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India's Missile Defence Systems: Impact on Regional Strategic Stability

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Abstract

India's ongoing development and procurement of Ballistic Missile Defence (BMD) systems are part of its broader strategy to modernise its nuclear and conventional military capabilities. In response, the country is enhancing its nuclear arsenal and delivery mechanisms, both in scale and sophistication. This effort is not merely a reaction to India's ABM advancements but also a proactive measure to maintain the credibility and effectiveness of its nuclear deterrent. Pakistan's approach involves upgrading its ballistic and cruise missile inventories and investing in a range of cost-effective and technologically advanced countermeasures. These measures are designed not only to counterbalance the emerging ABM threat but also to mitigate the risks of escalation, contributing to long-term peace and stability in South Asia. By focusing on strategic adaptability and technological innovation, Pakistan plays a crucial role in maintaining a balanced power dynamic and promoting a stable security environment in the region.

Keywords: Ballistic Missile Defence, India-Pakistan Nuclear Deterrence, Arms Race, Military Technology, Nuclear Risk.

Introduction

India has been developing and modernising its Ballistic Missile Defence (BMD) system, alternatively called the Anti-Ballistic Missile (ABM) system, since the 1990s with an aim to assemble a defence shield against inbound adversary missiles.[1] To date, India has made significant advancements in its BMD architecture, marked by a series of successful tests and developments. In 2018, the country test-launched an interceptor missile against decoy targets for the first time, demonstrating its growing capabilities in missile defence technology.[2] Further bolstering its defence portfolio, the 2019 anti-satellite (ASAT) test showcased her proficiency in space-based defence, successfully targeting a satellite orbiting at an altitude of 285 kilometres.[3] These developments were followed by two critical tests. On 3 November 2022, India conducted a successful flight test of the BMD interceptor missile from the APJ Abdul Kalam Island off the Odisha coast. This interceptor missile is designed to neutralise long-range missiles and aircraft.[4] Additionally, in a joint effort by the Defence Research and Development Organisation (DRDO) and the Indian Navy, a maiden flight trial of a sea-based endo-atmospheric interceptor missile was successfully conducted off the coast of

1 Frank O' Donnell and Yogesh Joshi, "India's Missile Defence: Is the Game Worth the Candle?" *Diplomat,* August 2, 2013, https://thediplomat.com/2013/08/indias-missile-defense-is-the-game-worth-the-candle/.

2 Franz-Stefan Gady, "India's Advanced Air Defence Interceptor Shoots Down Ballistic Missile Target in Test," *Diplomat,* August 3, 2018, https://thediplomat.com/2018/08/indias-advanced-air-defense-interceptor-shoots-down-ballistic-missile-target-in-test/.

3 Marco Langbroek, "Why India's ASAT Test Was Reckless," *Diplomat*, April 30, 2019, https://thediplomat.com/2019/05/why-indias-asat-test-was-reckless/.

4 Sushant Kulkarni, "India Successfully Tests Ballistic Missile Defence Interceptor Capable of Neutralising Long-Range Adversary Missiles," *Indian Express*, https://indianexpress.com/article/india/ballistic-missile-test-8245478/.

Odisha in the Bay of Bengal on 21 April 2023.[5] While enhancing the capabilities of its two-layered ABM system,[6] India is also in negotiations with the United States (US), Israel, and Russia to procure other such systems to expand its ABM architecture.[7]

This study provides a comprehensive analysis of India's ABM capabilities and their impact on regional strategic stability. The focus is on understanding the integration of ABM systems within India's evolving military strategy, as well as examining Pakistan's current countermeasures in response to its advancing ABM infrastructure. Additionally, the paper explores potential avenues for Pakistan to enhance and strengthen its missile penetration capabilities. By assessing the feasibility and strategic implications of developing new options, this study aims to provide insights into the ongoing arms dynamic between India and Pakistan and the broader implications for regional security.

This study adopts an analytical and explanatory approach, utilising a qualitative research methodology and draws upon a blend of primary and secondary data sources. These sources encompass a diverse range of materials, including scholarly books, research papers, and official documents such as statements and speeches. The study's scope is intentionally narrowed to provide a more in-depth and concentrated examination of the India-Pakistan dynamic in relation to ABM technologies and strategies. It deliberately

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5 "India Carries Out Maiden Flight-Test of Sea-Based Ballistic Missile Defence Interceptor," *Economic Times*, April 22, 2023, https://economictimes.indiatimes.com/news/defence/india-conducts-successful-trial-of-bmd-interceptor-missile/articleshow/99694589.cms?from=mdr.

6 Balraj Nagal, "India and Ballistic Missile Defence: Furthering a Defensive Deterrent," Carnegie Endowment for International Peace, June 30, 2016, https://carnegieendowment.org/2016/06/30/india-and-ballistic-missile-defense-furthering-defensive-deterrent-pub-63966.

7 Ibid.

excludes considerations of Chinese nuclear forces and the influence of Indian ABM systems on China.

Introduction to Missile Defence Systems

An ABM system is described as an integrated system designed to intercept inbound aerial threats, including missiles, bombers, aircraft and drones during their flight towards their targets.[8] However, ABM systems are predominantly deployed against ballistic and cruise missiles of various ranges.[9] These systems comprise radars, satellites, sensors, fire control centres and interceptors. Radars and satellites are used for early warning and detection of inbound threats.[10] Sensors help in differentiating between warheads and decoys,[11] and assist in estimating the speed of aerial threats.[12] Fire control systems help in predicting the target location and guiding the interceptor missile to the intercept point.[13]

ABM systems are categorised as per their capabilities of interception: broadly, these categories are known as 'point' or 'theatre ABM systems' and 'area' or 'strategic ABM systems.' The point or theatre ABM systems are designed to defend a relatively small area, such as vital industrial complexes, strategic forces and offices, and missile silos. On the other hand, the area or strategic ABM systems are deployed to defend major cities or an entire

8 "Fact Sheet: An Introduction to Ballistic Missile Defence," Centre for Arms Control and Non-proliferation, April 27, 2017, https://armscontrolcenter.org/fact-sheet-introduction-ballistic-missile-defense/.

9 "Fact Sheet: An Introduction to Ballistic Missile Defence."

10 Ibid.

11 Decoys act as dummy warheads comprising iron bolts and shafts designed to deceive the interceptor missiles. See, Union of Concerned Scientists, "How Does Missile Defence Work?" Explainer, June 22, 2016, https://ucsusa.org/resources/how-does-missile-defense-work

12 Ibid.

13 Ibid.

country.[14] While missile defence systems could be dispersed across all domains including land, sea or in air or space, the interception of inbound missiles takes place at various stages of the flight path: terminal, mid-course, and boost phases.[15]

During the boost phase, the missile begins ascending until its propellant burns out following the launch and ejects the warhead over the atmosphere.[16] Interception of the missile, during this phase, remains advantageous as interception takes effect before the warhead is released. However, constraints of shorter timespan are an associated challenge with respect to boost-phase interception. Interception during the mid-course phase refers to the elimination of the inbound missile after it acquires parabolic trajectory as a result of Earth's gravity.[17] In this phase, the missile launch-path provides greater time for interception. However, release of decoys with a warhead represents a major challenge for the interceptor missile. During the terminal phase of the missile flightpath, the payload enters the Earth's atmosphere. Interception remains easy during the terminal phase as decoys slow down, providing an advantage to the ABM systems to distinguish between dummy objects and warheads.[18] Thus far, no country has deployed

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14 "Missile Defence Systems at a Glance", Arms Control Association, August 2019, https://www.armscontrol.org/factsheets/missiledefenseataglance; Charles D. Ferguson and Bruce W. MacDonald, *Nuclear Dynamics in a Multipolar Strategic Ballistic Missile Defence World,* report (Washington, D.C.: Federation of American Scientists, July 2017), 1-20, https://fas.org/issues/project-on-nuclear-dynamics-in-a-multipolar-strategic-bmd-world/.

15 "Missile Defence Systems at a Glance."; Ferguson and MacDonald, "Nuclear Dynamics in a Multipolar Strategic Ballistic Missile Defence World."

16 *Missile Defence, The Space Relationship and the 21st Century*, report (Institute for Foreign Policy Analysis, 2009), x, http://www.space-library.com/0902IFPA_IWG2009.pdf.

17 Ibid., xii.

18 Ibid., xii.

any ABM system capable of boost-phase interception. All the ABM systems currently deployed across the world are either capable of mid-course interception or terminal-phase interception.[19]

Missile Defence Policies

Keeping in view improvements in missile interception technologies, ABM systems have been gaining greater significance in the security policies of states, specifically after the unravelling, in 2002, of the 1972 'Anti-Ballistic Missile Treaty', signed between the US and former Union of Soviet Socialist Republics (USSR).[20] Later, the ABM Treaty was expanded and included Russia, Ukraine, Belarus, and Kazakhstan.[21]

Article IV of the Treaty restricted both the US and USSR to deploy a limited number of ground-based ABM systems and prohibits the two countries from developing and deploying missile systems in different domains, including air, land, and mobile transport launcher.[22] Under the Treaty, the two countries could initially only deploy two fixed, ground-based ABM systems using 100 missile interceptors. However, in a protocol signed on 3 July 1974, both countries halved the number of permitted defences, limiting each side to only one ABM site.[23] The Treaty played a significant role in restraining various missile defence programmes that the US and the USSR had been pursuing during the 1950s and 1960s.

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19 "Defence Systems," Missile Threat, CSIS Missile Defence Project, Center for Strategic & International Studies, https://missilethreat.csis.org/defsys/.

20 "Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems (ABM Treaty)," Bureau of Arms Control, Verification, and Compliance, US State Department Archived Content, https://2009-2017.state.gov/t/avc/trty/101888.htm.

21 Ibid.

22 "Fact Sheet: An Introduction to Ballistic Missile Defence."

23 Ibid.

While the ABM Treaty effectively helped in controlling an arms race, it recognised that offensive and defensive weapons were linked, and that continued development and deployment of the ABM systems had adverse effects on strategic stability between the US and the USSR.[24] While the Treaty remained intact, the US continued research on several ABM systems, including the National Missile Defence (NMD) system with an aim to counter missile threats from Iran and North Korea.[25] In 2000, the massive cost of development of the NMD system and the restraints of the ABM Treaty had barred the US from multiple deployments of ground-based ABM systems. However, former US President, George W. Bush, favoured deployment of the NMD at the cost of withdrawal from the ABM Treaty.[26] Consequently, the US withdrew from the ABM Treaty in June 2002, while rationalising its withdrawal on the limitations it had on the US to assemble effective defences against possible 'rogue state' ballistic missile attacks.[27]

The US, after the demise of the ABM Treaty, continued working on its NMD system. With an aim to further improve its missile defence capabilities for defending its territory, it deployed Armed Forces around the world,[28] and upgraded its NMD legislature in 2016, which was earlier enacted in 1999.[29] Former President Barack Obama's Administration's Ballistic Missile Defence Review, in 2010, adopted a posture on the ABM systems similar to that of the Bush Administration, focusing on expanding the missile defence

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24 Ibid.

25 "The Anti-Ballistic Missile (ABM) Treaty at a Glance," Arms Control Association, December 2020, https://www.armscontrol.org/factsheets/abmtreaty.

26 "US Withdraws from ABM Treaty; Global Response Muted," Arms Control Association, July/August, 2002, https://www.armscontrol.org/act/2002-07/news/us-withdraws-abm-treaty-global-response-muted.

27 Ibid.

28 Ibid.

29 Ibid.

systems against Chinese and Russian threats.[30] Former US President Donald Trump's Administration presented its own Missile Defence Review (MDR) in 2019. The 2019 US MDR directed the US to adopt its ABM systems 'for Great Power competition', raising threat perceptions against Russia, China, Iran and North Korea.[31] Meanwhile, the MDR advocated the development of space-based interceptors and capabilities to eliminate missile threats in their boost-phase.[32]

While President Bush announced the US' withdrawal from the ABM Treaty, both Russia and China warned that they would be forced to increase their offensive capabilities against modernised US ABM systems. In response, Russia remained focused on the development of its missile defence capabilities. Russia has now been developing different types of missile interception capabilities against intercontinental, intermediate, medium and short-range ballistic missiles.[33]

China, though opposed to the US' missile defence, is also working on the development of its indigenous ABM system.[34] China found

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30 Thomas Karako, "The Missile Defeat Review in Context," in *Missile Defence and Defeat: Considerations for the New Policy Review*, ed. Thomas Karako, report (Washington, D.C: Center for Strategic & International Studies, March 2017), 8, https://missilethreat.csis.org/missile-defense-and-defeat/.

31 "2019 Missile Defence Review," Office of the Secretary of Defence, US Department of Defence, 4, https://media.defense.gov/2019/Jan/17/2002080666/-1/-1/1/2019-MISSILE-DEFENSE-REVIEW.PDF.

32 Ibid., xvi.

33 Keir Giles, *Russian Ballistic Missile Defence: Rhetoric and Reality,* report (Strategic Studies Institute and U.S. Army War College Press, June 2015), 15-25, https://www.jstor.org/stable/resrep11662?seq=1.

34 Lora Saalman, "China's Evolution on Ballistic Missile Defence," Carnegie Endowment for International Peace, August 23, 2012, https://carnegieendowment.org/2012/08/23/china-s-evolution-on-ballistic-missile-defense-pub-49171.

itself in a security dilemma by the early 1980s, owing to the US and Russian ballistic missile capabilities. Hence, Beijing began working on its ABM system during the early 1980s, in order to defend against the 'first strike' of an adversary country. Chinese ABM programme, dubbed as the '863 Programme', matured in March 1986.[35] The country test-launched its interceptor missile for the first time in 2010, while the second launch took place in 2013.[36] According to a few Chinese experts, China was scheduled to deploy its missile defence systems in a limited fashion, however, this plan remained unimplemented owing financial constraints. Experts argued that if China did not invest in its ABM systems, it would harm its status as a major nuclear power.[37] Apart from the US, Russia and China, several other countries including NATO states, Saudi Arabia, Iran, South Korea, and Japan possess different types of ABM systems.[38]

India's Anti-Ballistic Missile Defence Systems and Policy

India's ABM Development

According to open-source data, India started working on its ABM system development in the 1990s and gained considerable success in interception capability in the last two decades. However, there is no official record or data available noting that when

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35 Bruce W. MacDonald and Charles D. Ferguson, "Chinese Strategic Missile Defense: Will It Happen, and What Would It Mean?," Arms Control Association, November 2015, https://www.armscontrol.org/act/2015-11/features/chinese-strategic-missile-defense-happen-what-mean.

36 Ibid.

37 MacDonald, *Nuclear Dynamics in a Multipolar Strategic Ballistic Missile Defence World*.

38 Shea Cotton and Jeffrey Lewis, *The Global Missile Defence Race: Strong Test Records and Poor Operational Performance*, report (The CNS Missile and SLV Launch Databases, Nuclear Threat Initiative, September 16, 2020), https://www.nti.org/analysis/articles/global-missile-defense-race-strong-test-records-and-poor-operational-performance/.

development of its indigenous ABM system began.[39] In fact, while New Delhi claims that its two-layered ABM system is indigenously developed, including all its elements, numerous foreign suppliers have assisted its ABM programme. The DRDO considered several provisions from foreign manufacturers for key components, including command and control and sensors/radars.[40] India underwent a significant policy shift regarding the ABM Treaty to better position itself for acquiring foreign technology. During the Cold War, India was a supporter of the Treaty. However, in a strategic pivot, it aligned itself with the US, challenging the Treaty's effectiveness. In 2001, New Delhi backed Washington's missile defence initiatives, primarily to gain access to advanced missile defence technology and elevate its international standing. This policy reversal was seen by India as a strategic opportunity to forge a partnership with the US and enhance its own defensive capabilities.[41]

India's indigenous BMD is based on two-layers, comprising high altitude interceptors, including Prithvi Air Defence (PAD) and Prithvi Defence Vehicle (PDV), and low altitude interceptors, including Advanced Air Defence (AAD). The high and low altitude interceptors are capable of eliminating missiles in mid-course (exo-atmospheric) and terminal course (endo-atmospheric) levels of the missile flightpath, respectively.[42] The PDV is capable of targeting a missile at an altitude of 50-120 kilometres. The PDV is claimed to replace the PAD. The AAD is reportedly designed for eliminating missiles at an altitude of 15-40 kilometres.[43] India has also tested

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39 Yogesh Joshi, "India's Missile Defence: Is the Game Worth the Candle?", and, "India's Ballistic Missile Defence System: All You Need to Know," *Times of India,* February 12, 2017, https://timesofindia.indiatimes.com/india/indias-ballistic-missile-defence-system-all-you-need-to-know/articleshow/57105516.cms.

40 Nagal, "India and Ballistic Missile Defence."

41 Ibid.

42 "DRDO Ballistic Missile Defence System," Army Technology, January 8, 2021, http://www.army-technology.com/projects/drdp-bmd/.

43 "DRDO Ballistic Missile Defence System."

its AAD interceptor against decoys in 2018.[44] Meanwhile, in 2019, India also conducted a successful anti-satellite (ASAT) test using a modified version of the PDV anti-ballistic-missile interceptor, called PDV Mark II missile, to destroy a satellite orbiting at 285 kilometres in altitude.[45] Experts believe that the ASAT capability could be used for interception of Intercontinental Ballistic Missiles (ICBMs). This capability would effectively enhance India's BMD architecture.

According to the DRDO, India's indigenous ABM system comprises of two phases. Phase-I, consisting of the PDV and AAD interceptors, engages missiles with a strike-range of 2,000 kilometres. Hence, it provides defence against short and medium-range missiles. However, phase-II of the ABM architecture will comprise new interceptors which would intercept intermediate and intercontinental-range ballistic missiles (IRBMs and ICBMs), with strike-ranges between 3,000 and above 5,000 kilometres.[46]

In November 2022, India conducted the maiden flight-test of phase-II ballistic missile defence interceptor AD-1 capable of engaging many different types of targets. The AD-1 is a long-range interceptor missile designed for both 'low exo-atmospheric' and 'endo-atmospheric' interception of long-range ballistic missiles as well as aircraft.[47] Apart from its two-layered ABM system, India is also fielding an indigenously designed medium-range mobile surface-to-air missile defence system, known as *Akash*.[48] It also started deploying the Russian S-400 air defence systems, worth

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44 Gady, "India's Advanced Air Defence."

45 Langbroek, "Why India's ASAT Test Was Reckless."

46 "Missile Defence Shield Ready, DRDO Chief," *Hindu,* May 6, 2012, http://www.thehindu.com/news/national/missile-defence-shield-ready-drdo-chief/article3390404.ece.

47 Kulkarni, "India Successfully Tests Ballistic Missile Defence Interceptor."

48 Franz-Stefan Gady, "India Successfully Test Fires Supersonic Surface-to-Air Missile", *Diplomat,* December 6, 2017, https://thediplomat.com/2017/12/india-successfully-test-fires-supersonic-surface-to-air-missile/.

USD 5 billion, in 2018.[49] Moreover, in September 2021, the Indian Air Force (IAF) inducted a medium-range surface-to-air-missile (MRSAM) system, called *Barak-8*, capable of intercepting aircraft and cruise missiles. The *Barak-8* systems are jointly developed by India and Israel.[50] In early February 2021, India also announced the flag off of the final production batch of their Navy's Long-Range Surface-to-Air Missile (LRSAM), capable of intercepting both aircraft and cruise missiles. The LRSAM is jointly developed by India and Israel.[51]

India's ABM Policy

The primary stated objective of India's efforts to bolster its BMD shield is to defend its territory against incoming missile threats. [52] However, deeper analysis suggests that the pursuit of prestige and the desire to be recognised as a great power are also significant driving forces behind these efforts.[53] The emphasis on territorial

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[49] Krishn Kaushik, "Explained: S-400 Purchase & Implications," *Indian Express,* November 18, 2021, https://indianexpress.com/article/explained/s-400-purchase-air-defence-system-india-us-relation-7626388/.

[50] Rahul Singh, "IAF Inducts Barak 8 Air Defence System that Can Hit Multiple Targets 70km Away," *Hindustan Times,* September 9, 2021, https://www.hindustantimes.com/india-news/iaf-inducts-barak-8-air-defence-system-that-can-hit-multiple-targets-70km-away-101631198455089.html.

[51] "Indian MoD Announces Flag Off of Final LRSAM Missiles Production Batch," *Naval Technology*, February 15, 2021, https://www.naval-technology.com/news/indian-mod-lrsam-missiles/.

[52] Petr Topychkanov, "India's Prospects in the Area of Ballistic Missile Defence: A Regional Security Perspective," (Working Paper No. 3, Carnegie Moscow Centre, 2012), 9, https://carnegieendowment.org/files/WP3_2012_Topychkanov_en.pdf.

[53] Zafar Khan, "India's Ballistic Missile Defence: Implications for South Asian Deterrence Stability," *The Washington Quarterly,* 40, no. 3 (Fall 2017): 187,

defence, while crucial, is overshadowed by Delhi's broader strategic goals. The development and deployment of ABM systems are not just about neutralising potential military threats; they are also a symbol of technological prowess and military strength. This dual purpose serves both practical and symbolic needs. The country's investment in ABM technology is a clear indicator of its aspirations to be seen as a major player on the global stage. Possessing advanced missile defence capabilities is often associated with great power status, as it demonstrates not only the ability to defend against sophisticated threats but also the capability to engage in advanced technological warfare. Therefore, while the defence of territory is a key aspect, the role of ABM systems in India's military strategy extends beyond mere protective measures. It is part of a larger narrative of seeking greater international prestige and influence, positioning India as a formidable power with advanced defence capabilities.[54]

In January 2020, an Indian media report suggested that the Indian ABM programme was completed, and the IAF and the DRDO were working on proposals to seek the Indian Government's approval to begin the installation of the ABM system.[55] According to the report, the IAF and the DRDO would take three to four years to install the system.[56] While quoting Indian authorities, the report indicated that the two-layered ABM system was for New Delhi, and the Indian Government would decide which other cities would receive the system.[57] However, the DRDO has not yet issued any updated announcement regarding the timeframe of its ABM system

https://www.tandfonline.com/doi/abs/10.1080/0163660X.2017.1370339.

54 Khan, "India's Ballistic Missile Defence." See also, Topychkanov, "India's Prospects," 9.

55 Snehesh Alex Philip, "India's Ballistic Missile Defence Shield Ready, IAF and DRDO to Seek Government Nod to Protect Delhi," *Print,* January 8, 2020, https://theprint.in/defence/indias-ballistic-missile-shield-ready-iaf-drdo-to-seek-govt-nod-to-protect-delhi/345853/.

56 Ibid.

57 Ibid.

deployment. It may be due to the fact that the system has not yet been tested in an assimilated mode, with both inside and outside interceptor missiles together.

Though India has gained significant advancement in the development of its ABM system, its operationalisation and assimilation with its nuclear strategy remains open to speculation. Currently, there is no publicly available official operational or doctrinal policy from India regarding its ABM capabilities.[58] This lack of public documentation leads to the argument that Indian ABM systems may not play a significant role in its nuclear posture.[59]

However, several academics have offered their assumptions about the potential direction of Indian ABM policy. It is believed that India may opt for area ABM systems rather than a point ABM system,[60] as India deems exposing the exact locations of where its ABM systems are stored a threat to the survivability of its nuclear forces.[61] A few Indian experts and officials had indicated the possibility that the missile defence system would cover an area of 200 square kilometres.[62] Limited Indian ABM systems may be poised to protect the country's Command and Control (C2) centres, and the national capital against decapitating strikes. Academics also contend that the Indian ABM capability will be used to reinforce its so-called Nuclear No-first Use (NFU) policy.[63]

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58 Yogesh Joshi and Frank O'Donnell, *India and Nuclear Asia Forces, Doctrine, and Dangers* (Washington, D.C: Georgetown University Press, 2019), 2.

59 Ibid.

60 MacDonald, *Nuclear Dynamics in a Multipolar Strategic Ballistic Missile Defence World,* 11.

61 Ibid., 11-12.

62 "India Missile Chronology," Nuclear Threat Initiative, June 2012, https://media.nti.org/pdfs/india_missile_3.pdf.

63 Happymon Jacob, "Deterrence Debates and Defence," *Hindu*, April 21, 2014, http://www.thehindu.com/opinion/lead/deterrence-debates-

Implications of Indian ABM Systems on South Asian Strategic Stability

Wars are governed by strategy, and strategies and doctrines are significantly affected by changes in technology. For example, the nuclear revolution and long-range ballistic missiles heavily transformed the concept of total wars.[64] With missile technology advances, particularly in precision and guidance systems, both offensive and defensive weapon systems have undergone significant modernisation. This technological sophistication raises concerns that such systems might encourage armed conflicts, contrary to the deterrent role traditionally associated with nuclear weapons.[65]

BMD systems represent a significant innovation in the field of weaponry, born from advancements in missile technology. Although inherently defensive, these systems have a profound impact on strategic stability. [66] Strategic stability can be understood as a condition among states where no party is able to undermine mutual deterrence or feels compelled to initiate a nuclear strike against an adversary. This concept encompasses three key components: deterrence stability, which ensures that no state sees

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and-defence/article5931349.ece; See also, Yogesh Joshi and Alankrita Sinha, "India and Ballistic Missile Interception: From Theory to Practice," *Nuclear Notes* 2, no. 1 (June 2012): 27–28, https://www.ciaonet.org/attachments/21076/uploads.

64 J. Boone Bartholomees, Jr., "Continuity and Change in War," in *US Army War College Guide to National Security: Theory of Strategy and War*, ed. J. Boone Bartholomees, Jr., (Exeter: Strategic Studies Institute Books, 2012), 79-90.

65 Simon A. Mettler and Dan Reiter, "Ballistic Missiles and International Conflict," *The Journal of Conflict Resolution* 57, no. 5 (October 2013), 860-870, https://www.jstor.org/stable/24545573.

66 Igor Ivanov, "The Missile-Defence Mistake: Undermining Strategic Stability and the ABM Treaty," *Foreign Affairs*, September/ October 2000, https://www.foreignaffairs.com/articles/2000-09-01/missile-defense-mistake-undermining-strategic-stability-and-abm-treaty.

benefit in a first strike; arms race stability, which discourages the escalation of arms development; and crisis stability, which aims to prevent conflicts from escalating to nuclear exchanges. The development of BMD systems, by altering the balance in these areas, challenges this delicate equilibrium, potentially disrupting the established norms of nuclear deterrence and arms control.[67]

Central to deterrence stability is the principle of Mutual Assured Destruction (MAD), where the mutual vulnerability to nuclear forces of opposing states plays a crucial role in maintaining effective deterrence. This sense of mutual vulnerability, coupled with the high costs and catastrophic consequences associated with a nuclear conflict, acts as a powerful deterrent. Under the shadow of MAD, the perceived cost and damage of an attack are significantly higher than any relative benefits that might be gained from war, thus inhibiting the likelihood of conflict initiation.[68]

The introduction of ABM systems, however, has a significant impact on deterrence stability, potentially leading to inadvertent escalation. The possession of an ABM system can impart a false sense of security to a state, diminishing the perceived mutual vulnerability that underpins the MAD doctrine. In the case of India, the deployment of ABM systems could create a perception of reduced vulnerability, potentially making inadvertent escalation more likely. This perceived invulnerability might embolden India towards military assertiveness against Pakistan. Consequently, Pakistan views the Indian ABM systems with serious concern, as they pose a challenge to the existing deterrence stability between the two nations. This altered perception of risk and vulnerability

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[67] James M. Acton, "Reclaiming Strategic Stability," Carnegie Endowment for International Peace, February 5, 2013, https://carnegieendowment.org/2013/02/05/reclaiming-strategic-stability-pub-51032.

[68] Acton, "Reclaiming Strategic Stability." and, "Mutual Assured Destruction", Encyclopaedia Britannica, https://www.britannica.com/topic/mutual-assured-destruction.

could destabilise the fragile equilibrium that has historically deterred open conflict in the region.[69]

Additionally, the deployment of Indian ABM systems is undermining arms race stability by triggering an arms escalation in the region. Typically, the concept of an arms race suggests that states refrain from significantly expanding their nuclear and missile forces if they perceive no strategic incentives to do so. However, India's expanding ABM capabilities, which challenge Pakistan's missile penetration ability, disrupt this balance. In response to India's ABM advancements, Pakistan finds itself compelled to augment its nuclear capabilities and delivery systems, both qualitatively and quantitatively. This escalation is aimed at overcoming or overwhelming Indian missile defence systems, indicating a shift away from the restraint that characterises arms race stability. This dynamic reflects a growing arms competition in the region, driven by the perceived need to counterbalance advancements in defensive technologies with offensive capabilities.[70]

Furthermore, the presence of ABM systems can intensify brinkmanship in a region.[71] A state equipped with an ABM system, perceiving a lower level of vulnerability, may feel emboldened to initiate or escalate a conflict. This perceived sense of protection can destabilise crisis stability, as it might motivate the state possessing the ABM system to contemplate the first use of nuclear

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69 Zafar Nawaz Jaspal, "The Introduction of Ballistic Missile Defence in South Asia: Implications on Strategic Stability," in *Nuclear Learning in South Asia: The Next Decade,* ed. Feroz Hassan Khan, Ryan Jacobs and Emily Burke (Monterey: Naval Postgraduate School, June 2014), 127-128, https://nps.edu/documents/104111744/106151936/Nuclear+Learning+in+South+Asia_June2014.pdf.

70 Jaspal, "The Introduction of Ballistic Missile Defence in South Asia," 129-130.

71 Robert Powell, "Nuclear Deterrence Theory, Nuclear Proliferation, and National Missile Defence," *International Security* 27, no. 4 (Spring, 2003): 90, https://www.jstor.org/stable/4137605.

weapons or a pre-emptive strike against its adversary. The false sense of security provided by the ABM system can lead the possessor state to take greater risks, operating under the assumption that it could effectively absorb or neutralise a retaliatory strike. This scenario highlights the paradox where defensive systems, intended to enhance security, can paradoxically lead to more aggressive postures and increase the likelihood of conflict escalation.[72] India's ABM systems would affect crisis stability as well. In a crisis, India might be more inclined to consider a pre-emptive strike or first-use of nuclear weapons,[73] especially as its No First Use (NFU) policy has become a subject of controversy,[74] partly due to the perceived sense of security provided by the ABM shield. In response, first, Pakistan may continue to rely on its Full Spectrum Deterrence (FSD) policy to deter perceived Indian nuclear pre-emption with the help of adequate retaliation capability of disastrous consequences for India,[75] including Pakistan's assured second-strike capability.[76] However, if India's ABM systems become fully operational and effective, Pakistan may find itself compelled to revise its strategic posture. This could involve keeping its nuclear arsenal in a state of hair-trigger alert and permanently mating its nuclear warheads with delivery systems, representing a shift from a recessed deterrence posture to active deterrence.[77] Such a shift would signify an escalation in nuclear readiness,

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72 Jaspal, "The Introduction of Ballistic Missile Defence in South Asia," 127-128.

73 Ibid.

74 Ankit Panda, "From 'No First Use' to 'No, First Use?'", *Diplomat*, August 18, 2019, https://thediplomat.com/2019/08/from-no-first-use-to-no-first-use/.

75 "Rare Light Shone on Full Spectrum Deterrence Policy," *Dawn News*, December 7, 2017, https://www.dawn.com/news/1375079.

76 "Pakistan Test-Fires Nuclear-Capable Submarine-launched Cruise Missile," *Dawn News*, January 10, 2017, https://www.dawn.com/news/1307531/pakistan-test-fires-nuclear-capable-submarine-launched-cruise-missile.

77 Jaspal, "The Introduction of Ballistic Missile Defence in South Asia," 128.

reflecting the heightened tension and reduced crisis stability brought about by the advancement of ABM systems in the region. Thus, crisis instability may force Pakistan to consider first-strike against India in order to strengthen survivability of its nuclear force under India's conventional or nuclear pre-emptive strike,[78] though Pakistan has no official declaratory nuclear first-use or NFU policy, aimed at keeping its nuclear posture ambiguous.

The advancement of Indian ABM systems will also play a role in diminishing the prospects for both India and Pakistan to consider establishing a Strategic Restraint Regime (SRR). Pakistan has consistently proposed the idea of a regional SRR or an arms control mechanism to India. However, development and deployment of Indian ABM systems could be perceived as a move away from the concept of mutual restraint. This scenario implies a reduced likelihood of both nations agreeing on measures that would limit their respective military capabilities, particularly in the realm of missile defence and nuclear weapons. The presence of these advanced ABM systems thus not only complicates existing security dynamics but also poses significant challenges to the initiation and implementation of any form of arms control or restraint regime in the region, especially since India has continued to decline such proposals.[79]

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[78] Ibrahim Anjum, "Implications of Indian Ballistic Missile Defence (BMD) on Strategic Stability," *Policy Perspectives*, 13, no. 1 (2016): 110, https://www.jstor.org/stable/10.13169/polipers.13.1.0097#metadata_info_tab_contents.

[79] "Offer for Strategic Restraint Still on Table, Pakistan tells UN," *Dawn News*, October 16, 2020, https://www.dawn.com/news/1585312; Ayesha Rana, "Challenges to Strategic Stability in South Asia," *Strategic Studies* 38, no. 2 (Summer 2018): 10-20, https://www.jstor.org/stable/48539134; and, Jaspal, "The Introduction of Ballistic Missile Defence in South Asia," 129.

Options for Pakistan

MAD currently serves as the foundational principle of the nuclear postures for both India and Pakistan, with each country possessing a credible nuclear arsenal.[80] However, as discussed earlier, deployment of India's ABM systems presents a significant challenge to regional strategic stability. In light of this evolving security landscape, it becomes imperative for Pakistan to explore and consider multiple options to uphold and maintain strategic stability. This necessity stems from the need to adapt to the changing dynamics introduced by India's ABM capabilities, which potentially undermine the mutual vulnerability essential for the MAD doctrine to effectively function as a deterrent. Pakistan's strategic considerations, therefore, must evolve to address these new challenges and ensure a continued balance in the region's strategic equation.

Presently, the prospects for Pakistan to develop indigenous ABM systems appear somewhat limited. While technically, Pakistan may possess the capability to develop a point missile interception system, the effectiveness of such a system in the face of India's extensive offensive missile arsenal remains a matter of concern. The development of a point ABM system, although potentially feasible from a technical standpoint, might not provide comprehensive protection against the spectrum of threats posed by India's missile capabilities.

Furthermore, the economic implications of such a development cannot be overlooked. Investing in ABM technology represents a significant financial undertaking, and for Pakistan, directing substantial resources towards developing point ABM systems

[80] Khalid Ahmed Kidwai, "Keynote Address," (speech, CISS-IISS Workshop on *Defence, Deterrence and Stability in South Asia*, December 6, 2017), Centre for International Strategic Studies (CISS), https://ciss.org.pk/ciss-iiss-workshop-on-defence-deterrence-and-stability-in-south-asia/.

could lead to considerable economic strain. This consideration is particularly crucial in the context of Pakistan's broader economic landscape and the need to balance defence spending with other national priorities. [81]

According to Lt. Gen. Khalid Ahmed Kidwai (Retd), Adviser to the National Command Authority (NCA) of Pakistan, the country has consciously chosen not to pursue the development or procurement of BMD systems. Instead, Pakistan's strategy focuses on the development of ballistic and cruise missiles across a variety of ranges. This approach is aimed at maintaining strategic stability in relation to India. By diversifying and enhancing its missile capabilities, Pakistan seeks to preserve a balance of power and deterrence, countering the evolving security dynamics influenced by India's defense advancements. This decision reflects a strategic calculation that prioritises the development of offensive capabilities over investment in defensive BMD systems, aligning with Pakistan's broader security and defence objectives.[82]

In January 2017, Pakistan successfully test-launched both of nuclear-capable Submarine-Launched Cruise Missile (SLCM), *Babur-III*,[83] and *Ababeel*, land-based ballistic missile, capable of

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81 Ghazala Yasmin Jalil, "Indian Missile Defence Development: Implications for Deterrence Stability in South Asia," *Strategic Studies,* 35, no. 2 (Summer 2015): 39, https://www.jstor.org/stable/48527460.

82 Khalid Ahmed Kidwai, "Keynote Address" (speech, Seminar on *Strategic Stability in South Asia: Is India a Responsible Nuclear State?* June 13, 2019) Institute of Strategic Studies Islamabad (ISSI), https://issi.org.pk/remarks-by-lt-general-khalid-ahmed-kidwai-seminar-on-strategic-stability-in-south-asia-is-india-a-responsible-nuclear-state/.

83 "Pakistan Attains 'Second Strike Capability' with Test-Fire of Submarine-Launched Cruise Missile," *Dawn News,* January 9, 2017, https://www.dawn.com/news/1307384.

delivering multiple warheads using Multiple Independent Re-entry Vehicle (MIRV) technology.[84]

Opting not to pursue ABM systems, it is a more prudent for Pakistan to continue enhancing its nuclear and missile arsenal in both quantitative and qualitative terms. This approach is aimed at countering the growing missile interception capabilities of India. The development of MIRV capability is particularly crucial. It would enable Pakistan to ensure the penetration and survivability of its nuclear forces amidst the expanding missile defence systems of India. MIRVs, which allow a single missile to carry multiple warheads and target them independently, significantly increase the likelihood of penetrating missile defence shields. This technology not only complicates the interception efforts but also serves as a robust deterrent by guaranteeing a credible second-strike capability.

Additionally, the advancement of sea-based missile capabilities would further bolster Pakistan's ability to evade ABM systems. Deploying missiles from naval platforms, such as submarines, adds an element of stealth and unpredictability, enhancing the survivability of the nuclear force. This two-pronged approach, combining MIRV capabilities with sea-based assets, would provide Pakistan with a more comprehensive and effective strategy to counterbalance India's ABM systems, thereby maintaining strategic stability in the region.

Moreover, Pakistan can also consider various other technologies to strengthen its missile penetration capabilities. For example, it could consider missile skin cooling technologies which provide stealth technologies in order to conceal missiles from heat detectors.[85] It could explore development of decoys for its missile systems.

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[84] "Pakistan Conducts First Flight Test of Ababeel Surface-to-Surface Missile," *Dawn News,* January 24, 2017, https://www.dawn.com/news/1310452.

[85] Ghazala Yasmin Jalil, "Indian Missile Defence Development," 39-40.

Decoys are designed to mimic the appearance and radar signature of actual warheads, creating multiple false targets. This tactic significantly complicates the interception process, as ABM systems may struggle to distinguish real warheads from decoys, thereby increasing the probability of the genuine warhead reaching its target. In addition to decoys, Pakistan could consider investing in the enhancement of Manoeuvrable Re-entry Vehicles or Warheads (MaRVs). MaRVs are designed to alter their trajectory during re-entry, making it challenging for ABM systems to predict and intercept them accurately. This capability allows the missile to evade defensive systems by making last-minute adjustments to its flightpath, greatly reducing the likelihood of interception.[86]

Pakistan could also consider employing less expensive other offensive means including cyber operations to foil Indian ABM systems. As missile defence systems remain connected to networks and the Internet, and heavily rely on the transmission of data or digital information amongst its various including sensors, radars, fire control and C2 systems, they are quite vulnerable to cyber-attacks.[87] Reports highlighting vulnerabilities in US ABM systems,[88] particularly due to weak cybersecurity measures, point to a potential strategic avenue for Pakistan in countering the effectiveness of Indian ABM systems. Developing offensive cyber capabilities could be a critical component of Pakistan's strategy to neutralise or mitigate the threat posed by advanced Indian missile

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86 Jeffrey Lewis, "Is China Developing a MARV?" *Arms Control Wonk*, June 30, 2005, https://www.armscontrolwonk.com/archive/200655/is-china-developing-a-marv/.

87 Patricia Lewis and Beyza Unal, "The Destabilizing Danger of Cyberattacks on Missile Systems," Chatham House, July 2, 2019, https://www.chathamhouse.org/2019/07/destabilizing-danger-cyberattacks-missile-systems.

88 Geoff Ziezulewicz, "Audit Finds Cyber Vulnerabilities in US Missile Defence System," *Navy Times*, December 15, 2018, https://www.navytimes.com/news/your-navy/2018/12/14/audit-finds-cyber-vulnerabilities-in-us-missile-defense-system/.

defence systems. Focus in this area could likely involve strategies aimed at infiltrating and disrupting the technological and operational infrastructure of the Indian ABM systems. This could include targeting key components such as sensors, radars, satellites, fire control systems, and C2 networks. By employing tactics such as phishing or other forms of cyber-attacks, Pakistan could potentially gain access to these critical systems. Successful cyber operations could impair the functioning of the ABM systems in various ways. For instance, they could disrupt the launching capabilities of the system or interfere with the guidance and targeting mechanisms, preventing the system from effectively reaching and neutralising its targets. Such a disruption would significantly enhance the penetration capability of Pakistan's missiles against the Indian ABM defence architecture.

Incorporating offensive cyber operations into its military strategy would require Pakistan to invest in developing sophisticated cyber capabilities, including building a skilled workforce adept in cyber warfare techniques. This approach would add a new dimension to the regional strategic balance, underscoring the increasing importance of cyber capabilities as a tool for national defence and strategic deterrence.

Conclusion

In response to India's continued advancement in Anti-Ballistic Missile (ABM) systems, Pakistan's decision not to pursue similar systems, but rather to enhance its nuclear and missile capabilities, both quantitatively and qualitatively, stands as a prudent strategic choice. This approach directly addresses escalating missile interception capabilities of India. Central to this strategy is the development of Multiple Independently Targetable Re-entry Vehicle (MIRV) technology and advancement of sea-based missile capabilities.

To further strengthen its missile penetration capabilities, Pakistan can explore additional technological avenues, including missile

skin cooling for enhanced stealth, use of decoys, and development of Manoeuvrable Re-entry Vehicles or Warheads (MaRVs). Furthermore, recognising the strategic value of cyber capabilities, Pakistan can consider developing offensive cyber operations as a cost-effective measure to counter and potentially neutralise the threat posed by India's missile defence systems.

In navigating the evolving security landscape marked by India's development of ABM systems, Pakistan's strategic focus on enhancing its nuclear and missile capabilities serves not only as a counterbalance but also as a vital component in upholding regional stability. In scenarios of heightened crisis, India's perceived sense of invulnerability could prompt considerations of pre-emptive strikes against Pakistan. This security dilemma necessitates Pakistan to develop effective countermeasures. While these measures are part of an ongoing arms dynamic between the two South Asian nuclear states, they also represent a cautious and calculated effort by Pakistan to ensure a stable strategic equilibrium. The focus, therefore, is not merely on responding to immediate security threats but also on fostering a stable environment that can mitigate the risks of escalation and promote long-term regional peace and stability.

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