLES IN SOUTH ASIA

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Abstract

Pakistan has adopted a realistic approach to progressing its cruise and ballistic missile arsenal. India seems in a better position in the modernization processes of its missile arsenal due to the generous transfer of missile technologies and gears by its allies named the US, Israel, and Russia. The Americans appear inclined to prioritize their geostrategic interests over their non-proliferation norms and objectives. New Delhi's confidence in the steady progress in the BMD systems, hypersonic cruise missiles, hypervelocity-gliding projectiles, and anti-satellite kill vehicle capability adds a new variant to India-Pakistan's competitive strategic dyad. India's sharpening of its missile arsenal necessitates Pakistan to take similar measures concerning its nuclear forces to ensure the credibility of its Full Spectrum Deterrence posture. The modernization of missile systems added new variants of strategic stability riddles in the South Asian strategic environment.

Keywords: Missiles, Modernization, Arms Race, Strategic, Riddles.

Introduction

In South Asia, among principal contenders, while India has aimed to advance its missile inventory to progress its nuclear warfighting competency without reference to its short range targets. Pakistan, primarily relying on nuclear technology and missiles as a deterrent only, focused more on medium and short range missiles so as to justify its Indian targets only. The missile utilization is presently undertaken from all four dimensions: land, sea, air, and submerged sea surfaces. Though Pakistan has adopted a realistic approach in progressing its cruise and ballistic missile arsenal, India seems in a better position due to its

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allies' generous transfer of missile technologies and gears, especially the U.S., Israel, and Russia. The evolving regional and global geopolitics and Americans' determination to contain China are significant drivers of India's missile modernization. It is evident, currently, "India is central to the United States' strategy for countering China through the Indo-Pacific Framework."¹ Therefore, the United States is agreed to assist India in advancing its space, cyber, and Artificial Intelligence proficiency.

Since the 1980s, India's DRDO² has been struggling to manufacture a series of missile systems. However, it has been encountering serious technological impediments in assembling indigenous missiles. Currently, therefore, New Delhi is relying on imported missile kits. Its membership to the Missile Technology Control Regime (MTCR) has also contributed constructively to introducing new missile systems in its arsenal. On March Pakistani Minister, Hina R. Khar, pointed out that India "remains a net recipient of generous supplies of advanced conventional and non-conventional weapons, technologies, and platforms."³ There is an order of magnitude between India's rate of missile development and Pakistan's slow expansion. Suppose Pakistan sticks to its over two decades of nuclear restraint approach. In that case, Islamabad may soon find itself increasingly overmatched by India's missile expansion and unable to deter the aggressive strategies of New Delhi.

The Pakistani defense policymakers must focus on India's rapid missile modernization program, mainly its endeavor to fabricate and integrate new emerging technologies in the missile systems to boost speed, precision, and lethality. Islamabad needs to match India's aggregating missile arsenal. How Islamabad solidifies its defensive fence?

Since India and Pakistan acquired nuclear parity, limited war escalating to total war has become an unthinkable rational military option between them. Indeed, such analytical strategic calculations in Islamabad and Delhi are conducive to the permanency of "nuclear taboo—a normative inhibition against the first use of nuclear weapons," which is crucial for regional deterrence stability. Interestingly, the nuclear parity between New Delhi and Islamabad has caused a stability/instability paradox, i.e., 'the likelihood of nuclear conflict declines, the risk of conventional war increases, and as the probability of nuclear conflict increases, the risk of conventional war declines.' Nevertheless, this converse

connection between nuclear and conventional battle debilitates the taboo in South Asia.

India's continual missile buildup compels Pakistan to advance its nuclear forces. Notwithstanding, Islamabad has been pursuing a 'nuclear restraint policy' to prevaricate an arms race with India since May 1998. Theoretically, introducing new missile systems, such as hypersonic cruise missiles, hypervelocity-gliding projectiles, and anti-satellite kill vehicles, in the Indian military arsenal added a new strategic instability variable in the South Asian strategic environment. These developments oblige Pakistan to modernize its nuclear weapons for the sustainability of Full Spectrum Deterrence. Thus, the current drivers of Pakistan's nuclear force modernization are India's BMD development, deployment, and mastery of hypersonic cruise missiles and Hypervelocity-gliding projectile technologies.

The hypothesis that India's missile systems modernization could encourage the Indian military planners to launch the decapitating first strike against Pakistan germinates four interlinked questions.⁴ What are the drivers of missile systems modernization in South Asia? What is the level of India's missile systems modernization? Is Pakistan prepared to repeal its over two decades of nuclear restraint policy to ensure the credibility of its Full Spectrum Deterrence strategy? How does introducing new missile systems affect the overall South Asian strategic environment? These questions will be answered in this paper. For better understanding, the study is divided into five sections. The first section explains Indian missile modernization with the tacit support of its strategic partners. The second section describes India's new missile systems and their prowess. The third section contemplates Pakistan's challenges and missile modernization drivers. The fourth section documented Pakistan's addition of new missiles to the arsenal. The fifth section professes the strategic stability riddles caused by missiles modernization in the region.

India's Missile Systems Modernization Facilitators

During the last four decades, India developed, tested, and operationalized ballistic and cruise missiles.⁵ Through reverse engineering, India produced a series of ballistic and cruise missiles and missile defense systems. Its ballistic missiles project was successful, but its cruise missiles and missile defense systems achievements claims are debatable. Despite the challenges, currently, New Delhi is vigorously utilizing cutting-edge technologies to modernize its missile systems.

Realizing its indigenous resource limitations, New Delhi has approached and secured the generous support of the Russian Federation, Israel, and the United States. Gregory Koblentz wrote, "India has been pursuing two methods to obtain an anti-missile capability: creating an indigenous system and buying the stuff off-the-shelf."⁶ Understanding New Delhi's strategic relationship with Moscow, Tel Aviv, and Washington that has caused the transfer of missile technology and material to DRDO is a prerequisite to indexing the level of India's missile systems modernization. The following subsections precisely spell out the current facilitators of the Indian missile systems modernization, including contemplation on Indo-US accelerating tempo of strategic partnership instituting a 'threshold-alliance' despite New Delhi and Washington's avoidance of the usage term alliance and the former's continued purchasing of Russian S-400 Triumpf, i.e. 'surface-to-air missile defense system'.⁷ Nevertheless, the Indo-US threshold alliance may have geopolitical effects similar to nuclear latency, which assures, emboldens, deter, and applies leverage in crisis bargaining.

India-US: A Threshold Alliance

The politico-economic and military cooperation between Delhi and Washington has been expanding due to the United States' fractious relationship with China. On October 27, 2022, the American Defense Secretary wrote, "The PRC remains our most consequential strategic competitor for the coming decades."⁸ According to the U.S. 2022 NDS, the DoD will advance "its Major Defense Partnership with India to enhance its ability to deter PRC aggression and ensure free and open access to the Indian Ocean region."⁹ Therefore, the Biden administration asserts that it is a "long game" of "engagement with India, one that differences over Ukraine will not be allowed to undermine." On June 15, NSA Sullivan said, "We are playing a long game here. We are investing in a relationship that we are not going to judge by one issue, even if that issue is quite consequential, but rather that we are going to judge over the fullness of time as we try to work to converge on the major strategic questions facing our two countries."¹⁰ He added, "On one of those questions, how to deal with the challenge posed by China, there is much more convergence today, and that is important to U.S. foreign policy."¹¹

India-United States' strategic partnership has evolved from an episodic cooperation to a 'threshold-alliance' since the dawn of the twenty-first century.¹² "Forming threshold alliances involves developing military-technical interoperability. Some interoperability of two militaries' materiel, organizations,

and geographic access—insufficient for a formal mutual defense alliance—is arguably a necessary precursor to joint war plans on the modern battlefield. With the increasing complexity of warfare demanding complicated equipment and increased decision speed, allies that want to support each other meaningfully will require advanced levels of military interoperability.”¹³ India today holds more joint military exercises with the U.S. than any other country despite Indian Foreign Minister S. Jaishankar's diplomatic observation that "a formal alliance between India and the United States is not in the cards."¹⁴ The Indo-US evolving alliance against China was mirrored in the joint statement issued after President Biden and Premier Modi summit in Washington in June 2023. It stated, "the U.S. efforts to cement India more firmly in an anti-China coalition and use it as a counterweight to Beijing."¹⁵ The statement lucidly confirmed the United States' defense commitments to India, rivaling those made to NATO or other treaty allies. Today, India no longer speaks of non-alignment, which was the hallmark of its foreign policy until Modi became Prime Minister in 2014. Conversely, during Modi's state visit in June 2023, the Biden administration clarified that human rights concerns would not hinder the relationship with India, a trademark of American policy.

India is an essential member of the Quad.¹⁶ Notably, the Chinese strategic commentators labeled Quad as “an Asian version of NATO”.¹⁷ Another significant development in the Indo-US threshold alliance formation is the United States Congressional Committee on Chinese Communist Party recommendation for including India in NATO-plus in May 2023. The Committee stated, “Including India in NATO Plus security arrangements would build upon the U.S. and India's close partnership to strengthen global security and deter the aggression of the CCP across the Indo-Pacific region¹⁸ The NATO-plus is a security bloc of NATO and five countries named Australia, New Zealand, Japan, Israel, and South Korea. The bloc is aimed at boosting defense cooperation among members. Being a member of the bloc, India will gain access to seamless intelligence sharing, access to the latest military technology, and further threshold alliance between India and the United States.¹⁹

The constitution of a threshold-alliance or quasi-alliance between New Delhi and Washington has served India's numerous interests, including capability aggregation, logistical facilities pooling (LEMOA), high-tech communications infrastructure, and geospatial data sharing in the Indo-Pacific (COMCASA and BECA), and power projection. Moreover, recently, India and the United States

inked an agreement under it; the former will transfer to the latter one of the U.S. defense sector's crown jewels: the technology to manufacture fighter jet engines. Consequently, Hindustan Aeronautics Limited (HAL) manufactures F414 jet engines in India. The jet engines will power Tejas M.K. 2 fighter planes—with greater power and efficiency, longer service life, and less maintenance.²⁰ Notably, it is the first time the U.S. is transferring F414 technology for the coproduction of jet engines to a non-ally or a country with which Washington DC doesn't have a treaty. The F414 engine technology transfer will expand on the growing interoperability between U.S. and Indian military systems.

The pro-Indian lobby in the United States has been lobbying Washington to transfer sophisticated nuclear and missile technology and material to India. For instance, Indian-origin American strategic analysts named Tellis wrote that the U.S. could provide India with a reliable thermonuclear weapon design. They also suggested including India in "the trilateral security pact among Australia, the United Kingdom, and the United States that is known as AUKUS, which will assist Australia in acquiring nuclear-powered submarines."²¹ So that the Americans share their nuclear reactor designs with New Delhi, the said arrangement would be an addition to the existing American nuclear technological and material assistance to India. For instance, "the 2008 U.S.-India deal on civil nuclear cooperation has been steadily expanding its nuclear arsenal, increasing the number of warheads, stockpiling weapons-grade nuclear material, and expanding plutonium production facilities."²²

The Indo-US military cooperation agreements facilitated New Delhi to purchase cutting-edge military hardware from the United States. Also, they influenced India's strategic outlook and military force structure, leading to the commonality of doctrines and operational plans. Besides, these agreements enable India to use the cyber and space domains to gain operational, logistical, and informational advantages over Pakistan. The remarkable breakthrough in Indo-US strategic partnership is the Biden administration's abetting India in the realm of new emerging technologies. On May 24, 2022, Prime Minister Modi and President Biden announced the U.S.-India initiative on Critical and Emerging Technology (iCET). "The U.S. plans to join six of India's Technology Innovation Hubs to support at least 25 joint research projects in 2022 in artificial intelligence and data science to advance progress in agriculture, health, and climate applications. The U.S. National Science Foundation and Department of Science and Technology of India will deepen this cooperation through the new U.S.-India Initiative on

Critical and Emerging Technology."²³ On January 31, 2023, U.S. National Security Advisor Jake Sullivan and Indian National Security Advisor Ajit Doval led an inaugural meeting of iCET in Washington. The meeting was attended by the Indian and American scientific and defense organizations' high-ups.²⁴ They deliberated for cooperation in artificial intelligence (A.I.), quantum technologies, 5G/6G, biotech, and semiconductors and space. These technologies contribute significantly to modernizing India's missile systems.

Significantly, the iCET improves cooperation in the space domain.²⁵ The space technologies have their origin in the military domain. For instance, launch vehicles can also be employed as ballistic missiles. The iCET "is being heralded as a game changer along the lines of a prior strategic partnership between the United States and India called the Next Steps in Strategic Partnership (NSSP) that was inked in 2004. The NSSP led to the landmark U.S.-India nuclear deal in 2005—an agreement to pursue full civil nuclear energy cooperation with India."²⁶ Thus, it could aggregate India's offensive missile strike capabilities and missile defense systems.

India-Israel Defense Partnership

India is Israel's largest customer of military equipment. Since the 1990s, India has purchased sophisticated military hardware from Israel, such as advanced Green Pine radar systems, ballistic missile propellants, guiding systems, unmanned aerial vehicles, missiles, air defense systems, and radar systems. Indeed, Israeli-manufactured Phalcon AWACS (Airborne Warning and Control Systems), Heron, Searcher-II, Harop drones, Barak anti-missile defense systems, and Spyder quick-response anti-aircraft missile systems, precision-guided munitions ranging from Python and Derby air-to-air missiles to Crystal Maze and Spice-2000 bombs strengthen the Indian armed forces surveillance and operational capabilities.²⁷

India's Cabinet Committee on Security (a government body responsible for military procurements) approved 17,000-crore (\$ 2.5 billion) to purchase a medium-range surface-to-air missile system from Israel in February 2017. "The deal is for 200 missiles for five regiments, each getting 40 units. The missile has a range of 50-70 km. The system will be based on the older Barak system of Israel, which is in use in India. It is being changed as per requirements."²⁸ In June 2022, New Delhi and Tel Aviv finalized the "India-Israel Vision on Defense Cooperation" for a 10-year roadmap to enhance cooperation on futuristic defense technologies.²⁹

Significantly, Indo-Israel cooperation in missile domains would revolutionize India's offensive and defensive arrangements against Pakistan. For instance, Israel Aerospace Industries (IAI) and India's DRDO jointly manufactured the Medium-Range Surface Air Missile (MRSAM) based on Barak-8 surface-to-air missile system.³⁰ According to the Indian Ministry of Defense (MoD), the MRSAM would improve the combat effectiveness of the Indian Navy. In May 2019, the Indian Navy successfully conducted a live firing test of MRSAM using the cooperative engagement capability (CEC) sensor netting system, which allows the real-time sharing of sensor data on incoming air targets among warships.³¹ It completed the first cooperative engagement firing of the MRSAM on May 17, 2019. The Indian MoD stated, "With the successful proving of this cooperative mode of engagement (IAI and DRDO), the Indian Navy has become a part of a select group of Navies with this niche capability. This capability significantly enhances the combat effectiveness of the Indian Navy, thereby providing an operational edge over potential adversaries."³² According to the media reports, the MRSAM was fitted on the Kolkata Class Destroyers and would be installed on the Nilgiri-class stealth frigates, also known as Project 17A frigates. Besides the Indian Navy, the MRSAM would be provided to India's air and ground forces.³³

Purchase of Russian S-400 Triumph: Tacit Approval

Despite being a threshold-ally of the United States, India has been intelligently nourishing its longstanding and beneficial security relationship with Russia since the late 1940s. In 2000, India-Russia Inter-Governmental Commission on Military Technical Cooperation (IRIGC-MTC) was set up to facilitate and oversee their military-technical cooperation. Consequently, military cooperation has evolved from a purely buyer-seller relationship to joint research, design development, and production of state-of-the-art military platforms. Currently, various bilateral military projects are underway, named indigenous production of T-90 tanks and Su-30-MKI aircraft, supply of MiG-29-K aircraft and Kamov-31 and Mi-17 helicopters, upgrade of MiG-29 aircraft and supply of Multi-Barrel Rocket Launcher Smerch."³⁴ For this study, their bilateral cooperation in developing the BrahMos cruise missile is remarkable. They have jointly developed a supersonic 290 km BrahMos, which was inducted into Indian Army, and Navy and integrated into Airforce Su-30 MKI. Since India joined MTCR, they have been working to increase its range up to 800 km. In 2017, India tested 450 km BrahMos. "The extended range BrahMos hit the target with centimetric accuracy. It's a big leg up

for us, and it was a fantastic test flight. With this new version, all three forces, Army, Navy, and IAF, will be able to strike deep into the enemy's territory."³⁵

Since the Ukraine war began in February 2022, India's trade with Russia has multiplied extraordinarily despite several Western leaders criticizing India's proximity to Russia.³⁶ For instance, "Due to accelerated oil purchases since the invasion, India's imports from Russia have multiplied 400 percent over this past fiscal year. Russia is now India's fourth-largest trade partner and still surging (it was the seventh-largest only in October 2022)."³⁷

Russia transferred the third squadron of the S-400 Triumf in March 2023,³⁸ and the remaining two squadrons would be delivered to India by the end of 2023. The third squadron either deployed in Punjab-Rajasthan or in India's Illegally Occupied Kashmir to thwart attacks from Pakistan. "The S-400 can engage enemy fighter jets, unmanned aerial vehicles, and ballistic and cruise missiles, with a range of up to 400 kilometers." India's acquisition of an S-400 provides the capability to undermine Pakistan's ballistic and cruise missile and fighter jets operational capability.

The Western states did not object to the recent S-400 trade between India and Russia. Washington did not levy sanctions on India under the 'Countering America's Adversaries Through Sanctions Act (CAATSA)'. Conversely, in March 2023, "a few Pakistani firms were put on the U.S. Commerce Department's 'entity list,' allegedly, for contributing to ballistic missile programs of concern, including Pakistan's missile program, and for involvement in unsafeguarded nuclear activities."³⁹ Biden administration did not include India in the entity list's separate category titled "Ballistic Missile and unsafeguarded Nuclear Activities" despite the announcement of U.S. Deputy Secretary of Commerce Don Graves in March 2023 that "We act to stand against proliferators, oppose military aggression in the case of Russia and China's military modernization, and protect and advance human rights,"⁴⁰ because American security pundits have recommended that Washington "let other countries take the lead in checking China's rise." Therefore, the U.S. has facilitated India modernizing its armed force and pressuring it to "demonstrate China's containment policy to justify and progress their defense cooperation." Therefore, Washington overlooked India's purchase of the S-400 and oil from Russia. The Americans believe that militarily modernized and economically stable India could check China's augmenting effect in Asia-Pacific. However, they must

realize this appeasing approach towards India could undermine South Asian strategic stability.

India's New Missile Systems

India continues to develop, improve, expand, and diversify its conventional and nuclear-armed ballistic, cruise, and hypersonic missile technologies and capabilities. It has “focused on improving the technical quality of its missile systems by incorporating composite materials in its airframes, better heat shields and guidance systems in its re-entry vehicles, and, with an eye to the future, developing different kinds of penetration aids as well as hypersonic glide vehicles to ensure that its missiles can reach their targets despite any adversary attempts at intercepting them.”⁴¹ The recent remarkable warfighting missile development projects are “multiple independently targetable re-entry vehicle (MIRV) warheads, the 700 kilometer-range Shourya nuclear missile, and the potentially nuclear-capable short-range Pahaar, Brahmos, and Nirbhay missiles.” Besides, India has been determined to develop and deploy missile defense systems, which contribute to deterrence by denying or mitigating some effects of an attack. Currently, it utilizes Israeli and Russian air and missile defense systems. In addition, it is developing indigenous BMD systems. A few new missile projects brief details are given below.

New Generation Missile: Agni-P

India developed and conducted four tests of a new version of ‘Agni-P’ or ‘Agni-Prime’ capable of carrying a nuclear warhead. “It is a two-stage, surface-to-surface, road-mobile, and solid-fueled MRBM (1000-2000km).”⁴² “It is transported by a truck and launched via a canister. It has an advanced navigation system and a new mobile canisterized launch system, reducing the time required to place the missiles on alert in a crisis.” On June 07, 2023, “DRDO did the first pre-induction night launch test after three successful developmental trials of the missile, validating the accuracy and reliability of the system.”⁴³ “The solid-fuelled Agni-P can reportedly maneuver during re-entry, which could allow the missile to evade future missile defenses of states in the region (e.g., China and Pakistan).”⁴⁴ The maneuverable re-entry vehicle (MaRV) enables the missile to deliver the warheads to two places in salvo mode.⁴⁵ The MoD announced the induction of Agni-P into the armed forces.

Hypersonic Missiles

The striking hypersonic vehicles—"maneuvering weapons that fly at speeds of at least Mach 5"—are becoming very attractive for the Great Powers. "A hypersonic missile travels at speeds upwards of Mach 5, i.e., five times faster than the speed of sound (6173kmph), generating a speed of 1.06 km per second."⁴⁶ These weapons can launch from "aircraft, surface vehicles, ships, and submarines." Due to high speed, maneuverability, and flying at lower altitudes, hypersonic cruise missiles can strike the target while evading early-warning radars and BMD shields. "The true innovative quality of aerial hypersonic weapons is their ability to maintain hypersonic speeds within the atmosphere. This ability allows them to use aerodynamic forces to maneuver and follow less predictable flight paths than conventional ballistic missiles, which makes it challenging to map their flight trajectories."⁴⁷

The hypersonic missiles are tempting for nations pursuing first-strike counterforce and decapitation capabilities. India has been seeking hypersonic missiles to acquire counterforce capability against Pakistan. "It has set its sights on two classes of hypersonic systems: the hypersonic cruise missile and the hypervelocity-gliding projectile," to gain proficiency in hypersonic technologies. India's DRDO developed the "Hypersonic Technology Demonstrator Vehicle (HSTFV), a scramjet demonstrator," and conducted its first test in June 2019, which failed. However, India successfully tested an indigenously built hypersonic weapon on September 7, 2020. A supersonic combustion ramjet,⁴⁸ or air breathing scramjet engine powered the hypersonic vehicle. "It can fly at six times the speed of sound."⁴⁹ It was launched by a solid-fueled ballistic missile rocket motor, "which took it to an altitude of 30 kilometers. Then the cruise vehicle separated from the launch vehicle, and the air intake opened." Indian MoD pointed out that "The successful demonstration proved several critical technologies including aerodynamic configuration for hypersonic maneuvers, the use of scramjet propulsion for ignition and sustained combustion at hypersonic flow, thermo-structural characterization of high-temperature materials, separation mechanism at hypersonic velocities, etc."⁵⁰ The strategic analyst concluded that this vehicle would be "the basis for a nuclear-capable cruise missile." Rajnath Singh said, "The test was a success and described it as a 'landmark achievement' contributing to Prime Minister Narendra Modi's vision of India becoming self-sufficient."⁵¹

India has been upgrading its BrahMos series with the collaboration of the Russian Federation. It was reported that the Russians have been assisting the

Indians in researching and developing “the BrahMos II, a follow-on missile designed to fly at speeds up to Mach 7” using a supersonic combustion ramjet, or “scramjet, engine.” It may be operated by 2025.⁵² “Unlike a ramjet engine, a scramjet engine uses oxygen from the atmosphere rather than an on-board tank, which makes the missile lighter and faster.”⁵³ “The BrahMos-II could be a variant of one of the hypersonic anti-ship missiles developed by Russia,”⁵⁴ and at least six times faster than BrahMos missiles. “Short-range hypersonic missiles would be precious for India due to their maneuverability for striking targets otherwise obscured by mountains in contingencies involving Pakistan and China.”⁵⁵ India can extend the BrahMos II because it entered the Missile Technology Control Regime. The regime has removed the 300 km range cap, and therefore India can extend the range of BrahMos missiles to a minimum of 450 km with a goal of 850 km.

The DRDO complex in Hyderabad developed and tested Submarine Launched Ballistic Missile (SLBM), Sagarika (K-15, B05), with a 700 km range.⁵⁶ Besides, it has been working on Sagarika’s land-based version of the Shourya hypersonic missile with a 750 km range. The Shourya—a Canister launched hypersonic surface-to-surface missile—is a two-stage missile operating on solid fuel. “The missile, after achieving a height of 50 km, flies at a speed of Mach 7.5, making it a hypersonic category with a Circular Error Probability of 20-30 meters.”⁵⁷ DRDO’s hypersonic missile pursuit seems realistic due to India’s missile technologies imported from Israel, Russia, and the United States. Notably, New Delhi is relieved from the MTCR denial approach.

India’s Craze for BMD System

The proponents of Ballistic Missile Defence (BMD) systems believe that “Missile defense capabilities add resilience and undermine adversary confidence in missile use by introducing doubt and uncertainty into strike planning and execution, reducing the incentive to conduct small-scale coercive attacks, decreasing the probability of attack success, and raising the threshold for conflict.”⁵⁸ Similar perceptions exist in the Indian strategic community about the missile defense system. They are convinced that BMD effectively neutralizes Pakistan’s missile strikes. Samir Sen opined those Indian defensive systems “will effectively neutralize Pakistan’s missile capabilities.”⁵⁹ Ironically, they have failed to realize that the operability of BMD against geographically contiguous nuclear-armed rivals—Pakistan and China—is debatable. Yet, they are advocating the development of BMD systems.

“India’s BMD project aimed to produce a two-tiered defensive system. The two-layer ballistic missile defense shield comprised the Prithvi Air Defense (PAD) system and Advanced Air Defense (AAD)/ Ashvin Advanced Defense. The former provided long-range high-altitude ballistic missile interception during an incoming missile’s midcourse phase. The latter offered short-range, low-altitude defense against missiles in the terminal phase of their trajectory.”⁶⁰

The DRDO successfully tested an AAD, “the exo-atmospheric interceptor missile, in January 2017.” In addition, “it tested an endo-atmospheric missile capable of intercepting incoming target missiles at an altitude of 15 to 25 km range on March 1, 2017.”⁶¹ “AAD missiles are terminal phase interceptors capable of intercepting missiles after re-entering the earth’s atmosphere.”⁶²

The DRDO tested: “a successor to the PAD—the Prithvi Vehicular Defense—with greater range and speed and a maximum interception altitude approaching the U.S. THAAD system.”⁶³ The missile interceptors “are cued onto their targets by giant Swordfish Long-Range Tracking Radars, an indigenously built derivative of the Israeli Green Pine radar.”⁶⁴ New Delhi decided to install its BMD system at two villages—Alwar and Pali—in the western state of Rajasthan in August 2017.⁶⁵ The deployment of BMD systems in Rajasthan very close to the Pakistani border signaled the Cold Start Doctrine’s operationalization.⁶⁶

The Indian missile bureaucracy had claimed “the success of a few tests of its missile defense systems.” However, the strategic analysts questioned India’s BMD’s credibility due to its backward “geospatial intelligence and lack of high-speed missile interceptors.” Nevertheless, it is expected that India could resolve these shortcomings due to the generous transfer of sophisticated military technologies by the United States.

India has been developing anti-satellite weapons (ASAT) to destroy satellites from direct ascent interceptors launched from the ground. The anti-satellite kill capability introduces an option to blind the adversary in the fog of war. On March 27, 2019, India tested the ASAT missile “to demonstrate its prowess to destroy satellites in orbit.”⁶⁷ Premier Modi tweeted, “In the journey of every nation, there are moments that bring utmost pride and have a historic impact on generations to come. One such moment is today. India has successfully tested the Anti-Satellite (ASAT) Missile.”⁶⁸

Pakistan's Challenges and Missile Modernization Drivers

Pakistan faces strategic challenges stemming from the Indian ruling elites' increasingly provocative rhetoric, the threat of coercive military doctrine (surgical strike), and rapid military forces modernization, including introducing new missile systems. These developments have inbuilt destabilizing or risk miscalculating ingredients, threatening regional stability. Therefore, Pakistan needs to maintain a safe, secure, and effective nuclear deterrent and flexible nuclear capabilities to achieve the full spectrum deterrence posture's twin tasks, i.e., deterring India's large-scale conventional attack through the threat of nuclear first-use and deterring a nuclear attack through the threat of nuclear retaliation.⁶⁹ It ought to continuously upgrade its operational and strategic weapons to complicate India's entire decision calculus, including whether to instigate a crisis, initiate armed conflict at the LoC, conduct surgical strikes using non-nuclear capabilities, originate limited war, or escalate the crisis to the use of nuclear weapons on any scale.⁷⁰ Forces that provide flexibility in nuclear decision-making include low-yield or miniaturized battlefield ballistic missile (NASR-missile) warheads, dual-capable fighter aircraft, solid-propelled ballistic missiles, and cruise missiles.

Importantly, Islamabad seems steadfast with its over two-decades nuclear restraint policy, which it has advocated since May 1998. The difficult task for the Pakistani defense policymakers is ensuring the credibility of FSD—effectiveness, responsiveness, survivability, flexibility, and visibility—without quashing its nuclear restraint policy or avoiding a costly nuclear arms race with India. Though India straightforwardly rejected Pakistan's nuclear restraint regime proposal, Islamabad has been struggling to prevent a conventional and nuclear arms race with New Delhi. The alarming reality is that if Islamabad continues pursuing a restraint approach and is inept at fabricating and integrating new emerging technologies to advance its conventional and nuclear weapons, especially missiles inventories, "New Delhi will have such a lead over Islamabad in defense spending and armed forces modernization that Pakistan is left with stark options."⁷¹ Hence, Islamabad must be more active toward the presence of five destabilizing dynamics in its strategic environment. The following five developments in its external environment drive its missile modernizations.

First, "India is the third-highest military spender after the U.S. and China."⁷² In February 2023, the Modi government announced "5.94 trillion rupees (\$72.6 billion) in defense spending for the 2023-24 financial year. It was a 13

percent increase in its defense spending.”⁷³ According to press reports, “1.63tr rupees would be spent to purchase new weapons, aircraft, warships, and other military hardware.”⁷⁴ In addition to expanding its conventional forces and rapidly advancing and integrating its space, counter-space, cyber, electronic, and information warfare capabilities to support its holistic approach to joint warfare.

Second, the arms control approach in regional and global geopolitics seems out of vogue. The United States exited from 1972 ABM Treaty in June 2002 and the 1987 INF Treaty in 2019. The current Ukraine war decreases the prospects of nuclear arms control between Moscow and Washington.⁷⁵ “In February 2023, the former announced the suspension of its participation in the New START, the last remaining arms control agreement between the United States and the Russian Federation.”⁷⁶ Consequently, great powers have been spending hugely on the modernization of their armed forces. For instance, the Biden administration remains committed to spending a tremendous amount of money—more than \$600 billion over the next decade—on nuclear weapons.⁷⁷ The great powers’ mega investments in the military sector have originated an exorbitant arms race. Hence, despite having a nuclear restraint policy, Pakistan cannot cease advancing its nascent triad of aircraft, ground-launched ballistic and cruise missiles, and sea-launched cruise missiles.

Third, the Russian military operation in Ukraine on February 24, 2022, “marked the revival of Cold War-ish rivalry in Europe, which validated the legitimacy and expansion of NATO as an institution and rejuvenated the military alliance politics in Europe and Asia.”⁷⁸ On April 4, 2023, Finland became the 31st member of NATO. “Biden administration’s cold war-ish foreign and strategic policy expanded NATO in the Euro-Atlantic geostrategic setting. It sprouted Quad and AUKUS in Asia-Pacific’s transforming geopolitical environment.”⁷⁹

Fourth, India may make an AUKUS-like deal with the United States. Besides, the U.S. Congress Committee recommended India for NATO-plus status in May 2023. These security cooperative arrangements contribute constructively to India’s military modernization. For instance, “the United States security documents released in October 2022 reconfirmed the advancement of Indo-US strategic partnerships and increased American investment in modernizing India’s warfighting ability and capability. The Americans’ generous support to the Indian armed forces may enable India to may contribute to the U.S. containment strategy of China.”⁸⁰ Still, it does intensify Pakistan’s security dilemma.

Fifth, India has been developing an array of precise counterforce weapons and missile defenses with the assistance of leading arms exporters that threaten Pakistan's ability to strike back. An "accuracy revolution in missile guidance technology' has enabled India to place nuclear and conventional warheads much closer to an intended target." The technology development is coupled with a "low-yield revolution, which enabled India to develop radically smaller strategic nuclear warheads, including flexible dial-a-yield weapons."⁸¹ Hence, Pakistani defense policymakers could be worried about the Indian offensive and defense capability that encourages it to conduct nuclear first-strike against Pakistan because it's confident it can counter any retaliation. Besides, India's advanced counterforce and BMD systems compel Pakistan to maintain a significant portion of its arsenal on high alert because retaliation delayed is retaliation denied.⁸² In such a scenario, Pakistan is forced to invest heavily in developing an effective early warning system, advancing the command-and-control system, and also revisiting its policy of retaining centralized control over its nuclear weapons, especially while operationalizing the naval tier of nuclear triad to reduce its arsenal's vulnerability by sending its weapons out to sea. Notably, Pakistan never expressed its desire to match India weapon for weapon. No information is available whether Pakistan is developing nuclear powered submarines or not. Yet Islamabad would prefer to maintain its full-spectrum deterrence so that its nuclear forces cover multiple contingencies in the event of war with India to inflict unacceptable damage on the Indian armed forces and cities.

Pakistan's New Missile Systems

The preceding discussion alarms the increasing military strength of India, which compels Pakistan to increase its defense spending and modernization of its armed forces. Indeed, "it is a Hercules task due to the sliding trend in the national economy. Having limited options in purchasing military hardware from the international military market due to political and financial constraints, Pakistan is more dependent on its domestic military-industrial complex for both conventional and non-conventional weaponry."⁸³ Besides conventional weapons upgradation, Pakistan has struggled to maintain the credibility of full spectrum deterrence without intertwining with India in an arms race. However, for the credibility of FSD, "Islamabad has been improving its nuclear capability within the precincts of credible minimum nuclear deterrence."⁸⁴

Pakistan has been advancing its indigenous ballistic and cruise missile production. Therefore, it has displayed a wide range of military capabilities and

infrastructure, including Multiple Independently Targetable Re-entry Vehicle (MIRV), improved ballistic and cruise missile inventories, and investing in the research and development of supersonic missiles. In January 2017, “Pakistan successfully conducted the first test of a medium-range, surface-to-surface ballistic missile Ababeel, which uses the MIRV to deliver multiple conventional and nuclear warheads.” It was reported that with the assistance of China, Pakistan has been developing “space access and advanced optical tracking systems for MIRVs.”⁸⁵ “On March 29, 2018, Islamabad tested Babur-III, a Submarine-Launched Cruise Missile (SLCM) with a range of 450 kilometers and the ability to deliver various payloads, including nuclear warheads. It was tested from a submerged platform using underwater controlled propulsion.”⁸⁶

The literature review also implies that Pakistan has been seriously pursuing supersonic and hypersonic weapons to deter India. Pakistan’s Ministry of Defense Production (MoDP) planning for 2017-2018 revealed that the country has been researching and developing supersonic missiles to increase its defensive capabilities against supersonic-cruising anti-ship missiles, such as the BrahMos.⁸⁷ Pakistan Navy also expressed its desire to develop and equip future warships with “an anti-ship ballistic missile (P-282) modeled on China’s DF-21D”—a hypersonic missile.⁸⁸ Another option could be that Pakistan equips a medium-range ballistic missile with a hypersonic glide vehicle.

Strategic Stability Riddle in South Asia

The term ‘strategic stability’ is used by the Americans and European experts “in binary nuclear contingencies, emphasizing either the ‘absence of incentives to use nuclear weapons first’ (crisis stability) or the ‘absence of incentives to build up a nuclear force’ (arms race stability).”⁸⁹ Theoretically, the nuclear weapons capability of India and Pakistan germinate the strategic stability in South Asia. The following table discloses that neither India nor Pakistan deployed nuclear weapons.

Table-1: Strategic Stability Riddle in South Asia

Country	Year of the First Nuclear Test	Deployed	Stored	Total Inventory
India	May 18, 1974	---	164	164
Pakistan	May 28, 1998	---	170	170

- Deployed: These are warheads placed on missiles or located on bases with operational forces.
- Stored: These are warheads in central storage that require some preparation (e.g., transport and loading onto launchers) before deployment.

Source: SIPRI Yearbook 2023: Armaments, Disarmament and International Security www.sipriyearbook.org, p. 248

The startling development in the South Asian strategic environment is that "India's nuclear arsenal is being kept at a much higher state of readiness."⁹⁰ The nuclear weapons readiness indicates that "India has been transitioning towards a counterforce nuclear posture to target an adversary's nuclear weapons earlier in a crisis, even before they could be used."⁹¹ India's counterforce capability creates a situation in which Pakistani striking power would be vulnerable to a disarming first strike by India. Besides, it relies on its missile defenses to intercept any Pakistani missiles not destroyed on the ground by counterforce strikes.

The preceding discussion reveals that the strategic stability riddle has spiraled in the region due to modernization by India and Pakistan's missile systems. The developments of new missile systems stimulate four interlinked challenges to the strategic stability in South Asia, i.e., an arms race instability, intensified security dilemma puzzle, deepened stability and instability paradox, and persistent strategic competition between the strategic competitors. Theoretically and practically, they are opposed to deterrence stability. Hence, introducing the new missile systems contains an ingredient to destabilize deterrence. Conversely, the new missile systems could augment deterrence stability provided these systems intensify the balance of terror between the strategic rivals and increase mutual vulnerabilities. This paradox heightens the strategic stability riddle in South Asia.

The strategic stability riddle in South Asia has intensified because India is taking the lead in introducing new missile systems such as hypersonic cruise missiles, Anti-satellite kill vehicles, and missile defense systems with a clear

intention to disrupt the current delicate equilibrium in the region. While; Pakistan is following the defensive realists' diktats to deter its adversary. These contrasting missile development approaches systematically increase qualitative and quantitative asymmetry in missile systems, which is not conducive to deterrence stability in South Asia. The following discussion contemplates the strategic riddles that potentially cause strategic instability in South Asia.

Currently, the operational reliability of India's new missile systems is dateable. However, with continuous technological perfection through the allies' assistance, India could revolutionize its missile arsenal, which is not an optimistic signal for regional deterrence stability. For instance, the BMD system is a new weapon that could shift a balance of power to its holder's advantage. The historical literature review reveals that power imbalance has always been detrimental to deterrence stability, escalation control, confidence-building measures, and peace process between belligerent neighbors.

Second, the BMD systems increase the first strike or counterforce temptation. Such a situation germinates misperception and heightens the dilemma of "use it or lose it." According to Stephen M. Walt, "Second-strike retaliatory forces are stabilizing because they protect the state via deterrence but do not threaten the other side's second-strike deterrent capability. For example, ballistic missile submarines are stabilizing because they provide more reliable second-strike forces but do not threaten each other. By contrast, counterforce weapons, strategic anti-submarine warfare capabilities, and missile defenses destabilize the other side's deterrent capacity and thus exacerbate its security fears."⁹² India's counterforce weapons and BMD could inspire Islamabad to approve a "use it or lose it" strategy, 'calling for the early use of its nuclear forces in the event of a conflict to penetrate India's defenses' before it could neutralize Pakistan's nuclear strike capability.

Third, the technical glitch is a significant challenge during the missile systems modernization process. The countries usually confront technological glitches when they use reverse engineering to advance their indigenous missile inventories. India has been facing technical glitches in its missile systems modernization. The technological malfunction during the testing and training may destabilize the South Asian strategic stability due to the redundancy of missile CBMs between India and Pakistan.

Fourth, the redundancy of the agreement (Agreement on Pre-Notification of Flight Testing Ballistic Missiles between India and Pakistan signed in 2005) increases the probability of accidental or inadvertent retaliation. Indeed, it was very effective, but its limited scope made it ineffective after introducing the new missile systems. For example, the subsequent developments after India's a misfired cruise missile landed in Pakistan on March 9, 2022, revealed, "Pakistan reportedly prepared to launch a proportional retaliatory strike against India before it realized that the missile might have been accidentally fired."⁹³ If the scope of the missile notification agreement was broadened and India notified the testing of a cruise missile, the situation had not have been alarming.

Fifth, introducing new missile systems taxes the ballistic missile notification agreement signed in 2005. The agreement aimed to prevent accidental or inadvertent retaliation. Besides, it serves the purpose of transparency in delivery vehicle capability, which is imperative for deterrence between India and Pakistan. Introducing new missile systems practically outdated the 'ballistic missile notification agreement.'

Sixth, the ongoing missile modernization could lead India and Pakistan to "a bolt-out-of-the-blue" nuclear attack situation—"the one contingency that was greatly feared by both the United States and the Soviet Union during the Cold War" because threats of nuclear use or coercion increases with the fabrication and integration of new emerging technologies in the offensive missiles and deployment of defensive missile shields. Pakistan has been subjected to surprise nuclear attacks, a possibility that Pakistani policymakers can view as probable after India's surgical strike strategy, punitive strike at Balakot on February 26, 2019, nuclear assets deployment, and Prime Minister Modi's nuclear signaling during the post-2019 Pulwama military standoff between India and Pakistan.

Seventh, the missile systems modernization necessitates the doctrinal transformation of India and Pakistan. Notably, the contemporary declassified characteristics of both states military doctrines are alarming for the strategic stability in South Asia. Indian strategic pundits would expect modernizing their armed forces for a proactive military operation strategy (Cold Start Doctrine) as part of its transforming nuclear doctrinal posture like the Russian "escalate to de-escalate." This means that India has the military ability and capability wherewithal to escalate the conventional crisis and simultaneously be able to de-escalate the crisis without potentially risking defeat or crossing the nuclear threshold. Pakistan's doctrine is also grounded on the warfighting contingencies, i.e., quid

pro quo-plus. The nerve-wracking reality is that any drift into conflict would have catastrophic consequences.

Conclusion

India's rapidly expanding cruise and ballistic missiles arsenal, the introduction of hypersonic cruise missiles, Russian S-400, and various Israeli missiles, a test of anti-satellite systems, and rhetoric of successful tests of BMD systems put Pakistan at a disadvantage regarding missile count and warhead reliability. These systems are strong drivers for Pakistan to adopt a more assertive nuclear stance and increase its defense spending to solidify its defensive fence, a Hercules task due to the sliding trend in the national economy. Having limited options in purchasing military hardware from the international military market due to financial constraints, Pakistan is more inclined towards a domestic military-industrial complex for both conventional and non-conventional weaponry.

Indeed, for the credibility of full spectrum deterrence, Pakistan must improve its nuclear capability within the precincts of credible minimum nuclear deterrence and advance its indigenous ballistic and cruise missile production. In this context, the arithmetic approach guides, simply propelling one more vehicle and warhead to the target than what is required to destroy it. Hence, increase the numerical strength of nuclear triad forces by replacing single warhead missiles with MIRVs having up to 10 re-entry vehicles (R.V.s) per missile. Moreover, collapse the battle space by minimizing the engagement time available. The primary techniques available to collapse the battle space for offensive missile designers are to exploit speed, altitude, and radar cross-section. Therefore, the Pakistani ruling elite has to devise a practical economic and diplomatic policy to ensure its full spectrum deterrence capability without succumbing to internal and external pressures.

The rational solution is that instead of entangling itself in an arms race by immediately rushing to develop ABM and anti-satellite systems, Islamabad should limit efforts to enhance its deterrent credibility by accelerating cruise and ballistic missile inventories and nuclear warhead manufacturing. Besides, Islamabad chalks out a strategy to bridge the gap by intelligently commencing research and development of new missile systems and integrating emerging technologies in its defensive apparatus to meet the cardinal constituent of the deterrence concept, which is 'Credible Capability.'

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