

A FRAGILE SHIELD: INDIA'S BALLISTIC MISSILE DEFENCE

Asim Ahmed* & Mahroona Hussain Syed**

"Peace cannot be kept by force; it can only be achieved by understanding"
(Albert Einstein)

Abstract

India's interest in developing Ballistic Missile Defence (BMD) originates from its desire to counter ballistic missiles threats emanating from its traditional rivals in the region. Therefore, in 2001, India positively responded to United States of America's offer of BMD, which created consternation among the regional countries particularly in Pakistan about its effects on the prevailing strategic stability and prospective arms race in the region. India's ability to develop a BMD has been debated due to fallibility of the system particularly taking the lessons from the Antiballistic Missile Treaty 1972, when USA and former USSR decided to enter into the treaty due to the weakness of the shield and degeneration of nuclear deterrence, which could provoke a nuclear war. This article analyses India's rationale and current ability to develop the 'defensive shield' and questions the assertion that BMD as a concept is a 'defensive mechanism' given India's geographical vulnerabilities and availability of cost-effective offensive strategies to counter BMD.

Keywords: BMD, NMD, TMD, THAAD, India, Pakistan, China, Nuclear Deterrence, ABM Treaty

Introduction

India's ambition to seek Ballistic Missile Defence is justified as an effort to protect itself against ballistic missile threats emanating from its

* A PhD Scholar at the Department of Defence and Strategic Studies, Quaid-i-Azam University, Islamabad. Email: asimahmed68@gmail.com.

** A PhD Scholar and Lecturer, Department of Government and Public Policy, National Defence University, Islamabad. Email: mahroona@ndu.edu.pk

traditional rivals and necessarily advertised as an exercise in self-defence.¹ Such a venture, however is reminiscent of the Cold War era military strategies adopted by the two ideological blocks led by the former Soviet Union and United States of America heavily relying on the Inter-Continental Ballistic Missiles (ICBMs), as these proved to be the most reliable means to deliver nuclear weapons upon the adversary's mainland. The competing military strategies of the superpowers during the era focused on deterring the rival with the annihilating effects of nuclear weapons (NWs) and included prominent deterrence strategies of Mutual Assured Destruction (MAD), massive retaliation, and flexible response. However, amongst them, the ICBMs are the most reliable means to cover longer ranges and reach the target location with precision, which caused insecurity amongst both the Cold War rivals and forced them to look for security elsewhere, possibly with a strategy, which could offset the inherent advantages of ICBMs. Such a strategy was named BMD.

Ballistic Missile Defence, propounded as the 'defensive' strategy was conceptualised to protect the mainland against the nuclear armed hostile ballistic missiles.² A prototype BMD is a multi-layered system, capable of providing early warning of the missile launch, while simultaneously tracking and intercepting the incoming missile.³ The components of such a system include radars and interceptors. Radars provide early-warning and interceptors destroy the incoming missiles during the flight. Simultaneously, over time, modern technologies have permitted real-time information to flow from longer distances to the interceptor. Such information is extremely useful for BMD system, as it enhances its capacity to intercept the missile and overall viability of the system. Infrared is an advancement, which is greatly useful in the BMD system for aiming at the targeted missile.⁴ The high speed of laser also greatly helps in surveillance, target detection, target tracking, and discrimination.⁵

¹ Dr. Rajeswari Pillai Rajagopalan, "Strategic Implications of India's Ballistic Missile Defense," *Working Paper*, June 18, 2019, <https://fas.org/wp.../Strategic-Implications-of-India's-Ballistic-Missile-Defense.pdf>.

² Henry S. Rowen, "Introduction," in *Getting Mad: Nuclear Mutual Assured Destruction, Its Origins and Practice*, ed. Henry D. Sokolski (Pennsylvania: Strategic Studies Institute, U.S. Army War College, 2004), 1-13.

³ Dean A. Wilkening, "A Simple Model for Calculating Ballistic Missile Defense Effectiveness," *Science & Global Security* 8, no. 2, (1999): 183-215.

⁴ See "How does Missile Defence Works," *Union of Concerned Scientist*, <https://www.ucsusa.org/nuclear-weapons/missile-defense/how-gmd-missile-defense-works>.

⁵ M. Z. Tidrow and W.R Dyer, "Infrared Sensors for Ballistic Missile Defense," *Elsevier* 42, no. 3-5(June 2001): 333-336.

BMD has many variants like for smaller areas or some installations or area where forces are deployed and though too expensive but it could be considered for the complete state. The missile defence for complete state is called National Missile Defence (NMD). In planning for NMD, it is organised in layers to ensure that it is not penetrated easily.⁶ On the other side, Terminal High Altitude Area Defence (THAAD) is suitable for smaller operational areas previously known as Theatre Missile Defence (TMD).

TMD was deployed in the Gulf War, when USA deployed Patriot Air Defence (PAD) system in the Middle East to protect US troops from Iraqi Scud rockets. Although it is to be noticed that USA, being a signatory of the Anti-Ballistic Missile (ABM) Treaty 1972, was in violation of it.⁷ Nonetheless, in the wake of failure of the US to provide effective shield by PAC-2/3 (Patriot Advanced Capability) against incoming Iraqi rockets, THAAD provided a more comprehensive shield once deployed with endo-atmospheric area or air defence. As per Michael Elleman and Michael J. Zagarek, Jr., THAAD operates on exo-atmospheric intercept with a capability to intercept short, medium, and intermediate missiles up to the range of 1000 kms.⁸ However, NMD is an entire system providing missile defence to a state in all the stages of missile launch: launch, boost, intermediate, and terminal phase.

In 2001, the USA decided to withdraw from ABM Treaty 1972 and deployed BMD in the face of missile threats from terrorists or rogue states of Iran and North Korea.⁹ The decision had different implications for the US and the rival states without a BMD. On the one hand, nuclear deterrence was further strengthened as well as the second strike capability and on the other an opportunity arose for offence to a state deploying BMD.¹⁰ This was a dangerous proposition for the rival state; as the BMD state or defender after feeling secure in a BMD, may provoke it for an offensive as well.¹¹ Therefore, a state without a BMD may expect a pre-emptive strike. This fear may even provoke such a state for first strike.

⁶ Charles L. Glaser and Steve Fetter, "National Missile Defense and the Future of U.S. Nuclear Weapons Policy," *International Security* 26, no. 1 (2001): 40-92.

⁷ ABM Treaty 1972, signed between USA and USSR at Moscow on 26 May 1972.

⁸ Michael Elleman and Michael J. Zagarek, Jr., "THAAD: What it Can and Can't Do," *38 North* (March 10, 2016), https://www.38north.org/wp-content/uploads/pdf/2016-03-10_THAAD-What-It-Can-and-Cant-Do.pdf.

⁹ Terence Neilan, "Bush Pulls out of ABM Treaty; Putin Calls Move a Mistake," *The New York Times*, December 13, 2001, <https://www.nytimes.com/2001/12/13/international/bush-pulls-out-of-abm-treaty-putin-calls-move-a-mistake.html>.

¹⁰ Kenneth G. Weiss, "The Limits of Diplomacy: Missile Proliferation, Diplomacy, and Defense," *World Affairs* 163, no. 3 (2001): 118.

¹¹ *Ibid.*, 118.

Baldwin considered, "there are, of course, situations in which one state's efforts to increase its security reduce the security of other states."¹²

The USA's decision to deploy BMD was an important milestone as many states considered that deployment of BMD by USA could help in countering missile threats emanating from the rival states. India also considered that BMD capability will help counter missiles threats originating from the regional neighbouring states. However, it is a matter of debate whether BMD system is able to provide effective security to states. This article analyses India's rationale and struggle towards developing the BMD shield. It tries to find out whether the BMD will be able to guarantee an effective shield to India's mainland? Answer to these questions particularly become important, as the deterrence stability will be directly affected by the Indian decision to deploy BMD. In order to offset the advantage to India, the rivals may look for complementing the nuclear deterrence through other means.

India's Gambit for BMD

The USA's decision to finally abrogate the ABM treaty in 2001, and deploy BMD for itself and to offer it to friendly countries, was a matter of concern for the world except a few allies of USA.¹³ The USA's considerations for developing BMD in the Cold War were against the missile threat that originated from USSR. However, in the post-Cold War, USA wanted to counter ICBMs originating from North Korea and Iran.¹⁴ Moreover, this decision was not a good news for the proponents of disarmament and non-proliferation. Particular repercussions of such a decision are expected between Indo-Pakistan, Eastern Europe, and Japan, Taiwan, and China.¹⁵

India expressed keen interest in USA's BMD offer, as Delhi intended to pursue Theatre Missile Defence (TMD) to ward-off missile threats from the regional neighbouring countries.¹⁶ However, there could be other reasons, which could be attributed to India's desire to pursue

¹² David A. Baldwin, *War*, (London: SAGE Publication, 2005), 16.

¹³ Colin S. Gray, "European Perspectives on U.S. Ballistic Missile Defense," *Comparative Strategy* 21, no. 4 (2002): 279-310, <https://doi.org/10.1080/01495930290043056a>.

¹⁴ Richard Dean Burns, *A Missile Defence Systems of George W. Bush: A Critical Analysis* (USA: Praeger, 2010), 1.

¹⁵ Brad Roberts and Shen Dingli, "The Nuclear Equation in South Asia," in *Chaillot Papers, Nuclear Weapons: a New Great Debate* (France: Institute for Security Studies for Western European Union, 2001): 145-147, <https://www.iss.europa.eu/sites/default/files/EUISSFiles/cp048e.pdf>.

¹⁶ Ashley J. Tellis, "The Evolution of U.S.-India Ties: Missile Defence in an Emerging Relationship," *International Security* 30, no. 4 (2004), 131-151.

BMD. For example, India may perceive BMD to be more of a status symbol as development of BMD will make her a part of big powers who are pursuing BMD programme. In a nutshell, the decision carried some serious strategic problems for the region, which would upset the prevailing strategic stability.

Indian conventional and strategic development programmes are a clear manifestation of Indian strategic goals and culture put forth by their political leadership. Before becoming an overt nuclear power in 1998, India conducted a nuclear test in 1974, describing it as Peaceful Nuclear Explosion or Smiling Buddha.¹⁷ After 1998 nuclear tests, India pursued to achieve a triad delivery system for its nuclear weapons i.e. air, surface to surface missiles and sea-based missiles.¹⁸ India's effort to achieve triad delivery means reflected its persistent effort to strengthen deterrence.

Prime Minister Vajpayee's interest in USA's offers created a huge debate among the strategic community in India.¹⁹ The opposition parties in India criticized the government as this decision was taken without entering into any worthwhile deliberations among stake holders of the state. There was also criticism that India's decision was too early as until then repercussion of USA withdrawal from ABM Treaty on international politics were not thoroughly debated by USA and NATO at policy and academic levels.²⁰ On the other side, the proponents of the BMD in India were wary of missile threats coming from neighbouring Pakistan and China. In the realist paradigm, both states were perceived as restricting India's rise in global politics. The ideological differences between India and Pakistan, predominately played a role in shaping strategic thinking in India.²¹ Shinichi observed that it was always India, which took the lead in development of strategic weapons and conventional weapons while Pakistan followed to achieve strategic balance in order to avoid being coerced by its arch adversary.²²

¹⁷ John F. Burns, "India Carries Out Nuclear Tests in Defiance of International Treaty," *The New York Times*, May 12, 1998, <http://partners.nytimes.com/library/world/asia/051298india-nuke.html>.

¹⁸ Naeem Ahmed Salik, *The Genesis of South Asian Nuclear Deterrence, Pakistan's Perspective* (New York: Oxford University Press, 2009), 192.

¹⁹ Tellis, "The Evolution of U.S.-India Ties," 113-151.

²⁰ Clifford Krauss, "Canada Says It Won't Join Missile Shield with the US," *New York Times*, February 24, 2005, <https://www.nytimes.com/2005/02/24/world/americas/canada-says-it-wont-join-missile-shield-with-the-us.html>.

²¹ Thorsten Wojczewski, "The Persistency of the India-Pakistan Conflict: Chances and Obstacles of the Bilateral Composite Dialogue," *Journal of Asian Security and International Affairs* 3, no. 1 (2014), 319-345.

²² Izuyama Marie Ogawa Shinichi, "The Nuclear Policy of India and Pakistan," *NIDS Security Reports*, no. 4 (2003), 59-89.

South Asia Analysis Group, an Indian based think tank considers that India and Pakistan are vigorously engaged in revising and refining their delivery system.²³ However, to justify India's pursuit of BMD, the group offered stereotypical arguments that China is supporting Pakistan in the development of missile technology.²⁴ Pant also supports the view that China is involved in building-up missiles of different ranges at Tibet in the immediate neighbourhood of India. These threats are multiplied once seen against the backdrop of Pakistan-China cooperation in such strategic ventures. He also points a finger on a not so good non-proliferation record of both states, which is a source of continuous concern for India. He says:-

....the transfer of missiles and missile-related items from China and Pakistan to states as far and wide as Syria, Iran, North Korea, Libya, and Saudi Arabia has been a constant feature of the Asian security landscape for quite some time now.²⁵

Pant contends that there is an immediate need for India to pursue missile defence. Such missile defence will enhance India's deterrent capability against such threats. He also emphasizes on the necessity to pursue limited indigenous missile defence capability, which can be continuously pursued thereafter.²⁶ It has been observed that Pakistan has been largely the focus of strategic development taking place in India, despite India's frequent denial of the idea, as it portrays China as their main strategic rival in the region. This Indian contention does not hold true, once deployment pattern of India's strategic and conventional forces is examined objectively. The huge amount of RAPIDs and mechanised forces of India do not find their employment against China in the Himachal region or across it. Simultaneously, these forces find no application for the other militarily not so relevant states of the region. The ideal employment is in the deserts in the south of Pakistan or its plains in the center. The exponents of Indian missile defence system consider that this is the most prudent way to keep Pakistan's nuclear threat in check.²⁷ It appears to be an effort to build a narrative against the rationale of Pakistan's nuclear

²³ Suresh Dhanda, "Dangers of Missile Race in South Asia: an India-Pakistan Perspective," *International Affairs and Global Strategy* 2 (2011) www.iiste.org.

²⁴ R.K. Mishra, "Nuclear and Missile Threats to India," *South Asia Analysis Group*, Paper 296, accessed November 29, 2019, www.saag.org/papers3/paper296.html.

²⁵ Harsh V. Pant, "India Debate Missile Defence," *Defense Studies* 5, no. 2, (2006), 228-246, <https://doi.org/10.1080/14702430500336418>.

²⁶ Sandeep Dikshit, "India to Build Missile Shield with US Help," *The Hindu*, June 2, 2002, <https://www.thehindu.com/todays-paper/tp-national/india-to-build-missile-shield-with-us-help/article27850317.ece>.

²⁷ Pant, *India Debates Missile Defense*, 228-246.

weapons to mislead the world and simultaneously project its efforts for pursuing BMD to counter it.²⁸ Actually, this is based on a classical understanding of deterrence theory, based on denial. USA strategic thinkers during the Cold War propagated similar ideas that if rival state is denied from achieving its objective through nuclear strike, it will be effectively deterred from taking this course.²⁹ This is how support for BMD was generated in USA. India's strategic planners on the other hand, manipulating the fact, tried to project their concerns that India's missile programme is behind Pakistan's missile due to the fact that Pakistan missile programme has its links with North Korea and China. In the same backdrop, missile defence for India would be able to effectively check such missile threats.³⁰

Harsh Pant justifies India's stance to opt for BMD system as:

....the 1999 Kargil conflict demonstrated for many the inability of India to come up with an appropriate response to the stability/instability paradox operating in the sub-continent that has put India at a strategic disadvantage vis-à-vis Pakistan. A missile defense system would help in blunting Pakistan's 'first-use' nuclear force posture, that had led Islamabad to believe that it had inhibited India from launching a conventional attack against it for fear of escalation to the nuclear level. With a missile defense system in place, India would be able to restore the status quo ante, thereby making conventional military options against its rival potent again.³¹

Ashley Tellis also supported the BMD cover of India. He contended that there is a fear in India that Pakistan government did not have sufficient control over its nuclear weapons and India would be the likely target. Therefore, nuclear capability alone would not be sufficient to offset this disadvantage and thus required BMD to counter it. Building his argument, he emphasized that the nuclear and strategic coercion by Pakistan since 1980's had helped Islamabad to support a number of insurgencies in India, particularly in Kashmir, as Pakistan's nuclear capability gave it immunity from any conventional response from India.³² President Pervez Musharraf during India and Pakistan stand-off following attack on the Indian Parliament in 2001 was quoted stating; "Indian government had started pulling back its troops due to his various covert

²⁸ Ibid., 228-246.

²⁹ Phil Williams, *Contemporary Strategy II, the Nuclear Powers* (Great Britain: Croom Helm Ltd', 1987), 44.

³⁰ Pant, *India Debates Missile Defense*, 228-246.

³¹ Ibid., 228-246.

³² Tellis, *The Evolution of U.S.-India Ties*, 139.

messages to the Indian Prime Minister, Atal Bihari Vajpayee, that if a war was imposed on Pakistan it would not remain a conventional one."³³ According to Tellis, proliferation of technologies i.e. missile and nuclear material was another issue, which was not directly linked to developing ballistic missile but did reinforce the thinking in India.³⁴ In order to deal with such threats, India needed a long term strategy including nuclear doctrine and ballistic missile defence.³⁵

Another contributing factor towards developing BMD by India is China. Persisting border disputes with China towards Himachal Pradesh and war of 1962 on the issue³⁶ and power politics in the region will continue to be part of the strategic calculus within India. In addition, in Indo-US strategic partnership, countering rise of China in the region stands at the center.³⁷

Pant also considers that there are two major areas where strategic cooperation between India and USA is likely to benefit India in its strategic outlook. One is BMD and the other is the nuclear deal with USA. Both states are rapidly progressing in these areas, which underwrite their closer strategic partnership. Although in this partnership, India benefits the most as it helps in reaching out to advanced technologies while USA also finds a market for its defence productions.

The likely outcome of Indo-US strategic-partnership is the strategic instability in the region. The two nuclear powers in the neighbourhood of China will go for balance of power, which has been disturbed. Nuclear deterrence is likely to be strengthened through an increase advancement in technologies as well as through increasing cooperation between China and Pakistan. This may trigger an arms race in the region,³⁸ reinforcing primacy of traditional security over human security. In addition, BMD protected India may lower threshold of nuclear deterrence and provoke the regional countries to go for first strike.³⁹

Conversely, strategic thinking in India does not overrule the USA offer for BMD as a counter-proliferation measure in a quid pro quo to missile defence.⁴⁰ India might be constrained in developing strategic nuclear posture as per the USA's security requirements, which may

³³ Shamim-ur-Rahman, "Warning Forced India to Pull Back Troops, Says President," *Dawn*, December 31, 2002.

³⁴ Tellis, *The Evolution of U.S.-India Ties*, 113-151.

³⁵ *Ibid.*

³⁶ Brigadier J.P. Dalvi, *Himalayan Blunder* (Bombay: Dinkar Sakri Kar, 1969), 1.

³⁷ Tellis, *The Evolution of U.S.-India Ties*.

³⁸ *Ibid.*

³⁹ Pant, *India Debates Missile Defense*, 228-246.

⁴⁰ Bharat Karnad, "Missile Defense: Immature Technology, Counter-Proliferation Trap," *Force* (May 2004); Bharat Karnad, "After Pak, India," *Asian Age*, April 12, 2004: 103.

ultimately increase India's reliance on USA in the nuclear domain. Additionally, how much is India prepared to financially support the technology, which is itself in its early stages of advancement, particularly once compared with the likely high cost and possibility of being out-dated in an earlier timeframe due to flow of modern technologies like infrared and space.⁴¹ However, despite drawbacks like inability to develop a perfect system due to technological want, exuberant cost, prospective arms race in the region and degeneration to nuclear deterrence, causing nuclear war; India still preferred to adopt BMD.

India's Pursuit of BMD

The basic design of India's BMD is based on USA's BMD design manifested during the Gulf War. Other contributory factors include 'used technology from Russia and Israel' and indigenous efforts. Given that, a general idea of how USA's BMD is structured would give a fair idea of what Indian design looks like.

In case of USA, Phased Array Tracking Intercept of Target (PATRIOT) is the basic programme under which USA's ballistic missile defence is structured. Over the last two decades, the programme has passed stage 2 and stage 3 that included its operation during the Gulf War. The stage 2, commonly known as Patriot Advanced Capability 2 (PAC-2) possesses both the components missile defence and air defence.⁴² The system has the capability to engage fighter aircraft, cruise missiles and even intercept short range tactical missiles. The capability of the interceptor to achieve an altitude of 24 kilometres and with a range of 70 kilometres is its obvious feature. It has potential to work in all types of weather conditions and has a flying time ranging between 3 seconds to 3.5 minutes.⁴³

As per Sharma, India perceived missile threats from Pakistan at the end of last century and wanted to secure itself. The first such effort was observed, when 6xbatteries of S-300 were purchased by India. These missiles were of Russian origin and were capable of intercepting M- 11 missiles.⁴⁴ This was the time, when India started to pursue its indigenous missiles defence system and to look for radars from market for early warning. The system was called Prithvi Air Defence (PAD) and Akash and

⁴¹ Pant, *India Debates Missile Defense*, 228–246.

⁴² *Ibid.*

⁴³ *Ibid.*

⁴⁴ Ashok Sharma, "India's Missile Defence Programme: Threat Perceptions and Technological Evolution," *Manekshaw Paper no. 15* (2009): 5, <http://www.kwpub.com/images/Papers/Manekshaw%20papers/Manekshaw%20Papers%20%20List.pdf>.

Trishul formed the basic missiles of the system.⁴⁵ Israel provided assistance to develop radar suitable for the system.⁴⁶ These were long range tracking radars and called LRTR. French company Thales also helped in improving the tracking system of the radar. The technological development for ABM continued but by the end of last century, India was prepared with the basic structure of indigenous PAD.⁴⁷ According to Sharma:-

...the Indian Ballistic Missile Defence Programme, an initiative to develop and deploy a multi-layered ballistic missile defence system, is a two-tiered system consisting of two interceptor missiles, namely Prithvi Air Defence (PAD) missile for high altitude interception, and the Advanced Air Defence (AAD) missile for lower altitude interception. The two-tiered shield will be able to intercept any incoming missile launched 5,000 km away.⁴⁸

The PAD and AAD were tested in 2006-2007, and after conducting these tests India became the fourth country with anti-ballistic missile system. The others were US, Russia and Israel. India claimed its system to be indigenously-built. The evidence of first near-successful test was found in 2009, when Danush, a ship launched missile, was intercepted by the system. The target Danush was engaged at an altitude of 75 kilometres and followed this trajectory for a distance of 1500 kilometres, whereas, on low altitude interception, India had been working on a set of two missiles. These were called as AD-1&2. Both were high speed interceptors and were able to engage missile with a range of 5,000 kilometres. The expected time for the completion and induction of these missiles was 2011.⁴⁹ Later in 2012, India's Defence Research and Development Organisation (DRDO) claimed that it had achieved missile defence, which could be deployed at two locations on short notice,⁵⁰ yet the tests conducted in 2015 were not

⁴⁵ Dr. Zafar Nawaz Jaspal, "Countering Indian Ballistic Missile Defense & Strategic Stability in South Asia," *Margalla Papers* (2018), https://ndu.edu.pk/issra/issra_pub/articles/margalla-paper/Margalla-Papers-2018/02-Countering-Indian-BMD.pdf.

⁴⁶ Tellis, *The Evolution of U.S.-India Ties*, 113-151.

⁴⁷ *Ibid.*, 1-23.

⁴⁸ Sharma, *India's Missile Defence Programme*.

⁴⁹ Sandeep Unnithan, "DRDO Readies Shield against Chinese ICBMs," *India Today*, March 9, 2009, <http://indiatoday.intoday.in/story/DRDO+readies+shield+against+Chinese+ICBMs/1/31874.html>.

⁵⁰ Air Marshal Narayan Menon, "Ballistic Missile Defence System for India," *Indian Defence Review* 27.3, September 2012, <http://www.indiandefencereview.com/spotlights/ballistic-missile-defence-system-for-india/>.

considered to be successful.⁵¹ However, the tests conducted in 2016-2017 by DRDO were declared successful, where Prithvi missiles were fired from Chandipur, India, and engaged by supersonic missile at Abul Kalam Island, Bay of Bengal, in both endo-atmospheric and exo-atmospheric interceptions.⁵²

India did not accept PAC-2, as according to them this was an older version. Its upgraded version PAC-3 was tried in the Gulf War. It had a fairly high success rate and claimed to be even more than 95 percent. Pant considered that, "the US might be willing to offer India the advanced version of PAC-2 missiles with the radar of the latest PAC-3 so that when India is ready, it can upgrade its missile defence capability."⁵³

The interceptors provided with PAC-3 were capable of covering much bigger area in comparison to its earlier version.⁵⁴ According to Lockheed Martin report:

PAC-3 interceptors can protect an area of about seven times greater than the original Patriot system. The PAC-3 missile is a smaller and high velocity interceptor that defeats incoming targets by direct, body-to-body impact, known as hit-to-kill system. It has a precision guidance system, featuring an active on-board radar seeker, enables complete target destruction through the kinetic energy released upon direct impact of the target. The PAC-3 provides guidance system to the missile to acquire the target shortly before the intercept, select the optimal aim point and initiate the terminal guidance to ensure target kill. The canister is approximately the same size as a PAC-2 canister but contains four missiles and tubes instead of a single round; and therefore, has the ability to fire 16 missiles against any incoming missile or threat.⁵⁵

⁵¹ "Interceptor Missile Tested 7 Times, DRDO's Rajinikanth Moment Still Far," *The Indian Express*, May 4, 2015, <http://indianexpress.com/article/explained/interceptor-missile-tested-7-times-drdo-rajinikanth-moment-still-far/dpuf>.

⁵² Franz-Stefan Gady, "India's Advanced Air Defense Interceptor Destroys Incoming Ballistic Missile in Test," *The Diplomat*, December 28, 2020, <https://thediplomat.com/.../indias-advanced-air-defense-interceptor-destroys-incoming>.

⁵³ Pant, *India Debates Missile Defense*, 228–246.

⁵⁴ *PR Newswire Lockheed Martin*, "Lockheed Martin Conducts Successful PAC-3 Missile Test at White Sands Missile Range," accessed June 13, 2020, <http://www.prnewswire.com/news-releases/lockheed-martin-conducts-successful-pac-3-missile-test-at-white-sands-missile-range-132998388.html>.

⁵⁵ <https://www.lockheedmartin.com/en-us/products/pac3-mse.html>

According to Sharma, India has already acquired PAC-3 and is aiming at Arrow II Missile system as part of its comprehensive missile defence shield.⁵⁶ India is also showing interest in Russian AD system, which also has a module of ABM. It consists of S-300V, S-300PMU systems and S-400 (SA-20 Triumf). India is also keen to acquire S-500, as it will support its BMD for mid-course interception with an extended range of 3500 kilometres. This will be 5th Generation ABM system, which “combine the elements of air, missile and space defence for targeting enemy system deeper into space.” This will allow India to reach out to exo-atmospheric and achieve Anti-Satellite (ASAT) access.⁵⁷ According to Unnithan, “India is also working for Laser-based BMD for the boost phased interception in next 10-15 years.”⁵⁸ NATO also encourages India’s move towards BMD and looks for cooperation in the technological field of the BMD system. It even proposed ABM system to India in following words, “you have a missile threat that confronts you. We have a missile threat that confronts us. It is a different one, but our ability to defend against it could be the same”.⁵⁹

Efficacy of India’s BMD

India is pursuing technologies from different countries in order to develop an effective BMD. Prithvi Air Defence is claimed to be a domestic system with an indigenously developed interceptor but with most of the technologies borrowed from the outside. Simultaneously, India is desirous of having PAC-3 due to the perfection in the kill-rate of the system as narrated above. However, merging different technologies in the system may not bring the kind of perfection a BMD system requires. Evidently, one does not expect perfection in the system right from the beginning but it does carry potential to survive. Therefore, irrespective of the present status of India’s BMD, its efforts towards BMD are likely to increase sense of vulnerability amongst the regional rivals. However, existing vulnerabilities of India’s BMD, is likely to be exploited by the regional rivals.

The first question is about the reliability of India’s BMD. Commenting on the reliability of India’s BMD, Sharma is of the opinion, “there is little apprehension that the existing air defence set-up is formidable and presents an effective challenge to aerial attacks upon airbases and important installations in India.”⁶⁰ The present structure of India’s BMD is partially capable of protecting some important sites and

⁵⁶ Sharma, India’s Missile Defence Programme, 1-23.

⁵⁷ Ibid., 1-23.

⁵⁸ Unnithan, DRDO Readies Shield against Chinese ICBMs.

⁵⁹ “NATO offers Missile Defence Cooperation to India,” *The Hindu*, September 4, 2011, <http://www.thehindu.com/news/national/article2424128.ece>.

⁶⁰ Sharma, India’s Missile Defence Programme, 1-23.

silos and does not have the capacity to cover complete state or work as NMD. However, once fully functional, the deterrence stability within the region will be disturbed in favour of India. However, India feels that due to its BMD, Pakistan will not be able to effectively employ "First Use" posture to intimidate India.⁶¹ On the other hand, owing to vulnerabilities in India's BMD, its rivals are likely to exploit these and may even consider targeting population centres of India and other weak areas to break the will of India.

The electronic and radar coverage by India is leaned towards Pakistan's and China's borders and vulnerable elsewhere, implies that India is more vulnerable in Centre, South and East. This was identified by the Comptroller and Auditor General (CAG) of India in his report presented to Lok Sabha in 2008, "Indian Air Force (IAF) does not possess adequate number of surveillance radars needed for providing efficient and reliable detection capabilities for ensuring credible Air Defence."⁶² Atul Kumar Singh VSM, commenting on the CAG report, confirmed:

Though the deployment pattern based on threat perception has ensured adequate radar coverage on the Western borders and part of Northeast and East, yet a very large part of Indian airspace is bereft of adequate radar cover particularly so in the central India, southern peninsula, coast lines in the west as well as east.⁶³

Kumar also identified that there is an no coordination of efforts in civilian and military radars for radar coverage. Military-civil radar coordination and procurement of Airborne Early Warning and Control System (AWACS) will help India to plug in vulnerabilities towards east and south but India's main focus will remain towards its traditional adversaries Pakistan and China towards West, North and East, thereby, leaving opportunity open for exploitation elsewhere.⁶⁴

Manoj Joshi, debating the Defence Research and Development Organization (DRDO) willingness to deploy the BMD around Bombay and New Delhi, first questions the independent validity of the success of the missile tests conducted so far. Secondly, he raises doubts about the capability of Prithvi to engage a solid fuel intermediate missile from Pakistan and China, as Prithvi is liquid fuel, which is slow moving missiles in boost and terminal phase. He is of the opinion that Pakistan will

⁶¹ Pant, India Debates Missile Defense, 228–246.

⁶² Report of Comptroller and Auditor General of India, *Performance Audit Air Force and Navy, No. PA 5 of 2008*, presented in Lok Sabha on October 24, 2008, 25.

⁶³ Group Captain Atul Kumar Singh VSM, "Deficiency in Air Defence Radar Cover: The CAG Report 2007-08," *Centre of Airpower Studies*, accessed October 31, 2018, www.aerospaceindia.org/.../2008/10%20December%202008%20-

⁶⁴ Ibid.

respond to India's BMD by increasing the number of nuclear capable missiles. He also questions the DRDO claim by enquiring about the security of Kolkata, Bangalore, Hyderabad, Lucknow, and the rest of the country; once Bombay and New Delhi are protected under the shield.⁶⁵

The next issue relates to the capability of India's BMD to provide an effective shield. During the PAD test in 2009, the interceptor was able to engage the incoming missile at an altitude of 75 kilometres,⁶⁶ which means that incoming missiles will be engaged in the endo-atmospheric stage, or in the terminal stage. This is generally believed, that interception at this stage may prevent nuclear explosion but will not guarantee a fool proof protection from the radiations or shock effects.

Another issue relates to effectiveness of BMD to intercept cruise missiles. These can be effectively used against land and sea targets from all the varieties of platform i.e. land, sea, and air.⁶⁷ The two basic categories of cruise missiles include anti-ship and land-attack⁶⁸ with ranges varying between 25 kilometres for French Exocet and 2200 kilometres for Russian cruise missile. The Russian Cruise Missile AS-15 Kent is capable of carrying 200 kiloton nuclear warhead.⁶⁹ The basic difference between anti-ship and land-attack cruise missile lies in their mode of flight in which anti-ship works on heat-seeking sensors and radar and land-attack is equipped with the Global Positioning System GPS.⁷⁰ GPS permits cruise missile to follow the layout of terrain and hit the target with precision.

The latest series of Hatf-VII Babur has been tested by Pakistan. The missile has a range of 700 kilometres. The missile has similarity in characteristics with the US Tomahawk. India's BMD may not be able to achieve success against it due to its varied characteristics.⁷¹ Therefore, it may become difficult to counter a cruise missile or combined effect of ICBM and cruise missile from a country, which exists in geographical contiguity to India.

⁶⁵ Manoj Joshi, "Government Baffled over DRDO Chief's Claim on Missile Shield," *India Today*, July 18, 2012, <http://indiatoday.intoday.in/story/government-baffled-over-drdo-chief-claim-on-missile-shield/1/208850.html>.

⁶⁶ Sharma, *India's Missile Defence Programme*, 1-23.

⁶⁷ Jeff Kueter and Howard Kleinberg, "Cruise Missile Challenge: Designing a Defence against Asymmetrical Threats," (Washington: George C Marshall Institute, 2007), accessed October 23, 2019, <http://www.marshall.org/article.php?id=522>.

⁶⁸ Jeff Kueter and Howard Kleinberg, "Cruise Missile Challenge: Designing a Defence against Asymmetrical Threats."

⁶⁹ *Ibid.*

⁷⁰ *Ibid.*

⁷¹ Baqir Sajjad Syed, "Pakistan Successfully Test Fires Nuclear-Capable Cruise Missile," *Dawn*, October 28, 2011.

Another factor is the geographical proximity of India with its rivals, which may not permit India's BMD to fully operationalize itself to intercept the incoming missile. In case of Pakistan and India, both share a very long border, which makes India vulnerable to incoming missiles. If ICBM speed is calculated as 7km/sec, it will approximately take 5-7 minutes from Pakistan to reach farther locations in India like Andaman etc. Therefore, India is more vulnerable due its contiguity with regional rivals, Pakistan and China, whereas US enjoys insulation due to its geography. Thereby, it may not be operationally feasible for India to completely provide BMD cover to its mainland against missile threats emanating from both states and even if desire so to do it will be at an excessive cost. In addition, Indian Ocean an important sea route excessively used for trade and its accessibility to rival navies makes India's vulnerability more expounded to sea-launched ballistic missiles. Besides, long and contiguous border of India with China and Pakistan permits both to use innocuous and unconventional ways to offset India's BMD.

Analysing India's BMD from a technological standpoint, one can make a safe guess that India's BMD is nothing more than TMD. However, technical fusion with outside technologies, it may achieve Terminal High Altitude Area Defense (THAAD) capability to engage missile in exo-atmospheric phase. The inability of India's BMD to intercept target at longer ranges, increases the risk for India as terminal phase interception will have fallout of biological/chemical and nuclear weapons in the host country. The ideal situation to avoid fallout within own state is to carryout boost phase or midcourse interception. Laser, infrared, and satellite technologies provide an answer to achieving long distance interceptions. India tries to behave as a hegemon in the region and avoids political approach towards achieving sustainable security. It continues to build up its military resources in order to achieve the status of regional power. Particularly, present encouraging state of economy also provides it an opportunity to opt for arms race. In case of Pakistan, the best way for India is to engage it in an unnecessary arms race that would adversely impact its declining economy. Further, if India develops BMD and Pakistan does not, the deterrence threshold would be lowered and it may become difficult for Pakistan to effectively operationalize its 'First Use' nuclear doctrine. Moreover, it will not only allow India to strengthen its deterrence as compared to Pakistan but will also provide an opportunity for an offensive through conventional and nuclear strategies. Second, if Pakistan also looks towards developing a suitable BMD system, it will further stress it's state of economy. This double advantage to India will put an extra pressure on Pakistan, whereby it cannot put up matching response to India's designs by developing its own BMD. There are very scant options for Pakistan in the present strategic environment and it has to find its way out from the economic morass to meet the strategic challenges arising out of the Indian BMD. Therefore, strategic options for Pakistan to counter

India's BMD may generally be restricted to developing offensive strategies. Pakistan's range of options would include modernizing its space technology, focusing on its second-strike capability, MIRVs (Multiple Independent Targetable Re-entry Vehicles), developing cruise missiles, and looking at the geographical vulnerabilities of India.

Conclusion

BMD as a strategy is a hazy concept. On the one hand, it has an element of deception in its portrayal as a defensive strategy but it is inherently offensive, giving leverage to the one who deploys it against the rival state. This has divided the world between the BMD "haves" and "have-nots", giving impetus to the have-nots to devise strategies to counter the leverage enjoyed by the BMD-endowed states. US's deployment of BMD for its own protection against any imminent missile threats may have less impact on the global security as compared to the impact of the Washington's decision to extend the BMD system to its allies. In fact, it has the potential to destabilize and cause imbalance in the regional security and stability matrix amongst the regional competitors to the detriment of regional peace in the long run. A case in point is India's deployment of BMD which will have far-reaching negative impact on peace and stability in South Asia. Pakistan would be left with no other option but to look for offensive strategies to restore the balance in regional stability and security ranging from employing Hatf series of cruise missiles and MIRVs (Multiple Independent Targetable Re-entry Vehicles) to other more offensive options, especially geared at enhancing its second-strike capability. These will possibly trigger a renewed arms race in the region, despite resource constraints which are the hallmark of any developing economy like Pakistan. For India, it will be a costly affair as it will require a major overhaul and advancement in its space program to ensure an impeccable missile defence system, specially the one supported by capability of boost-phase interception of incoming missile. At the moment, certainly it remains a distant possibility.

