IDSA Occasional Paper No. 56

TRUMP'S OWN "STAR WARS"

The 2019 US BMD Review and What it Augurs for India?

A. VINOD KUMAR

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STUDIES & ANALYSES
रक्षा अध्ययन एवं विश्लेषण संस्थान

Cover Photograph: Raytheon Standard Missile-3.
Image Courtesy: NATO Photo Gallery

ISBN: 978-93-82169-91-8

First Published: November 2019

Price: 140/-

Published by: Institute for Defence Studies and Analyses
No.1, Development Enclave, Rao Tula Ram Marg,
Delhi Cantt., New Delhi - 110 010
Tel. (91-11) 2671-7983
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Cover &
Layout by: Vaijayanti Patankar

Printed at: KW Publishers Pvt Ltd
4676/21, First Floor, Ansari Road
Daryaganj, New Delhi 110002, India
Phone: +91 11 2326 3498 / 4352 8107
www.kwpub.com

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Section I

A Proactive Bmd Plan

John F. Kennedy's 1962 statement, "the greatest danger of all, would be to do nothing", served as the concluding quote for Patrick Shanahan, the then Acting[1] United States (US) Secretary of Defence, while unveiling the 2019 Ballistic Missile Defence Review (BMDR) at the Pentagon early this year.[2] But for those words borrowed from a Democrat President, everything else about the BMDR was typically Republican in tone and tenor.[3] Besides the fact that President Donald Trump's ballistic missile defence (BMD) plan was expected to be radically different from his predecessor's "austere" approach, the Pentagon ceremony was high on muscular sloganeering that was not just expressive of the Republican rooting for missile defences but went a step ahead in declaring their elevated standing in the American security architecture. While Trump proclaimed that the US system will be the "greatest BMD anywhere on the face of Earth", and will be more "lethal than what our enemies can do", the Acting Defense Secretary stretched the theatrics by warning adversaries that "we see what you are doing, we will take action".

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1 Mark Esper has since taken over as US Defense Secretary after Shanahan, reportedly, withdrew from the confirmation process to move into the full-time role. See "Esper Named New US Acting Defense Secretary after Shanahan Withdraws", *The Defense Post*, 18 June 2019, at https://thedefensepost.com/2019/06/18/us-mark-esper-defense-secretary-patrick-shanahan/ and Joe Gould and Leo Shane III, "Esper Confirmed as New Defense Secretary, Ending Pentagon Leadership Uncertainty", *Defense News*, 23 July 2019, at https://www.defensenews.com/news/Pentagon-congress/2019/07/23/esper-confirmed-as-new-defense-secretary-ending-pentagon-leadership-uncertainty/ (accessed in July 2019).

2 All statements attributed to Shanahan and Trump (unless otherwise quoted with citations) are based on the live telecast of the BMDR launch on the Pentagon website. For the YouTube version, see https://www.youtube.com/watch?v=J3F9OdU6JI4&t=434s (last accessed in November 2019).

3 Full text of the BMDR available at https://media.defense.gov/2019/Jan/17/2002080666/-1/-1/1/2019-MISSILE-DEFENSE-REVIEW.PDF (accessed in May 2019).

Beyond this rhetoric, a closer look at the Review reveals a policy plan for the US BMD which could be described as the most proactive one since the Strategic Defense Initiative (SDI) of 1983. Unlike Ronald Reagan's "Star Wars", which was a hyper-futuristic conception of large-scale deployment of laser weapons and sensors in outer space to "make nuclear weapons obsolete", Trump's BMDR is a more realistic vision that seeks to explore workable options to harness the space frontier, even while plugging gaps in the current US missile defence development trajectory.

While the space mission intends to expand the missile defence network's reach "beyond geography", the Review espouses a broader geostrategic vision by declaring the Indo-Pacific as a "priority region for improved coverage". This marks a major shift from the European frontline as the focal point to the East Asian hinterland where the flourishing Chinese and North Korea arsenals will be direct targets for the US BMD, likely to be deployed in newer forms and greater numbers in the region. The renewed emphasis on directed energy and the quest for a suitable boost-phase platform are the other key highlights of the BMDR, which also seeks a new operational paradigm by calling for greater offence–defence integration.

The 2019 BMDR has been portrayed as a logical progression to the proclamations of the *National Security Strategy* (NSS)[4] of 2017 and *Nuclear Posture Review* (NPR)[5] of 2018. Both documents talked about a robust, layered missile defence system to "limit the damage if deterrence fails" in a regional contingency and complement American nuclear forces. The significant shift in the BMDR is that unlike the NSS, which talked of reassuring Russia and China that the US BMD will not undermine strategic stability or disrupt their "longstanding strategic relationships", it clearly identifies Russia and China as the pivotal threats.

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4 For a text of the US NSS (December 2017), see https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf (accessed in May 2019).

5 Text of the US NPR (February 2018) at https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF (accessed in May 2019).

Section II

The Threat Matrix

The BMDR, in fact, illustrates a broader threat canvas: on the one hand, it reiterates the regional threats (North Korea and Iran) that have persisted for long and justified the BMD forays in the concerned regions so far; and on the other, it comes around to reinforcing the great power rivalries, with Russia and China being declared as the primary challengers. The Review is blunt in terming Russia as a revisionist rival with geopolitical ambitions, while China is portrayed as a competitor seeking to displace the US in the Indo-Pacific. The belligerent tone seems clearly driven by the alarm in Pentagon from the dramatic unveiling of a series of new-generation weaponry by Russian President Vladimir Putin in March 2018 (barely a month after the NPR).[6]

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[6] In his address to the Russian Federal Assembly in March 2018, Putin unveiled a series of strategic weapons which, he claimed, were "invincible" and could overwhelm the US missile defences. The presentation included a description and video-cum-graphical description of the following systems:

- Sarmat intercontinental missile to replace the Soviet-era Voevoda system. It weighs over 200 tonnes, has a short boost phase and is equipped with a broad range of nuclear warheads, including the hypersonic vehicle and Kinzhal air-launched missile.
- Avangard, a manoeuvrable hypersonic glide vehicle (HGV) with Mach 10 speed. Being nuclear powered enables it to have non-ballistic trajectories and practically no range restrictions.
- An unmanned, nuclear-armed submersible, known by various names (Status-6/Poseidon/Kanyon). Putin declared that this system will be an "entirely new sea-based means to deliver a nuclear weapon" and "simply nothing in the world will be capable of withstanding them".
- A nuclear-powered cruise missile that will be a low-flying stealth missile carrying a nuclear warhead, with a claimed speed of Mach 20, intercontinental range and unpredictable trajectory.

For more on Putin's presentation, see http://www.thedrive.com/the-war-zone/22270/russia-releases-videos-offering-an-unprecedented-look-at-its-six-new-super-weapons (accessed in May 2019).

Though the US security establishment was dismissive of Putin's demonstration then, the BMDR specifically puts the spotlight on American vulnerability, or lack of response, to the hypersonic glide vehicles (HGVs) flaunted by Russia (and being developed by China as well). Besides listing the current state of Russian offensive forces (700 deployed intercontinental ballistic missiles [ICBMs], sea-launched ballistic missiles [SLBMs], heavy bombers and 1,550 strategic nuclear warheads), the Review talks about Russia's duplicity in criticising US BMD and yet making substantial investments in its own missile defences. It describes how Russia maintains a long-standing and modernised strategic BMD system around Moscow, including 68 nuclear-armed interceptors, besides fielding multiple shorter-range, mobile theatre defences (S-300 and S-400).[7] Though no mention is made of the S-500, which Russia is known to be developing to match the US Ground-based Mid-course Defence System (GMDS), the Review underlines Russia's ongoing work on ground-launched and directed-energy anti-satellite (ASAT) for counter-space capabilities.

As for China, the Review describes its ever-expanding arsenal and strategic modernisation (75–100 ICBMs, new road-mobile and multi-warhead versions; 4 Jin-class SSBN; 12 new SLBMs; etc.) and talks of Chinese investments in HGVs and manoeuvrable re-entry vehicles (MaRVs). Also mentioned are the Chinese double standards on BMD, that is, of long opposing the US BMD (by terming it as outer space militarisation) even while pursuing its own expansive air and missile defence capabilities. The recent tests of a Chinese mid-course system, besides its acquisition of S-400s from Russia, find mention. The new dimension in the BMDR, interestingly, is its reference to North Korea and Iran also developing BMD capabilities, which essentially leaves out Pakistan as the only nuclear-armed state without its own BMD system. The Review claims that Iran is working on an indigenous BMD—Bavar-373—along with its S-300 deployment. Similarly, it speculates that North Korea is developing its own missile defence capabilities, with interceptors and radar systems having Russian attributes.

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[7] The apparent reference is to the A-35 Galosh with 300 kilometre (km) range, which was deployed in 1968 and maintained through the provision in the Anti-Ballistic Missile (ABM) Treaty of 1972. The mention of 68 interceptors could also include the A-135 architecture that includes the Gorgon system with 350 km range and Gazelle with 80 km range, both last tested in December 2006.

Section III

The New US BMD Mission

The design of the new BMD mission signifies a departure from the pacifist slant of Obama years, besides echoing the realisation in Washington that its arch-rivals are not just matching but also outsmarting it on new-generation technologies. Shanahan sported a brave face when explaining this concern: "We are not interested in keeping pacing with emerging threats; we want to outpace them. This requires not just defensive weapons, but a hosted of enabling technologies which will allow us to integrate the missile defence mission across our department (DoD)." The BMDR manifests this changed scenario in numerous ways, like: the shift of focus from regional threats to gaining a global imprint; the intent for offence–defence integration (recalibrating the overall deterrence posturing); as also the resolve to pursue new concepts and technologies (with implications for areas like boost-phase interception, laser kill vehicles and space systems).

Comprehensiveness

One of the highlights of Trump's BMD strategy is the pursuit of comprehensive missile defence capabilities alongside offence–defence integration. Comprehensiveness, as per the BMDR, is the pursuit of capabilities to "identify and exploit every practical opportunity to detect, disrupt and destroy a threatening missile, prior to and after its launch, and to maximize the combined missile defense effort." This conception, in fact, goes beyond the multilayer architecture and entails an expanded collaboration of defensive and offensive capabilities which could be operationalised right from the moment a missile threat originates. While "comprehensiveness" is defined as the "integration of *active* missile defenses with intelligence, surveillance and reconnaissance (ISR) and strike capabilities" (emphasis added), in concept, it connotes an unprecedented level of jointness through the seamless integration of these capabilities

with the existing air–missile defence framework.[8] In Shanahan's words, this implies the US BMD mission as now "stretching from the Missile Defence Agency to the space force and across the joint force".

In practice, however, the pursuit of comprehensive BMD capabilities entails fielding, maintaining and integrating three different forms of capabilities wherein the existing multilayer architecture forms only one component, which is the *active missile defence* (to intercept missiles in all phases of flight).[9] The other two components include *passive defence* and *attack operations*. While *passive defence* comprises investments to defend key bases and facilities, the introduction of *attack operations* is what adds novelty and a new dimension to the characterisation of missile defence in the US national security strategy.

The BMDR conceives of "attack operations" in two scenarios: (a) after the US BMD systems counter the "initial" missiles launched at the US forces, allies or partners, the American offensive forces will strike remaining adversary missiles before additional ones are launched; and (b) if deterrence fails and the US enters a regional conflict, "attacking adversary missiles prior to their launch would be part of ongoing combat operations". Such attack operations will locate, target and destroy mobile missiles prior to launch in order to "reduce the burden on U.S. active defenses for post-launch intercept". There are multiple connotations to these scenarios: (a) both seem conditioned towards a definitive usage of "attack operations" and a limited usage of missile defence; and (b) the reference to attack

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[8] The existing US air–missile defence operations are guided by the Joint Chiefs of Staff's Joint Integrated Air and Missile Defense (IAMD) Doctrine.

[9] The three phases of a missile's flight are boost, mid-course and terminal. The multilayer architecture envisages development and deployment of interception systems for all three phases, with the terminal and boost-phase interception addressed by endo-atmospheric (interception within Earth's atmosphere) system and the mid-course interception largely by exo-atmospheric (outside Earth's atmosphere) system, through some systems in the US BMD programme, like Theatre/Terminal High Altitude Area Defense (THAAD) and Aegis Standard Missile-3/6, that are able to do interception in the higher extents of endo-atmosphere and lower exo-atmosphere. For a detailed explanation of these concepts, see A. Vinod Kumar, *A Shield against the Bomb: Ballistic Missile Defence in a Nuclear Environment* (New Delhi: Vij Books, 2019).

operations using offensive forces in the event of deterrence failure, regional conflict or after a first-round interception by BMD systems inherently carries the tone of both "pre-emptive strike" as well as a "second strike", irrespective of whether the considered scenarios cover conventional or nuclear conflicts.

What I consider as a bigger implication, though, is the actual "restricted" role envisaged for missile defence in the BMDR. Between the lines, it is quite evident that the Pentagon sees the US BMD infrastructure as not potent enough to give a foolproof defence to the US homeland or allies from the colossal adversarial missile inventory scattered around the world. The BMDR infers that the role of BMD systems will be to counter "initial" adversarial missiles and leave the rest of the job to be finished by the offensive systems. Similarly, in the description of diverse roles of missile defence, the BMDR avers that if deterrence fails, missile defence should "limit" the number of missile warheads that strike their target.

If the Trump administration sees only a constrained role for US BMD, why then does the BMDR seem to make out an elevated standing for missile defence in US national security strategy? The answer lies in offence–defence integration and the deterrence value addition.

Offence–Defence Integration

Comprehensiveness is across-the-board integration, though offence–defence integration has greater meaning. As an operational practice, the BMDR points out, integrated BMD plans and force management are supposed to leverage the full range of assets that could enable global coordination and assist decision-making on interceptor choices for each contingency. While the Review pushes for the integration of homeland and regional missile defence assets, especially the infrastructure deployed overseas for early warning and tracking, the significant part of its emphasis is the integration of offensive and defensive forces, that is, of attack operations with active and passive missile defences. This seems clearly driven by a postural imperative—of not just employing missile defences alongside offensive forces, but also signalling a holistic deterrence posturing. Shanahan explains it aptly: "missile defence necessarily includes missile offence."

Overall Deterrence Impact

What could be the deterrence impact that the BMDR signals through offence–defence integration? I have, in recent years, tried to understand this correlation veering around two premises: whether the addition of defensive depth provides any net deterrence value to a nuclear-armed state; or whether the nuclear-armed state will seek to posture this depth along with its offensive forces. The offence–defence integration in Trump's BMDR is, in fact, advancement from these paradigms. Instead of providing defensive depth to offensive forces, the BMDR alludes to offensive strength being imparted to missile defences. In other words, missile defences become an integral part of combat operations and could be projected as a deterrence instrument. Yet, the Review also leaves imaginative space to determine whether Pentagon was carving out a "constrained" space for its BMD in US deterrence strategy or envisioning new scenarios sans a nuclear caricature.

Section IV

The Great "Technology" Quest

While the doctrinal space will provide for calibrations in tune with the strategic environment, the actual role and significance of missile defences come to play when the performance of the interception platforms and their kill capabilities are assessed, especially since none of the deployed systems is supposed to be providing foolproof interception as yet. Having led the world on baseline missile defence technologies and an archetypal multilayer architecture, it is worthwhile to examine how the US BMD programme is destined to be transformed by the Trump administration. At the BMDR unveiling, Trump was critical of his predecessor for holding back the programme with "self-imposed limits". Obama's 2010 BMDR had focused on realigning the spending by terminating immature technologies and unrealistic concepts, and instead funding only affordable and proven systems.[10] The programmes that Obama wound up—Multiple Kill Vehicle (MKV), Kinetic Energy Interceptor and Airborne Laser (ABL)—in fact, found notable mention or focus in Trump's BMDR.

The US BMD programme comprises of platforms and technologies that span the interception phases across the multilayer architecture, backed by a global array of sensors and related support systems. The 2019 BMDR addresses this technological spectrum through three sections: homeland defence; regional missile defence architectures; and new technologies and initiatives. While most of the existing and operational systems get a fillip,

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[10] Text of 2010 BMDR available at http://archive.defense.gov/bmdr/docs/BMDR%20as%20of%2026JAN10%200630_for%20web.pdf (accessed in June 2019).

the strain is clearly seen on finding solutions for the boost-phase and space-based interceptions.

Expanding the Multilayer Architecture

The GMDS, with its Ground-based Interceptor (GBI) and a network of globally dispersed radars (X-Band, Cobra Dane, etc.), is the flagship platform of the US BMD that is supposed to protect the homeland from ICBMs. Despite struggling in its developmental stages (with only 56 per cent successful interceptions), over 44 GBIs are already deployed (40 in Fort Greely, Alaska, and four in Vandenberg Air Force Base, California).[11] Reposing faith in the flagship programme, the BMDR declares the plan to gallop towards the original target of 64 GBIs, and thereafter increase capacity to greater (undisclosed) numbers. The Missile Defense Agency (MDA) considers Fort Greely as the ideal location for another 40 interceptors, though the immediate plan is to increase GBIs from 44 to 64 by 2023. While Vandenberg may continue to host lesser numbers of mobile GBI launchers, the promising vision for the GMDS is the identification of a new interceptor site (termed as CONUS) in the continental US, which, the Review claims, will add interception capability against potential missile threats to the homeland, including a future Iranian ICBM. The real objective, though, could be to defend the East Coast, especially against Russian systems, thus initiating a major shift from the existing focus of the GMDS on the West Coast.

The challenging aspect for the GMDS has always been its Exo-atmospheric Kill Vehicle (EKV), which took the blame for its unimpressive interception record. The MDA, under the Obama administration, had been working on the Capability Enhancement (IInd generation) EKV to spruce up the GBIs with additional investments of over $41 billion. This enhancement

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[11] For an overview of the interception record of US BMD systems, see http://missiledefenseadvocacy.org/missile-defense-systems-2/missile-defense-intercept-test-record/u-s-missile-defense-intercept-test-record/ (accessed in June 2019).

basically seeks to instil confidence in the GMDS, and the Review provides a further stimulus by announcing the Multi-Object Kill Vehicle (MOKV)—another programme conceptualised during the Obama years, but gaining major impetus under the Trump administration. The MOKV is a "next-generation kinetic kill vehicle" (KKV) for the GBIs which, as the nomenclature suggests, entails the placing of a number of kill vehicles on a single interceptor to simultaneously engage multiple targets, including warheads, decoys and countermeasures.

In short, MOKV could be seen as a BMD version of multiple independently targetable re-entry vehicles (MiRVs), which could attempt interception against all multi-payload platforms and enhance the kill probability of the GBIs. In fact, the concept of advanced KKVs has been a sustained pursuit, with the MOKV itself being an improvisation of the Advanced Technology Kill Vehicle (ATKV) programme of the SDI days.[12] In its current avatar, the MOKV is the second phase of the Common Kill Vehicle Technology programme, which sought to develop a redesigned kill vehicle for the GBI. An earlier attempt in this direction—the MKV programme—was terminated in 2009 despite proving the capability to "hover on own power and track surrogate targets".[13] While the MOKV, as a revamped version, will seek to destroy several objects within a threat complex, the Review makes few references on the actual status of this project.

The emphasis of the existing capabilities is on the operational systems, including the Theatre/Terminal High Altitude Area Defense (THAAD) system and the Aegis Standard Missile-3 (SM-3), both functioning as frontline BMD platforms for the US Army and Navy, respectively. Both the THAAD and SM-3 are advanced theatre defence systems that have the range to operate at the fringes of the Earth's atmosphere, and hence can undertake comprehensive endo-atmospheric interception roles as well

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[12] *Inside Missile Defence*, Vol. 21, No. 17, 19 August 2015.

[13] Ibid.

as stretch out into low-Earth exo-atmospheric missions.[14] Owing to their multiple and advanced role utilities, major investments continue to flow into their programmes. Currently, seven THAAD batteries are operational, including one each in Guam and South Korea. However, the BMDR sees the current THAAD capabilities as a bit outdated, being validated over two decades ago. Hence, the Review has instructed the army, Joint Staff and MDA to assess the number of batteries needed for worldwide deployment, implying greater presence of THAAD not just in the US and North Atlantic Treaty Organization (NATO) bases, but also as the platform that could replace the Patriot Advanced Capability (PAC) system as the frontline theatre defence system for strategic and non-alliance partners, including probably India as well.

The Aegis sea-based system, on the other hand, will continue to expand as the primary naval interception platform with augmentations done on the SM-3 (Block IIA) and the SM-6 interceptors. Currently numbering 38 operational multi-mission BMD-capable ships, the Aegis network will expand to over 60 platforms by end of 2023 by converting all Aegis-class destroyers to BMD-capable platforms. The SM-3 Block IIA, being co-developed with Japan, will form a regional missile defence architecture (largely East Asian deployment) and will complement the GMDS by forming a second-layer defence against global long-range missile threats (by its ability to move into oceanic frontlines, be it in East Asia, West Asia or Europe). In fact, the BMDR recommends the need to elevate the SM-3 Block IIA into a capability against ICBMs by 2020, thus making up for the shortcomings of the GBIs as well as harnessing its mobility to full extent, along with its land-based version.

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[14] An example was the SM-3 interception and destruction of a dysfunctional American satellite in February 2008. For more on this episode, see A. Vinod Kumar, "Satellite Interception: US BMD Survives Acid Test", *IDSA Strategic Comment*, 26 February 2008, at https://idsa.in/idsastrategiccomments/SatelliteInterception_AVKumar_260208 (accessed in June 2019).

The latter, Aegis Ashore, was the cynosure of all eyes in the Obama administration years as the anchor system under the European Phased Adaptive Approach (EPAA), which replaced the Bush administration's plan to deploy GBIs in East Europe.[15] The Aegis Ashore, in fact, was a unique improvisation that enabled a naval platform like SM-3 to be reconfigured for land-based deployment (at a site in Romania). Though truncated from the GBI range to SM-3 coverage, Aegis Ashore occupies a significant position in not just providing a frontline defence to NATO forces in Europe, ostensibly against what the BMDR terms as "Middle East missile threats" (read Iran), but also against medium-range Russian missiles that are deployed on the Eurasian fringes. The Ashore systems, in fact, will also host the advanced SM-3 Block IIA, much like the naval variants, thus increasing its prowess against a wide spectrum of missile threats that could challenge the European hinterland.

While the Ashore's European segment could be deemed as having consolidated in terms of initial operational deployment and steadily moving into its next phase (Poland), the new proclamation in the BMDR for the Ashore is the likelihood of an Aegis Ashore Test Centre in Kauai, Hawaii, with the additional objective of protecting "Hawaii against North Korean missile capabilities". Though this plan is still in the conceptualisation stage with the MDA and the US Navy mandated to evaluate its viability, observers

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[15] The Bush administration, in 2008, planned a GMDS deployment in Eastern Europe which included GBIs in Poland and a radar installation in the Czech Republic. Following opposition from Russia and China, both fearing negation of their nuclear deterrent with a defensive system in Europe, President Obama, who was elected to office in 2009, changed it to a truncated deployment plan termed as the EPAA. Instead of the GBI, the EPAA deployed the Aegis Ashore, a land version of Aegis SM-3, which was of lesser range than GBI, and hence sought to address Russian and Chinese concerns. As part of the EPAA, Turkey hosts a radar at Kürecik, while Romania stations an Aegis Ashore site at Deveselu Air Base. While Germany hosts a command centre at Ramstein Air Base, another Ashore site is slated to come up at the Redzikowo military base in Poland. For more details, see Fact Sheet, "The European Phased Adaptive Approach at a Glance", Arms Control Association, January 2019, at https://www.armscontrol.org/factsheets/Phasedadaptiveapproach (accessed in June 2019).

of the US BMD programme might see this as a deviation from the purported plans, or rather demands made in some quarters, for an Ashore deployment in Florida for the defence of the US East Coast. Having decided on a Hawaii deployment, an Ashore appearance on the mainland may not be far away. Similarly, besides the Europe theatre, Ashore will make its presence felt in East Asia as well, with Japan slated to field two systems by 2023, armed with the SM-3 Block IIA, for which Japan is a co-development partner.

The last one in this list of existing deployed systems, the PAC, as an improvement on the original Patriot system first deployed in 1982 and having seen action in the Gulf War of 1990s, has a proven combat record of theatre interception against short-range ballistic missiles (SRBMs) since 2003. The latest variant, called the Missile Segment Enhancement (MSE), comes with a more powerful rocket motor and larger fins for increased range and lethality. The system is operated by the US Army with a strength of 33 batteries under eight battalions to protect the US homeland, and another seven battalions with 27 batteries are being operated by allies, thus making it the largest deployed theatre defence system. The BMDR lists the PAC as part of the troika—including THAAD and SM-3—that will form what is termed as "surge missile defense capabilities", which implies a rapid deployment of these systems in conjunction to deal with a crisis situation or to strengthen the defence of the homeland against rogue missile threats. Thus, the PAC-3 will continue to be a mainstay for theatre defence and rapid deployment, though the reference to its role in "homeland" defence may sound puzzling considering that the PAC may not be apt to deal with faster and long-range transoceanic threats that can target the US territory, if at all any would.

The key component that makes the US BMD architecture capable and workable is the wide array of sensors and expansive radar network omnipresent around the globe. For example, the Sea-Based X-Band radar is a naval flotilla that undertakes a global maritime patrol against missile launches, with focus over the Pacific Ocean and Atlantic. This is complemented by the Early Warning (EW) radars in California, the United Kingdom (UK) and Greenland, the Cobra Dane radar in Alaska, etc., besides a network of launch detection satellites that enables the MDA to gain a global monitoring envelope to detect in real-time all forms of

missile threats. The BMDR talks about further upgrades to the EW radars, along with impetus for transportable radar systems, like the AN/TPY-2 used by the US Army and Navy as forward sensors due to their inherent capability to track all classes of missiles and identify small objects at long distances. In fact, the THAAD essentially relies on the AN/TPY-2 deployed in the Indo-Pacific and West Asia.

New Technologies and Capabilities

If Reagan's "Star Wars" was all about hyper-futuristic technologies touching the realms of science fiction, Trump's BMDR is about manifold efforts. On the one hand, it seeks to fill critical gaps in the US BMD programme through a recalibration of baseline technologies in domains that have been struggling for years, notably the pursuit of boost-phase interception capability. On the other hand, it also entails some new quests like space basing of interceptors (originally envisaged as Smart Rocks and Brilliant Pebbles in the SDI),[16] as also exploring the technological means to deal with emerging challenges like hypersonic missiles.

Shanahan explained this quest thus: "The BMDR calls for…interceptors to new kill vehicles and to improved coverage over priority regions like the Indo-Pacific. We are focused, at the same time, on new capabilities for new threats. This includes hypersonic systems, space-based sensor and directed energy for boost-phase missile intercept." This quest, Shanahan pointed out, will be pursued by utilising "existing defense systems and an increasing mix of advanced technologies, such as kinetic or directed-energy

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[16] The major emphasis of the SDI was on space-based interceptors (SBIs) for which concepts like Smart Rocks (garage satellites with multiple interceptors) and Brilliant Pebbles (constellation of smaller interceptor satellites) were envisioned. The SDI conceptualized a four-layered architecture called Strategic Defense System (SDS), consisting of ground-, sea-, space-based and airborne components, delineating the interception stages of a missile—boost, post-boost, mid-course and terminal phases—which continue to be the fulcrum of contemporary BMD architectures. For a detailed analysis of the SDS, see Sanford Lakoff, *Strategic Defense in the Nuclear Age* (Westport: Praeger Security International, 2008).

boost-phase defences, and other advanced systems." He added: "It is technically challenging but feasible over time, affordable, and a strategic imperative. It will require the examination and possible fielding of advanced technologies to provide greater efficiencies for U.S. active missile defense capabilities, including space-based sensors and boost-phase defence capabilities."

No Boost-Phase System Yet

The BMDR describes the significance of boost phase thus:

> intercepting offensive missiles in their boost-phase would increase the likelihood of successfully countering missile threats, complicating an aggressor's attack calculus by reducing its confidence in its missile attack planning, and reducing the number of midcourse or terminal active defense interceptors needed to destroy the adversary's remaining offensive missiles.

Observers of the US programme can recall the struggle that the MDA and its technology partners faced on the ABL programme, the only boost-phase interception system that came close ever to operationalisation. The ABL, comprising a laser weapon mounted on a redesigned Boeing-747 aircraft, also happened to be the world's first high-energy laser weapon on an aerial platform operating inside Earth's atmosphere.[17] The first ABL aircraft rolled out in October 2006, followed by many ground-based tests of the laser system before its integration on the test aircraft. The fate of the programme was dependent on the airborne laser system's ability to track, acquire and destroy a boosting missile. However, technical problems (a "jitter" issue) during the in-flight testing, along with the exorbitant cost

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[17] The system consisted of a chemical oxygen-iodine laser (COIL) mounted on a Boeing aircraft. The aircraft crew operated the laser at altitudes of around 40,000 feet by flying over friendly territory and scanning the horizon for the plumes of rising missiles. For more on the ABL functioning, see A. Vinod Kumar, "Airborne Laser Aircraft Rolls Out", *IDSA Strategic Comments*, 6 November 2006, https://idsa.in/idsastrategiccomments/AirborneLaserAircraftRollsOut_AVKumar_061106, (accessed in June 2019).

of the platform, led to President Obama scrapping the ABL programme in 2011.[18]

Trump's BMDR attempts to fill this significant gap through a revisiting of boost-phase concepts, including key elements of the ABL—namely, the use of directed energy from aerial platforms—besides also reviving the strategically perilous idea of space basing of directed-energy weapons to attain what could supposedly be the most effective boost-phase interception capability.[19] While the inability to identify a suitable boost-phase interceptor platform or programme has emerged as a glaring lacuna in the Review, it endorses a more potent problem—the vulnerability to cruise missiles of various hues, as also the concern that no defences of reliability could be developed so far against hypersonic threats. Hence, the BMDR bundles this spectrum of threats into a broad framework of interlaced capabilities, namely, directed energy, airborne platforms and space basing.

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[18] The COIL was tested in an in-flight weapon test in August 2009. While an airborne aircraft firing a high-power laser was in itself a challenging endeavour, there were other concerns as well, especially whether adequate laser energy can be generated to overcome atmospheric absorption and be focused on a small point to damage a missile. The 'jitter' on the bulky laser system when airborne was also a serious issue since even small vibrations can destabilise the laser weapon, which needs to focus a high-powered beam of light on a rapidly moving target and maintain the beam's intensity.

[19] Boost-phase interception happens in the first few second or minutes into the launch when the missile would have a slowly changing altitude and large infrared signature while clearing Earth's gravity and would be easily trackable. Though the ideal interception (and literally a pre-emptive) phase, the challenge is for technologies to be capable of intercepting a missile at source, which implies being physically close to the location of the rival launcher or even at a beyond-visual-range (BVR) distance that allows precision tracking and targeting. While the ABL was attempting the latter objective, the Aegis system, as a naval platform, is currently the only reliable system that can attempt such interception in early ascent of the boosting missile provided the deployment distance is within reach for the SM-3 to hit the adversarial missile. Deploying (directed energy) interceptors in space, thus, become the most suitable option for effective boost-phase interception, though the consensus against weaponisation of space has so far mitigated this eventuality, which may, however, not last long.

Directed-Energy Platforms

The BMDR talks about developing "scalable, efficient, and compact high energy laser technology, and integrating it onto an airborne platform" as a future cost-effective means of destroying boosting missiles. This is proposed to be done by leveraging technological advances already made in the ABL programme, though not specifying whether it entails a revival of the discarded ABL programme or a focus on the other laser platforms developed thereafter. As a matter of fact, a handful of newer airborne laser platforms were conceived by the Department of Defense (DoD) soon after the ABL was jettisoned; none of which, however, finds mention in the BMDR but for a Low-Power Laser Demonstrator. Interestingly, most of these directed-energy projects were initiated during the Obama administration by mandating the DoD to build upon the technological know-how anchored by the ABL experience. The notable change was their reincarnation as smaller and lighter laser weapon systems and as platforms customised for the three services.

The plethora of airborne laser weapon platforms progressing at various stages of development comes across as an impressive lot, and all the more a reason why their lack of any mention in the BMDR is surprising. The earliest inspiration drawn from the ABL was the integration of a smaller laser system on a tactical aircraft, the AC-130, with an intended fielding by 2020. Christened the High Energy Liquid Laser Area Defense System (HELLADS), the mission was to develop a 150 kilowatt (kW) laser system that will be ten times smaller and lighter than current lasers of similar power, enabling their easier integration on tactical aircraft to defend against ground threats.

In fact, the quest for "several viable laser architectures" was intended not just to develop smaller and lighter laser systems (at 30 kW and less), but also to shift from chemical to solid state and electric lasers that enable "simultaneous power and beam capability".[20] Consequently, various wings

[20] *Inside Missile Defence*, Vol. 21, No. 17, 19 August 2015.

of the US military have drawn customised plans for directed-energy systems. Boeing, for example, has been working with the US Army to create the High Energy Laser Mobile Demonstrator (HELMD)—a compact laser weapon system with 2 kW laser and 10–15 second kill duration—as a mobile platform to target combat-unmanned aerial vehicles (C-UAVs). Other ventures that are being pursued include lasers of 50–60 kW and kill within 2–3 seconds of launch. The US Navy, for its part, is working on the naval Laser Weapon System (LaWS), while the US Air Force has the Self-Protect High Energy Laser Demonstrator (SHiELD) programme, which will be a solid state, 10 kW high-energy laser weapon that will be integrated into a pod and installed in fighter aircraft by 2020.

Beyond this spectrum, the DoD is also exploring the scope for installing smaller laser systems on C-UAVs which could fly at high altitudes and perform boost-phase interceptions.[21] Estimating to cost over US$ 30 million, these long-endurance UAVs could fly above the clouds into the stratosphere and could undertake boost-phase interception within minutes of an enemy missile launch. The Global Hawk, which can fly at 60,000 feet, is being considered for this venture with the integration of a 50 kW fibre laser system. However, the possibility of being vulnerable to enemy air defences while operating in close proximity of the target is cited as a certain drawback for such programmes, though a C-UAV is unlikely to be seen as too precious an asset to be compromised in hostile situations.

The BMDR gives no indication whether these programmes are steadily progressing or whether they have been altered or abandoned in favour of other new concepts. That a sole reference has been made to the low-power laser as a demonstrator might be indicative of the fact that most of the above-mentioned ventures might either be at conceptualisation or capability demonstration stages and might be headed for approvals and funding in the months to come. At least that seems to be the direction the Review is pointing to with its announcement that the DoD is preparing a

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[21] *Inside Missile Defence*, Vol. 21, No. 5, 4 March 2015.

strategic road map for the development and fielding of directed-energy weapons and key enabling capabilities, and that it will lead to "high-energy laser investments" in the preparation of the President Budget Request for fiscal year (FY) 2020, implying that many of these projects might figure in the upcoming budgetary planning.

Space Basing of Interceptors

But for the journey of offensive missiles in their mid-course phase and the exo-atmospheric quest of the ASAT weapon for its target, outer space has largely been restricted to the deployment of satellites and space stations, many with inherent military applications.[22] Though the Prevention of an Arms Race in Outer Space (PAROS) treaty[23] is still in the works and the

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[22] Though one could be clear about what differentiates militarisation (use of space assets for military purposes) of space from weaponisation (actual deployment of weapon systems on outer space platforms), these classifications can often get into grey areas. In principle, the entry of a weapon system, be it a ballistic missile or a directed-energy weapon, could be seen as both militarisation and weaponisation of the space frontier, though many experts may not agree with the contention that the passage of an ICBM in its mid-course phase through outer space should be seen as a weaponisation process. Nonetheless, the targeting and destruction of an outer space asset with a weapon system carries the implicit connotation of weaponisation; and so would the deployment of "defensive" weapons in outer space platforms.

[23] Towards the end of 2000, the United Nations (UN) General Assembly had voted on a resolution called the "Prevention of Outer Space Arms Race". In October 2006, 166 nations voted for a resolution to prevent an arms race in outer space. While Israel abstained, the US voted against it. For a backgrounder on the Proposed Prevention of an Arms Race in Space (PAROS) Treaty, 29 September 2017, see https://www.nti.org/learn/treaties-and-regimes/proposed-prevention-arms-race-space-paros-treaty/ (accessed in June 2019). Also see Pericles Gasparini Alves, "Prevention of an Arms Race in Outer Space: A Guide to the Discussions in the Conference on Disarmament", UNIDIR/91/71, United Nations Institute for Disarmament Research, Geneva, at http://www.unidir.org/files/publications/pdfs/prevention-of-an-arms-race-in-outer-space-a-guide-to-the-discussions-in-the-cd-en-451.pdf (accessed in June 2019).

Outer Space Treaty[24] is confined to weapons of mass destruction, there continues to remain an unwritten consensus among the space powers against the placement of weapon systems in outer space. The US approach, however, has been peculiar for its assumptive commitment towards inhibiting weaponisation and arms race in outer space and yet seeking to keep it open for military uses (currently espoused as "counter-space"), not just to park its military satellites but also to deploy "defences" against nuclear-armed missiles.[25] In fact, the core of the SDI project was the placement of kinetic interceptors in space,[26] which, the US contended,

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[24] The UN Outer Space Treaty, which entered into force on 10 October 1967 through its formal nomenclature, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, provides the basic framework on international space law affirming that space should be reserved solely for peaceful uses. For a text of the treaty, see http://disarmament.un.org/treaties/t/outer_space/text (accessed in June 2019).

[25] A 2019 report by the US Defense Intelligence Agency (DIA) states: "while China and Russia are developing counterspace weapons systems, they are promoting agreements at the United Nations that limit weaponization of space. Their proposals do not address many space warfare capabilities, and they lack verification mechanisms, which provide room for China and Russia to continue to develop counterspace weapons." See DIA, "Challenges to Security in Space", January 2019, at https://www.dia.mil/Portals/27/Documents/News/Military%20Power%20Publications/Space_Threat_V14_020119_sm.pdf (accessed in June 2019).

[26] A significant part of KKV ventures—Brilliant Pebbles and Smart Rocks—were intended to raise space-based platforms for a mid-course and boost-phase interception. While Smart Rocks aimed at deploying huge satellite garages to host a large number of KKVs, Brilliant Pebbles relied on "singlets" or small, self-contained kinetic interceptors orbiting the space in large numbers. From an initial plan for a 4,000-strong constellation, the Brilliant Pebbles was to have over a lakh pebbles in outer space. The shift to Brilliant Pebbles came after a debate on the vulnerabilities associated with large satellite garages, which could be sitting ducks for ASAT systems. Smaller and autonomous interceptors were seen as a better option in terms of asset safety and costs. It was also felt that Brilliant Pebbles can be used for mid-course interception if backed by a constellation of low-orbit satellites, christened the "Brilliant Eyes". For a recent update on Brilliant Pebbles, see Henry F. Cooper, "Brilliant Pebbles is Affordable", *High Frontier*, 8 January 2019, at http://highfrontier.org/january-8-2019-brilliant-pebbles-is-affordable/ (accessed in June 2019).

could be deemed as a defensive action in outer space against this very threat. Though the imaginative concepts of SDI like Brilliant Pebbles and Smart Rocks never materialised, the belief that there could be space-based interceptors had continued to live on in the post-SDI missile defence missions.

Many of the SDI conceptions, like the Exo-atmospheric Re-entry Vehicle Interceptor System (ERIS) and the High Endo-atmospheric Defence Interceptor (HEDI), metamorphosed into present-day systems like the GBI and THAAD; yet, the suitable concept of a space-based interceptor, ideally based on a directed-energy platform, continues to evade the MDA and American defence industrial designers till date. As various post-Cold War administrations progressed on the multilayer BMD architecture, there has been increasing pressure from sections in the US scientific and military establishments to optimally exploit outer space for missile defence applications.[27] In fact, an independent group had, in 2009, recommended to the US government the revival of space-based interceptors of SDI era for a layered interception, along with a space test bed.[28]

The significance of space basing in Trump's BMD vision is articulated thus by Shanahan: "we refuse to be bound by geography. Our new space-based layer will give us persistent, timely global awareness. These capabilities will remove adversaries' ability to coerce us, or allies and partners." Apart

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[27] The 2006 US National Space Policy declared that the US will "preserve its rights, capabilities, and freedom of action in space; dissuade others from either impeding those rights; take those actions necessary to protect its space capabilities; and deny, if necessary, adversaries the use of space capabilities hostile to US national interests." In 2008, the Pentagon request for a billion-dollar space-based weapon programme with the Joint Chiefs of Staff calling for "full spectrum dominance" in space. See "Missile Defence: The First Sixty Years," *Missile Defence Agency Backgrounder*, 15 August 2008, www.mda.mil/mdalink/pdf/first60.pdf (last accessed in April 2012). Also see the 2010 US Space Policy, which has comparatively peaceful overtones, probably owing to the Obama Presidency, https://history.nasa.gov/national_space_policy_6-28-10.pdf, (accessed in June 2019).

[28] See Independent Working Group Report, *Missile Defence, Space Relationship, and the Twenty First Century* (Washington: The Institute for Foreign Policy Analysis, 2009), at http://www.ifpa.org/pdf/IWG2009.pdf (accessed in September 2016).

from the quest for a boost-phase interceptor and the persisting concerns over increasing spread of ASAT and co-orbital platforms, the urgency espoused by the BMDR for space basing could also be underlined by recent developments, notably the unleashing of an advanced strategic arsenal by Putin, as also the creeping concerns in DoD about the lack of suitable responses to emerging threats like HGVs. This bother comes out subtly in Shanahan's words: "For decades the US chose to lead the world in hypersonic research, and deliberately chose not to weaponise these systems. China and Russia have chosen differently."

The BMDR, in fact, envisions a multidimensional "space-based missile intercept layer" to deal with this wide threat/operational spectrum: on the one hand will be a "space defensive layer" that could enable an early operational capability for boost-phase defence; and on the other could be space basing of (apparently a new generation of) sensors that could provide large-area coverage from space "for improved tracking and targeting of advanced threats, including HGVs and hypersonic cruise missiles, which fly at lower altitudes than ballistic missiles and can manoeuvre throughout their trajectories to avoid radar coverages." Though it proclaims a potential space-based interceptor as the best option for boost phase, all the BMDR does at this moment is to mandate the "MDA [to] identify the most promising technologies, estimated cost and schedule for a possible space-based defensive layer...for boot-phase defense."

The (new-generation) sensors are supposed to be the frontline against adversarial hypersonic systems; the actual challenge for the MDA's "HGV defence programme", however, is to identify and develop the suitable interceptor platform against hypersonic threats. The BMDR betrays a sense of unease that none of the existing BMD systems, nor the newly emerging technologies and concepts, have held out a promising option to tackle HGVs. While there is a reference to "limited" capability "to defend against HGVs in the terminal phase", the current efforts clearly seem to be centred on new capabilities for "early warning and tracking of HGV", not yet on the interceptors. As in the case of boost-phase interception, the BMDR informs that the MDA has been assigned to identify resources for defence against hypersonic threats by leveraging the work taking place at the Defence Advanced Research Projects Agency and the US Air Force. It could be known in the coming days and months on what strategy the MDA could devise to address this mandate.

Tactical Aircraft as Interceptor

This is what could be termed as the "surprise package" of the BMDR—announcing the deployment of tactical fighter aircraft for missile defence applications. In this case, it will be the new generation F-35 Lightning II which will be deployed to track and destroy adversarial missiles. The role currently tailor-made for the aircraft is to intercept cruise missiles, which entails a significant operational challenge of a fighter aircraft pursuing another air-breathing threat. However, the promising role dimension for the F-35 will be to equip it in the near future with a new or modified interceptor (missile) which will be capable of shooting enemy missiles in their boost phase. Designating a tactical fighter aircraft to intercept missiles (supposedly the long-range ones) in their boost phase may sound ambitious considering the mismatch in firepower. Moreover, the greater reason for misplaced optimism could be the fact that an air-to-air/surface missile fired from an F-35, either from beyond-visual-range (BVR) or close proximity, will have to undertake the mission (of hitting the boosting missile) without being targeted by adversarial air defence.

In fact, this is not the first time that a manned fighter aircraft has been used for similar tasks. In the mid-1980s, the US had used an F-15 Eagle to shoot down a satellite and had invested substantially in using tactical aerial platforms for ASAT applications even while working on futuristic interception concepts as part of the SDI.[29] Though the post-Cold War

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[29] The first ASAT test firing from the F-15 aircraft was undertaken on 21 January 1984, but did not involve an actual target. The second test, dubbed 'Celestial Eagle Flight', undertaken on 13 September 1985 had the mission of destroying a redundant US military satellite (Solwind P78-1) at nearly 550 km (340 miles) over the Pacific. The ASM-135 missile was fired from the F-15 at an altitude of 12–14 km and travelled at 11,000 miles per hour (mph) to hit to the satellite (coming down at a speed of 17,000 mph) at the designated point outside the Earth's atmosphere. See Dario Leone, "The F-15 Satellite Killer and the ASM-135A ASAT Missile", The Aviation Geek Club, 21 January 2018, at https://theaviationgeekclub.com/f-15-satellite-killer-asm-135a-asat-missile/ (accessed in July 2019). For an analysis of the ASAT capabilities at that point of time, see Jasjit Singh, "Anti-Satellite Missile and Strategic Warfare", *Strategic Analysis*, November 1985.

momentum against space weaponisation might have temporarily slowed down advances in ASAT technologies for some years, the picture of a fighter aircraft surging vertically, nose-tipped towards the sky, and firing a missile into outer space continues to inspire interceptor conceptions as much as the missile defence systems.[30] However, deploying an aircraft platform for boost phase could a different game altogether, as mentioned earlier, though the MDA seems to be geared towards this task with its new-generation fighter aircraft platforms.

In fact, the BMDR points out that the F-35 Lightning II has "a capable sensor system that can detect the infrared signature of a boosting missile and its computers can identify the threatening missile's location...transmit tracking data to the Joint Force for network centric warfighting." As indicated earlier, the MDA sees the F-35 as currently competent to tackle cruise missiles, but it certainly needs to be equipped with "a new or modified interceptor" to take on ballistic missiles in their boost phase in the near future. More importantly, the MDA positions the F-35 as an active defence utility that could be surged to hotspots in a crisis or conflict situation and used in attack operations by complementing other BMD forces that will be targeting enemy missiles in their boost phase. However, these plans also continue to be at premature stages as, like in the case of space-basing and directed-energy projects, the MDA and US Air Force have been mandated to study this integration of the F-35 "into the BMDS for both regional and homeland defense".

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[30] According to reports, Russia also has been working on converting its advanced MiG-31D/S (armed with Fakel 79M6/95M6 missiles) into an ASAT platform, replicating the American F-15 example. See Kyle Mizokami, "Russia's MiG-31 Spotted with Possible Anti-Satellite Missile", *Popular Mechanics*, 1 October 2018, at https://www.popularmechanics.com/military/weapons/a23549729/russias-mig-31-spotted-with-possible-anti-satellite-missile/ (accessed in July 2019).

Section V

Regional Partnerships

The US BMD architecture is now an important component in the global security partnerships that Washington has built around the world, spanning almost all the continents. American systems play a key role in the interoperable NATO active missile defence system, with the EPAA emerging as the pivot of European defence against adversarial missile systems from other parts of Eurasia. The EPAA, now moving into Phase 3, has become a role model on how a sea-based system can be effectively converted into a land-based platform, which, incidentally, had raised demands for a similar facility in the US mainland. The European theatre also saw recent action when Spain, Italy, Germany and the Netherlands deployed BMD systems in Turkey to support the US action in Syria. Of course, Turkey's decision to buy S-400 and Washington's belated attempt to block that sale by offering PAC-3 to Ankara has also influenced European BMD dynamics.[31]

On the East Asian front, American BMD systems, ranging from PAC-3 to THAAD and Aegis, have been deployed in greater numbers in Japan and South Korea in recent years. Japan's role as a co-development partner has enabled partnership in the development of SM-6 and upgradation of SM-3 to a Block IIA version. American systems are also finding greater presence in the Middle East. The United Arab Emirates (UAE) had recently procured THAAD systems to complement its existing PAC inventory, while Kuwait, Qatar and Saudi Arabia (the last two being regional rivals) recently became PAC customers, which has, in turn, enabled major American

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[31] For analyses on this issue, see Burak Bekdil, "Turkey's Bizarre Approach to Missile Defense", BESA, 22 January 2019, at https://besacenter.org/perspectives-papers/turkey-missile-defense/ (accessed in July 2019) and Debalina Ghoshal, "Why did Turkey Choose the S-400?", *Defence IQ*, 15 October 2018, at https://www.defenceiq.com/air-land-and-sea-defence-services/news/will-turkey-buy-the-patriot-system (accessed in July 2019).

role in the Gulf Cooperation Council (GCC) air and missile defence architecture. Washington's all-weather partnership with Israel has seen their co-development effort on the Arrow system now advancing to the Arrow-3 system. Besides a recent infusion of American funds worth $500 million into the Israeli BMD programmes, the US co-development-cum-production role has now expanded to existing Israeli mainstays like David's Sling and the Iron Dome programme.

India and the US BMD

A major highlight of the BMDR when it comes to regional partnerships is the reference to Indo-Pacific, a region which has seen substantial action and transformation since the previous BMDR in 2010, almost the same time when the Obama administration made the initial description of "Indo-Pacific" in its strategic expositions. While Indo-Pacific is already a focal point for the US BMD architecture with the presence of American interception platforms in East Asia and Australia, the key feature of this regional identification in the BMDR is the reference, for the first time, to India. The BMDR singles out the "emerging security relationship" with India as a key element of its security and diplomacy in Indo-Pacific. Citing a reference in the 2017 NSS, which states that "we will deepen our strategic partnership with India and support its leadership role in Indian Ocean security and throughout the broader region", the BMDR confirms that the US has discussed potential missile defence cooperation with India as a "natural outgrowth of India's status as a Major Defense Partner and key element of our Indo-Pacific Strategy".

It is unknown whether an India–US dialogue on missile defence, as pointed out by the BMDR, has taken place in recent times or is still ongoing. As a matter of fact, the India–US Next Step in Strategic Partnership (NSSP) of 2004 had called for a dialogue on missile defences, along with expanded cooperation in three core areas, namely, civilian nuclear activities, the space programme and high-technology trade.[32] While various avenues for the partnership were charted for the other areas (particularly the India–US

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[32] See US–India Joint Statement on NSSP, 17 September 2004, at https://2001-2009.state.gov/r/pa/prs/ps/2004/36290.htm (accessed in July 2019).

nuclear deal), no notable progress was publicly known to have been made on the missile defence spectrum despite channels of dialogue open between both sides.[33] The impression that came from various reports and statements was that India's Defence Research Development Organisation (DRDO) had convinced the government about its ability to develop an indigenous missile defence shield through interception platforms for point and area defence. There were also reports that the Indian demand for purchase of Arrow-2 from Israel was rejected by the US, a co-developer of the system, and was, in turn, offered the PAC-2.[34] However, documents of the US government, made available through Wikileaks, reveal that a steady flow of communications happened on this subject during some years in the previous decade when India was mulling options to raise a missile defence shield of its own. I summarise, next, these conversations to shed light on what transpired, seeking to know why the partnership did not take off.

Letter from Foreign Secretary, December 2004

At the far end of the year in which the NSSP was signed, probably the first formal correspondence regarding BMD cooperation was initiated from the Indian side when the Indian Foreign Secretary, Shyam Saran, wrote to US Undersecretary of State for Political Affairs, Marc Grossman, on 8 December, requesting a classified briefing on Patriot PAC-2 missile system.[35] It is evident from this letter that the momentum towards this end was generated at the US–India Strategic Stability Dialogue (reference

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[33] A Ministry of External Affairs (MEA) media release of July 2005 mentions about enhanced cooperation in missile defence, but does not detail where it has happened. See "India and United States Successfully Complete Next Steps in Strategic Partnership", MEA Media Centre, 18 July 2005, at https://www.mea.gov.in/bilateral-documents.htm?dtl/6789/India+and+United+States+Successfully+Complete+Next+Steps+in+ Strategic+Partnership (accessed in July 2019).

[34] See "The Argument against Sale of Arrow to India", *Rediff*, 6 September 2003, at https://www.rediff.com/news/2003/sep/06arrow.htm (accessed in July 2019).

[35] Wikileaks, "India Requests Patriot PAC-2 Classified Briefing", Telegram from Mulford, US Embassy, New Delhi (04NEWDELHI7754_a), *Public Library of US Diplomacy*, 8 December 2004, at https://wikileaks.org/plusd/cables/04NEWDELHI7754_a.html (accessed in July 2019).

telegram) a little earlier, and that Grossman had written in October offering India the opportunity to "purchase PAC-2 as part of the reciprocal steps contemplated in Phase 1 of NSSP". Saran's letter states that Indian experts are interested in a classified briefing on PAC-2 in order to evaluate the (Grossman's) proposal and thus move forward on the strategic dialogue and head to NSSP-II. The telegram from the US Ambassador India, (David) Mulford, in which Saran's letter is appended, seeks "DTSA's assistance in scheduling a classified briefing as early as possible in 2005" and opines that Saran's letter reflects the "GOI conclusion that deeper US–India collaboration in this areas [*sic*] would help strengthen our new partnership and advance India's security interests".[36]

First Briefing on PAC-2, 22 February 2005

According to the telegram from the US Ambassador in Delhi, the Indian government had not just shown a keen interest in procurement of the PAC-2 during that first briefing in February but also indicated an interest in technology sharing to include collaboration and joint production.[37] Emphasising this point, Gautam Mukhopadhaya, Joint Secretary in Ministry of Defence (MoD) and head of the Indian delegation, termed the briefing as indication of both sides stepping into more advanced areas of defence technology not limited to procurement but also joint development, while Ed Ross, the head of US delegation and Director of Defense Security Cooperation Agency (DSCA), pointed out that PAC-2 is given only to "our closest friends". During the briefing, Meera Shankar, the Additional Secretary in Ministry of External Affairs (MEA), and S. Jaishankar, Joint Secretary (Americas), tried to impress upon the Americans that India was at a very early stage in its "thought process" on missile defence and was still in the process of conceptualising whether it will pursue BMD, and if so, what would be the type and elements of the system it will seek.

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[36] Ibid.

[37] Wikileaks, "India Seeks Technical Cooperation Agreement on Missile Defence", Telegram from Mulford, US Embassy, New Delhi (05NEWDELHI1783_a), *Public Library of US Diplomacy*, 8 March 2005, at https://wikileaks.org/plusd/cables/05NEWDELHI1783_a.html (accessed in July 2019).

Besides the PAC briefing, the highlight of this interaction was the MEA officials telling the US delegation that the Indian government desired a missile defence collaboration agreement or a technology partnership similar to memorandums of understanding (MoUs) the US had with other allies, including full collaboration and industrial participation. Shankar pointed out that a consensus was yet to evolve in the direction the Indian BMD system should take and hence, technological collaboration could be an option the Government of India (GoI) could pursue. While many aspects of PAC-2 and PAC-3, particularly its performance parameters in the Persian Gulf War, were raised by the Indian side, Shankar was more forthcoming in affirming that India has an interest in PAC-3, instead of PAC-2, which the Americans were more keen to offer.

Ross tried to cushion this by stating that PAC-2 sold to India will be solely for India's use and not as part of the US' overarching missile defence programme. Explaining that PAC batteries were a mix of PAC-2 and PAC-3, Ross insisted that Ground Configuration-3, common for both interceptors, was the core of Patriot system.[38] Ross also opined that the Foreign Military Sales (FMS) will be the ideal route for India to procure PAC systems. He highlighted the differences and advantages of the FMS over direct commercial sales: the FMS enables engagement of the US government from earliest stages; guarantees lifetime system support; and facilitates a purchase price that will be at the same cost available to the US forces. More importantly, Ross pointed out that the FMS "fosters a strong working relationship, which can facilitate the acquisition of other sensitive technologies".

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[38] While Major John Eggert, US Army Staff, briefed about the Patriot Configuration-3 Ground system and the PAC-2 Guidance Enhanced Missile Plus (GEM+) missile, Phil Jamison, OSD/ISP Assistant for Missile Defence Policy, outlined the US approach to missile defence, and also noted that the addition of missile defence to the US defence posture has lessened dependence on nuclear forces for protection.

Shankar and Jaishankar then elaborated on the political dimensions and objectives envisaged within the GoI from this capability. While Shankar explained that BMD was seen as a concept that could strengthen India's nuclear posture of "No First Use", Jaishankar asserted that India brought some Cold War prejudices to its BMD considerations, also pointing out that many commentators in India saw BMD as "adding to the uncertainties" of those who might launch nuclear weapons. Jim Alverson, NESA India Director, concluded the briefing by stating that future BMD dialogue would continue in accordance with NSSP, while Shankar noted India's interest in the Roving Sands BMD exercise at the end of March and a planning meeting on the exercise with MDA in the first week of March.

Missile Defence Working Group Meeting, March 2005

The US–India Missile Defence Workshop was hosted at Research Centre Imarat (RCI), a top-secret missile facility of the DRDO in Hyderabad, on 3–4 March 2005.[39] At the meeting, Meera Shankar reiterated India's desire for a cooperative technology relationship for the long term and emphasised that GoI will like to formulate its overall missile defence strategic objectives in cooperation with the US government, which, in fact, was a major assertion of India's policy at that point of time when India–US relations were metamorphosing into a new level of convergence in the post-Cold War and post-Pokhran strategic milieu. Shankar also pointed out GoI's assessment that BMD could help India maintain a credible "No First Use" nuclear posture, neutralise "nuclear blackmail" and stabilise India's security affected by an "arc of proliferators".

Probably pointing to the NSSP mandate, Shankar affirmed that there was a political commitment for both countries to advance BMD cooperation, which, in fact, locks India's obligation to partner with the US on this front.

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[39] Wikileaks, "India Wants High Fidelity Missile Defence Exercises", Telegram from Mulford, US Embassy, New Delhi (05NEWDELHI1938_a), *Public Library of US Diplomacy*, 14 March 2005, at https://wikileaks.org/plusd/cables/05NEWDELHI1938_a.html (accessed in July 2019).

To further this point, Shankar highlighted the fact that India was among the first countries to recognise and support the US missile defence proposals, seemingly pointing to the response by the then Prime Minister (PM) Vajpayee, who welcomed President George W. Bush's speech at National Defence University in May 2001, wherein he announced the new BMD plans.[40] The excitement of the emerging camaraderie was palpable when Shankar went on to declare that besides the PAC, India may even be interested in other US BMD systems, including THAAD and Medium Extended Air Defense System (MEADS), howsoever premature such a declaration could seem at that point of time.

A.S. Sarma, RCI, DRDO, presented a classified briefing on GoI's assessment of the missile threat to India, which included threat rings from existing ballistic threats in the region and those still evolving. The briefing revealed that the threat constitutes not just from a single sector, but could include "coordinated, simultaneous attacks from 360 degrees with multiple objects", palpably indicating the threats from two nuclear-armed rivals in the neighbourhood. A separate briefing followed, with the DRDO's N. Prabhakar—who later went on to head the indigenous BMD development programme—presenting a "wish list" for cooperative US–India BMD modelling and simulation exercises. The Indian side also offered to make DRDO experts available for a collaborative effort with the US to develop advanced BMD system modelling and simulation software.[41]

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[40] Though Shankar lists the Indian response as welcoming of US BMD plans, the actual context then of PM Vajpayee's response was supposed to be the endorsement of Bush's declaration of breaking from the "adversarial legacy of the Cold War". See text of "President Bush's Speech on Missile Defense, May 1, 2001", at https://fas.org/nuke/control/abmt/news/010501bush.html (accessed in July 2019).

[41] The Indian side pointed out that its expertise are in four areas, namely, system analysis, modelling and simulation, planning and control, and software development, and indicated that "if the US wants India to do (future) hardware and software development, that could be used with 'others', India wants to do it." See n. 39.

In fact, the Embassy telegram on this working group meeting noted a large gap between the Indian and US conceptions on how the modelling and simulation exercises should be undertaken. While the Indian side hoped for "very high-fidelity simulation of actual threats and actual BMD options against a variety of attack scenarios that could generate hard data for use in strategic and acquisition planning", the US side recommended a lower fidelity and realistic plan to exercise decision-making at policy and operational (air defence commanders) levels during a missile attack. Eventually, the Indian delegation agreed to a PLANEX/CPX exercise scheme, with PLANEX designed under two sections, one involving stand-alone BMD and the other incorporating EW sensors and upper-tier BMD systems, besides simulation of geography relevant to India and also a wide threat spectrum, including land and sea-based multi-direction ballistic threats. The Indian side decided to plan on CPX after looking at the PLANEX experience in the December 2005 exercise.

The Embassy telegram also noted, with palpable disappointment, that the Indian briefing lacked explicit references to indigenous BMD production, specific categories of assets that India might like to defend against a missile attack or co-production of BMD system hardware with the US. Mulford, though, mentioned that V.K. Saraswat, Chief Controller, DRDO, hinted in a private conversation with Jamison, a member of the US delegation, that "such cooperation might be a desirable long term goal". Shankar too echoed this sentiment when she, in her concluding remarks, affirmed her hope that the US–India missile defence cooperation would go well beyond the proposed PLANEX and CPX exercises. While the US delegation suggested that the GoI could redefine its requirements and put a new request to the US government, Jamison proposed scope for another forum to discuss missile defence policy–programme issues to parallel other political–military technical discussions.

The Embassy telegram, in its assessment, commented that questions raised by Indian side, issues like MoU, next-generation BMDS, availability of sensor and tracking data to friends and allies, all pointed to the GoI's desire for extensive US–India cooperation on BMD systems on the lines of US–Japan partnership. It further added that the Indian delegation gave the impression of being willing to devote sufficient resources for BMD and become a significant player, even though Indian strategic thinking on

this area was in its infancy as yet. The telegram, however, noted that Saraswat had mentioned about DRDO being on cutting edge of strategic and acquisition planning with its data available to policymakers—an indication that the DRDO thinking on BMD was also progressing at its own steady pace. Finally, the Embassy felt that the hosting of this exchange at the most sensitive Indian missile research facility (RCI) was a reflection of "the deepening candour in US–India MD relationship".

US–India BMD Planning Exercise, January 2006

The PLANEX was held from 11 to 12 January 2006 at RCI, Hyderabad, with four simulations of BMD deployment as response to regional threat scenarios, which were provided by the Disarmament and International Security Affairs (DISA) division of MEA, along with details like type of missiles, and their trajectories, and location of launch sites. The telegram from the US Embassy in Delhi, on 17 January 2006, quoted the Joint National Integration Center (JNIC) of MDA opining that the exercise had an unprecedented level of involvement from a partner country in developing the programme, which, in fact, reflected the intense discussions of the March 2005 workshop.[42] The simulations tested missile threats of short, medium and long range from a neighbouring country in a proliferated environment.

The telegram noted that the successful simulations, which saw lively discussions on virtual threat depictions, missile defence designs and operational challenges, "paves the way for more ambitious cooperation including in command-and-control systems and BMD acquisitions from the US." The American optimism was also shared by Saraswat, who, according to the telegram, encouraged both sides to launch the next phase of missile defence cooperation, thus indicating that the India side was inclined towards acquiring the American BMD systems. Naveen Srivastava

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[42] Wikileaks, "Success of US–India Missile Defence PLANEX Calls for Way Forward", Telegram from Mulford, US Embassy, New Delhi (06NEWDELHI318_a), *Public Library of US Diplomacy*, 17 January 2006, at https://wikileaks.org/plusd/cables/06NEWDELHI318_a.html (accessed in July 2019).

of MEA, in fact, suggested the need for a new framework that will allow Saraswat (DRDO) and JNIC to proceed on cooperative activities. The US side proposed three parallel paths for collaboration to happen: the first involving planning for the exercises; the second being a framework for additional collaborative activities, including joint research and development (R&D); and the third for the US government to respond positively if the GoI decides on the acquisition of PAC-3.

Meeting in Hyderabad, August 2006

The 31 August 2006 meeting seemed like an exchange where the Indian side had to present their work and both sides had to decide on future collaborative forums. V.K. Saraswat of DRDO gave a presentation, which, the telegram from Ambassador Mulford stated, "revealed nothing about India's current MD capabilities".[43] The telegram underlined a palpable disappointment that DRDO was yet to reveal any details about India's BMD capabilities as the official delegation continued to maintain that it had none, or was unwilling to share, even while seeking to pursue R&D cooperation with the US. This was a crucial aspect that resonated in the Embassy correspondences as India maintained a discreet silence about its BMD programme and continued to insist that it was still in the process of deciding its options. However, around the time of these interactions, the indigenous BMD programme of the DRDO was seemingly progressing at an advanced stage, with the DRDO undertaking its first development tests by the end of the same year.[44]

In fact, Saraswat, in his presentation, "admitted" to the US delegation that India had not gone beyond the R&D stage in BMD capability and that

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[43] Wikileaks, "Progress on Missile Defence Cooperation with GOI; Political rather than Technical Benefits for U.S.", Telegram from Mulford, US Embassy, New Delhi (06NEWDELHI6086_a), *Public Library of US Diplomacy*, 31 August 2006, at https://wikileaks.org/plusd/cables/06NEWDELHI6086_a.html (accessed in July 2019).

[44] The first development test of the Prithvi Air Defence (PAD) system was undertaken in November 2006, and had a successful interception.

most progress was in software support. The Embassy telegram noted that with the Indians having affirmed this repeatedly, any technological cooperation will be one-sided and "only to their (India's) benefit", and that the US can at best benefit from "their software development for MD". While the telegram did not state whether the MDA team had made any assessment of the software capabilities, it made a profound remark that "any advantage we may gain is limited to political goodwill with the GoI". Nonetheless, the MEA representative, Naveen Srivastava, is quoted as stating that "India looks forward to opportunities for more cooperation in the future."

Thus, what comes out in the Indian approach is an unobtrusive attempt to gain maximum information, while keeping its own actual plans and capabilities under wraps. This aspect again comes to the fore, even if subtly, with the Indian delegation's insistence on keeping the dialogue restricted to the technical level and reluctance to bring in policy-level participants. Interestingly, Srivastava, who was the representative from the policy establishment, supported this expression by Saraswat, though the US delegation was disappointed with this approach as they entertained hopes of an early Indian decision on the PAC. The Embassy felt that the suggestion to hold another exercise in Hyderabad instead of New Delhi illustrated this palpable "attempt to distance themselves physically from policy-level participation". This was also an indication of the thinking in the Indian establishment of restricting such dialogue to technical discussions and not rushing to policy decisions.

In fact, the telegram highlighted the repeated probing questions from the Indian side on US–Japanese BMD cooperation and the technical aspects of the SM-3 missile, which was being deployed by the Japanese. The Embassy saw these queries as symbolising the Indian desire to "play at that level". The exercise, eventually, concluded with the Indian side committing to participate in the multinational BMD conference in London in September that year, and also send delegates to Colorado Spring to finalise planning for the SIMEX (Simulation Exercise) scheduled for December. Interestingly, Saraswat insisted that Hyderabad was the ideal place for SIMEX owing to "security reasons".

Mukherjee's Statement(s) Raises Doubts on Partnership, 2005 and 2007

It was becoming somewhat discerning to the American Embassy in New Delhi, after the 31 August meeting, that the Indians may not rush into a PAC purchase and may use the technical discussions to enrich their decision-making process and delve deeper into the options that might be available at their disposal. It is in this context that the statement by the then Defence Minister, Pranab Mukherjee, on 24 October 2007, as a response to questions from the media after a trilateral meeting in Harbin, China, perturbed the US security establishment. While the published cables do not include any report from the Embassy on the interactions after the PLANEX and SIMEX, Mukherjee dismissing the idea that India was to join a US-led missile defence system as "groundless" was prominently reported by the US Embassy in Delhi to the State Department.[45] Mukherjee, according to the telegram, went on to add that the foreign ministers had not discussed missile defence at the Harbin trilateral and that "India does not take part in such military arrangements".[46]

The statement fuelled anxiety in the US government for two palpable reasons. One was the prominent number of press reports in Delhi signalling an "abrupt" shift away from the US on missile defence. The MEA officials, according to the telegram, tried to reassure the Embassy that Mukherjee's statement did not imply that India was not interested in continuing to cooperate with the US on missile defence technology. The comment in Harbin "cannot be interpreted as a deviation from the status quo of current US–India MD cooperation", Amandeep Singh Gill, Director (DISA), was quoted as assuring, while also confirming that there had been no change in the "current level of bilateral missile defence cooperation". The

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[45] Wikileaks, "MEA Insists Indian Policy on U.S.-led Missile Defence has Not Changed", Telegram from Mulford, US Embassy, New Delhi (07NEWDELHI4767_a), *Public Library of US Diplomacy*, 29 October 2007, at https://wikileaks.org/plusd/cables/07NEWDELHI4767_a.html (accessed in July 2019).

[46] The reference was to the foreign ministers of India, Russia and China, who had met at Harbin for their third 'Troika' meeting.

telegram also stated that the Indian officials felt that the national press misconstrued Mukherjee's comments as they "failed to distinguish between the missile defence system discussed between the US and Russia, and the more generalized cooperation on MD agreed to by the US and India in the 2005 Defence Framework".

The second reason was an earlier statement by Mukherjee in July 2005, when, during a debate in the Indian Parliament on the India–US New Defence Framework Agreement, he categorically stated that "there is no question of accepting a missile shield from anyone" and that India is interested "in developing our own missile programme and we are doing that".[47] Though palpably puzzled then, the US Embassy in its July 2005 telegram had, however, noted that Mukherjee, despite this assertion, did not rule out collaboration with the US.[48] Having declared that India was already developing its own "missile programme", the minister, according to this telegram, explained to the Parliament then that "there were critical gaps in India's integrated guided missile defence programme" and that New Delhi would only accept critical US inputs that bridged the deficiency.[49] The telegram highlighted Mukherjee remarking that "if we don't get them, fine", which, the Embassy felt, was an indication that India would explore other avenues, including indigenous development or procurement from other sources, if the US inputs did not materialise.

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47 See "India Rules Out Accepting US Missile Defence System", *AFP* (New Delhi), 5 July 2005.

48 Wikileaks, "PM and DEFMIN Scoff at Leftist Criticism of U.S. Defense Ties; We should, too", Telegram from Blake, US Embassy, New Delhi (05NEWDELHI5354_a), *Public Library of US Diplomacy*, 12 July 2005, at https://wikileaks.org/plusd/cables/05NEWDELHI5354_a.html (accessed in July 2019).

49 If the telegram quotes are verbatim, then there seemed a minor flaw in Mukherjee's description of India's "missile programme" and "integrated guided missile defence programme". Though political leaders tend to conflate various projects, the reference here seem to be the missile defence programme and the integrated guided missile development programme (IGMDP), the latter having heralded Indian indigenous missile inventory, including those of the Prithvi and Agni series, among others.

Mukherjee's statements in a gap of two years and the manner in which the US–India dialogue and interactions on missile defence had progressed during this period are illustrative of the dynamics that were shaping India's early missile defence decisions. Some of these telegrams also shed light on the trajectory of the Indian BMD quest in those initial, defining years. The October 2007 telegram pointed out that "exploratory talks" began in 2001, prompted by India's early welcoming of President Bush's speech (described in telegram as "call for the development of missile defenses").[50] The telegram added that it was President Bush who first proposed the possibility of exploring cooperation on missile defence with India during a May 2001 meeting with PM Vajpayee. Subsequently, officials from both sides discussed this idea in detail at the 2001 and 2002 US–India Defence Policy Group meetings, as a result of which the US Secretary of Defense, Donald Rumsfeld, and Mukherjee, as India's Defence Minister, agreed to expand collaboration relating to missile defence in the July 2005 US–India Defence Framework Agreement.

While this understanding that BMD collaboration could happen under the Defence Framework Agreement could be seen as a natural progression

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[50] In a statement of 2 May 2001 (and issued well before many US allies responded to Bush's speech), India's MEA "welcomed the announcement of unilateral reductions of nuclear forces, to move away from the hair-trigger alerts associated with prevailing nuclear orthodoxies, and to make a clean break from the adversarial legacy of the Cold War." Press Release issued by MEA in Washington, DC and New Delhi, 2 May 2001, at www.indianembassy.org/press_release/2001/may/may_02.htm (accessed in June 2008). A day after the above MEA statement, the ministry spokesperson was asked by the media at a briefing whether the statement "marked a shift from its earlier objections to Washington's National Missile Defence (NMD)". The spokesperson replied that "the Statement speaks for itself", and reiterated the key elements of the statement covering "unilateral reductions', "hair-trigger alerts" and "adversarial legacy of the Cold war". The other lines of the MEA statement were reiterated, none of which had any direct or latent reference to NMD or missile defence. See Transcript of the Press Briefing by the Official Spokesperson, 3 May 2001, at https://www.mea.gov.in/media-briefings.htm?dtl/5769/transcript+of+press+briefing+by+the+official+spokesperson (accessed in August 2019).

from the NSSP, the Americans were seemingly puzzled with the way New Delhi was subsequently pursuing its missile defence policy. This was evident from the statement in the telegram that despite exploratory talks on BMD and both sides exchanging visits of technical teams and policymakers since 2001, "India has thus far not agreed to extend the cooperation beyond discussion into more binding collaboration." The telegram also noted that since 2001, India had been considering the possibility of purchasing off-the-shelf BMD systems, such as the PAC-3, Arrow 2 as well as the Russian S-300 system. The Embassy felt that though these acquisition plans had not been entirely abandoned, the GoI had been focusing on developing indigenous BMD capabilities and had given the go-ahead to the DRDO to produce a working model.

The US anxiety over Mukherjee's remarks in Harbin, when seen in this context, may look justified. For, Mukherjee had categorically declared in the Parliament debate on the Defence Framework Agreement soon after it was signed in July 2005 that India was interested in developing its own missile defence system on which work had already started. Yet, the MEA officials maintained at all the interactions and exercises with the MDA that the Indian BMD strategy was yet to be formulated, even as the DRDO team claimed that its expertise in this realm was limited to software systems. Consequently, having undertaken its first development test of a BMD system by end of 2006, even when the dialogue with the US was ongoing, was in itself an indication that DRDO's work on BMD system was rapidly progressing and probably was at advanced stages of vehicle development in the 2005–06 years.

While it is generally assumed that the initial work on India's missile defence programme could have started in the late 1990s (following transfer of Chinese missiles to Pakistan) soon after the nuclear deterrent was put in place, the US Embassy telegrams confirm the fact that even while the indigenous efforts were being pursued, India's security establishment was also exploring various options, including PAC-3, Arrow-2 and S-400. Relevant to this context are reports in some quarters that India was denied the Arrow-2, which it was supposedly interested in, and was instead offered the PAC-2; whereas the Embassy telegrams show that Arrow-2 was not much in discussion which was largely centred around PAC-2, though India

evinced interested in PAC-3 (instead of PAC-2), and wanted to closely follow the SM-3 operations the US had with Japan.[51]

Maintaining secrecy on an indigenous programme is standard strategic practice as much as a country keeping its cards close to the chest on exercising external acquisition options. Yet, the trajectory of India's missile defence decision-making in the initial years up till the first BMD test in December 2006, and the immediate months thereafter, has been confounding in many respects and raises some explanatory gaps, particularly on the dialogue with the US. What could have been the motive behind the interest shown by MEA officials on technological partnership with the MDA? Was the Indian government exploring the prospect of joint development between DRDO and MDA at any stage during those initial "planning" years, or was the co-development proposal just a safety net in case the DRDO failed or got perennially delayed in its missile defence mission? On similar lines, was the enthusiastic interest shown for a continuing dialogue and joint BMD exercises a tactic to extract maximum information on the US missile defence systems and their operational practices, without, maybe, holding a genuine interest for purchase and even while harbouring other acquisition options?

It is clear from these patterns that the India–US dialogue did not translate into concrete partnership plans and that the DRDO, after the purported success in the early development tests, was given the go-ahead to pursue

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[51] A related side story is the discussion about Japan's security and defence cooperation with India during a dialogue in July 2007 between James Clad, the US Deputy Assistant Secretary for Defense, and officials of the Japanese Ministry of Defense (MoD) and Ministry of Foreign Affairs (MoFA). While Clad noted that Japan, with its 'mature MD relationship' with the US can serve as a mentor to India, his Japanese counterparts agreed that Japan's experience in this field could be useful to the Indian leadership, and that MoFA and MoD are currently having senior-level communications with Indians in order to "compare notes on BMD", on which India seemed "forthcoming". Wikileaks, "DASD Clad talks India with Japanese officials", Telegram from Schieffer, US Embassy, Tokyo (07TOKYO2668_a), *Public Library of US Diplomacy*, 13 June 2007, at https://wikileaks.org/plusd/cables/07TOKYO2668_a.html (accessed in August 2019).

the indigenous programme in full steam. Accordingly, there have been few public conversations on the option of acquiring or co-opting a foreign system in the point, area or nationwide missile defence architecture that was being conceived and debated upon for over a decade since the first test in 2006.[52] The Russian S-400 began to figure in the Indian calculations early this decade, probably prompted by the initial test failures of the AD (Prithvi Defence Vehicle [PDV]), the long-range interceptor that DRDO was developing to gain actual exo-atmospheric interception capability.[53] Though the plans for the S-400 acquisition have been in the news quite often in the past few years,[54] especially after the Trump administration

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[52] Since 2006, the DRDO had undertaken many tests of the Advanced Air Defence (AAD), a lower-tier system for point defence, and the PAD, the upper-tier platform for area defence. Though the PAD has a purported interception altitude range of 50–70 km, DRDO had claimed this as an 'exo-atmospheric' interception range (and AAD as endo-atmospheric interceptor), though exo-atmosphere, by international standards, happens to be beyond the Earth's atmosphere that is roughly delineated by the Karman Line at around 100 km from the Earth's surface. For more insights on this, see chapter II of Kumar, *A Shield against the Bomb*, n. 9.

[53] The initiation of a PDV-1 and 2 (AD) programme in the early years of this decade was acknowledgement by DRDO on the need for actual long-range and exo-atmospheric interception capability. The first test of the PDV-1 to attain interception at a range of 120 km was conducted in April 2014. Though the DRDO claimed the mission was successful (in terms of inertial guidance and target seeking), the launch could not achieve a successful interception. A senior DRDO official later confirmed to me that the interception could not be achieved and more tests have to be conducted on the PDV before declaring it fit for deployment. While the second PDV test in February 2017 was reported as a success, the DRDO seems to be exercising visible caution by abstaining from a tight testing schedule for the PDV, as done for AAD and PAD. See DRDO press release, at http://www.drdo.gov.in/drdo/English/dpi/press_release/pdv.pdf (last accessed in May 2014).

[54] Rajat Pandit, "India Eyes Safer Skies with Russian S-400 *Triumf*", *The Times of India*, 11 October 2015; "India Signs $5.4-billion Deal to Buy 5 S-400 Missile Systems from Russia", *Business Today*, 5 October 2018.

red-flagged the Indian plans to purchase the system,[55] little is known on the actual reasons for India's decision to purchase the S-400, and particularly its implications for the indigenous BMD programme.[56]

That the political leadership, as represented by two successive governments (the United Progressive Alliance government until 2014 and the National Democratic Alliance government thereafter), has not been enthusiastic about the DRDO's claim of the two indigenously developed systems being ready for deployment has to be taken into account when assessing the S-400 decision. The S-400 is known for its twin capabilities in both air defence and missile defence roles; also, it is supposedly capable against faster missiles as compared to the Prithvi Air Defence (PAD) or Advanced Air Defence (AAD), though the interception range of the S-400 (40–60 km altitude and 400 km coverage, by various accounts) makes it only a superefficient

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[55] On 2 August 2017, the US President signed the Countering America's Adversaries Through Sanctions Act (CAATSA), which, among others things, imposes sanction on strategic and financial sectors in Russia, Iran and North Korea. The legislation empowers the US President to sanction 39 Russian companies, including key defence sector companies, which could also make third parties liable to sanctions if doing business with them. That the Almaz-Antey Corporation, manufacturers of the S-400, also figures in this list made an Indian purchase vulnerable to US sanctions. Meanwhile, the Conference Committee of the US House of Representatives and Senate, in its final version of the National Defense Authorization Act (NDAA) 2019, had recommended exempting India, Indonesia and Vietnam from Section 231 of CAATSA, enabling them to buy Russian defence equipment without attracting sanctions, provided the US President certify that they have significantly reduced dependence on Russia and increased cooperation with the US. Despite such reports, there is still confusion on whether the Trump administration has approved this exemption or whether the stalemate continues. See Jon Grevatt, "US Delivers CAATSA Warning to India", *Janes 360*, Bangkok, 3 June 2019, at https://www.janes.com/article/89008/us-delivers-caatsa-warning-to-india (accessed in August 2019).

[56] A recent report quotes Indian Air Force officials as being impressed by the S-400's ability to "cover an entire spectrum of threats", which includes all-breathing threats (aircraft and cruise missiles) and missiles from the neighbourhood. See Sandeep Unnithan, "Why the IAF Wants the S-400 Missile", *India Today*, 16 July 2019.

endo-atmospheric system, a goal tagged for the PAD system as well.[57] Hence, the larger puzzle is about the architectural conceptions currently being conceptualised by the Indian security planners and whether the Indian nationwide shield will be a mix of indigenous and foreign interception platforms.

An interesting development that has happened during the S-400 debate in the last few months has been the reports that emerged in sections of Indian media that the US had offered the THAAD system as a means to counter the S-400 deal.[58] This is significant considering the fact that THAAD rarely figured in the missile defence dialogue of 2004–07, and also happens to be a system that the DRDO seeks to mimic with its PAD. Further, had the India–US dialogue fructified into a technology partnership, it was likely that THAAD could have joined PAC-2/3 to form the basic structure of the Indian BMD system, with the possibility of a co-production of these systems in India as well. Nonetheless, with the arrival of S-400 and potential deployment of AAD and PAD, it is unlikely that American BMD systems of the endo-atmospheric kind may make their way into the Indian inventory.

However, the same cannot be said about exo-atmospheric systems. The prospects for India attaining a credible exo-atmospheric capability will depend on the fate of the PDV-1 and PDV-2 and the ability of these systems to intercept medium- and long-range nuclear-tipped missiles from

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[57] The S-400 has evolved itself as a superlative interception system after its genesis based on the S-300 designs and platform. Besides undergoing capability upgradations like shifting from proximity fragmentation warhead to hit-to-kill missiles, the S-400 continues to use an array of missile systems that enables varying range from 100 to 400 km depending on the type of the target and a wide extreme of altitude applications (100 feet to 40 km) to interdict everything from cruise missiles to missile systems. For an analysis, see "S-400 Trimuf", Missile Threat, at https://missilethreat.csis.org/defsys/s-400-triumf/ (accessed in August 2019); also see details of Triumph product at Rosoboronexport, at http://roe.ru/eng/catalog/air-defence-systems/air-defense-systems-and-mounts/s-400-triumf/ (accessed in August 2019).

[58] Yashwant Raj, "US Offers to Sell THAAD Defence System to India as Alternative to Russian S-400s", *Hindustan Times* (New Delhi), 12 May 2019.

China, as also Pakistan. In the event these systems fail to convincingly demonstrate these mission objectives during their development tests, it will not be surprising if the security establishment explores foreign options as building blocks of what could be a nationwide shield. In such a scenario, the Russian and the US exo-atmospheric platforms may emerge as preferable choices, with the Russian choice of S-500 providing interoperability with the S-300 and S-400 network environment, while the American systems, if available for acquisition, could be considered for their proven operational and developmental test record.

Amid reports of production already being initiated,[59] the S-500 is touted as the interception system with the longest endo-atmospheric range (481.2 km) and capable of intercepting even hypersonic systems.[60] Though its exo-atmospheric interception capabilities continue to be speculated despite occasional comparisons with the GMDS, it is clear that the system is supposed to replace the existing A-135 anti-ballistic missile system deployed during the Cold War years to protect Moscow and other strategic centres, notwithstanding reports of another Russian BMD system, with exo-atmospheric range, being under development.[61] The S-500 will, however,

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[59] "Production of S-500 Missile Systems Begin in Russia", *TASS*, 30 June 2019, at https://tass.com/defense/1066425 (accessed in August 2019).

[60] The S-500 missile's claimed range is 600 km (370 miles) for ballistic missile targets and 400 km (250 miles) for air defence. It will be able to detect and simultaneously engage up to 10 ballistic hypersonic aerial targets flying between 18,000 kmph (11,000 mph) to 25,000 kmph (16,000 mph). See "Russia Goes for S-500 Prometey Missiles as India, Turkey Get Ready for S-400 Triumf", *Zee News*, 27 June 2019, at https://zeenews.india.com/india/russia-goes-for-s-500-prometey-missiles-as-india-turkey-get-ready-for-s-400-triumf-2214761.html (accessed in August 2019).

[61] Christened as A-235, this system is undergoing tests currently and is touted as a hypersonic BMD system with 800 km (altitude) and 1,000 km (interception range). There is confusion among observers whether the A-235 is an improvement on the S-500 or an altogether new exo-atmospheric system. See "S-500 or A-235? Russia Test Advanced New Missile Defence System with Extreme Range", *Military Watch*, 5 June 2019, at https://militarywatchmagazine.com/article/s-500-or-a-235-russia-tests-advanced-new-missile-defence-system-with-extreme-range (accessed in August 2019).

be an ideal system for the Indian requirements not just for compatibility reasons but also because it is an upper-tier endo-atmospheric system that would have ideal range against Chinese medium-range ballistic missiles (MRBMs) deployed in Tibet as well as longer-range Pakistan missiles like Shaheen-3, both of which are designated to cover the whole of Indian territory, including far-flung strategic points like Andaman and Nicobar Islands.

The American GMDS, on the other hand, has not been tasked so far for any deployment outside the US homeland, though it was initially considered for the EPAA and subsequently withdrawn after Russian opposition. Accordingly, it may not be currently realistic to imagine this system ending up as part of an Indian nationwide shield, though, of course, one cannot speculate on the direction in which the India–US defence partnership can move in the coming years. Yet, considering the grand opposition mounted by Russia and China towards the EPAA plan, it is unlikely that GMDS, with its huge support infrastructure and networks, may not even end up with Asian allies where other US BMD systems are already deployed.

Hence, the system that has a higher probability of making it to the Indian inventory at some stage in the coming future would be the Aegis SM-3/6. This is largely because the SM-3 is an upper endo-atmospheric system which could also do outer space interceptions in the low-Earth domain (especially the new upgrades and the SM-6 range); and also, it is a mobile system being deployed on the Aegis destroyers. Beyond the competition it could offer to the Russian S-500, the Aegis SM option comes with the added advantage of being a naval interceptor and could fulfil dual objectives for India: as defence for the naval leg of its nuclear triad and also, a system that could do both late descent or early ascent (upper endo- and low-Earth exo-atmospheric) operations against what are essentially neighbourhood missile threats.

Though the prospect for an SM-3/6 acquisition does not seem currently imminent, as seen in the case of the THAAD offer, the possibility of US BMD systems finding their way into the Indian plans may not be remote any more. This is not merely because of the references in the BMDR about the "emerging security relationship" and India's "natural outgrowth as a Major Defense Partner", or the ongoing discussions over potential

BMD cooperation irrespective of whether the dialogue has been fruitful or not. It is more because the Trump administration, probably riding on the BMDR recommendation or as a compensation for Countering America's Adversaries Through Sanctions Act (CAATSA)-driven impediments, had decided to include India in its Strategic Trade Authorisation (STA) list, usually reserved for allies. As the first South Asian nation to be granted this status by the US, the STA-1 inclusion will facilitate the transfer of more sensitive defence and dual-use technologies to India, besides providing India "greater supply chain efficiency that will increase activity with US systems, their interoperability and reduce time and resources needed for license approvals."[62] While this inclusion is naturally meant to streamline the ongoing defence cooperation, especially of high-end military technologies and platforms, it invariably opens up the possibilities of critical missile defence technologies to be made available to India, provided New Delhi too make such preferences.

[62] "India on Strategic Trade Authorisation-1 List of US, Sign of Trust in Bilateral Relationship: Indian Envoy", *Press Trust of India*, Washington, 31 July 2018.

Section VI

Conclusion

The BMDR unveiled by the Trump administration early this year happens to be only the second in the series, the first having been prepared and released by the Obama administration in 2010. Mandated by the National Defense Authorization Act for FY 2009, Section 234 (Public Law 110-417), the DoD, pursuant to guidance from the President and Secretary of Defense, was to address the legislative requirement by conducting a review of the BMD policy and strategy of the US.[63] This mandate, seemingly a product of the Bush administration's 2001 decision to deploy a multilayered BMD network, has, since 2010, become an institutionalised mechanism to articulate and streamline the missile defence policy and strategy of each administration, as well as for long-term planning. While President Obama differed substantially from his predecessor on technological priorities and resource allocations, his BMDR devoted considerable wisdom on technological planning by emphasising on fiscal discipline and credibility of technology as core values of the mission. As a result, despite differing in the objectives and overall BMD vision, the Trump administration gained from many of the core initiatives propounded in the 2010 BMDR and ensured its continuity, especially of futuristic technologies centred on directed energy.

Notwithstanding such convergences, the Trump administration's BMDR stands out in many respects. Besides sticking to the political values of a Republican orientation on national security priorities, the DoD was seemingly given the leverage to formulate a proactive strategy that outclasses not just the previous version in the series, but also turns out to be a veritable

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[63] See US DoD, "2009 BMDR Terms of Reference Fact Sheet", 16 October 2009, at https://archive.defense.gov/news/BMDR.pdf (accessed in August 2019).

mission document that seeks to plug the critical gaps in the programme even while waking up to the new threats on the horizon. The belligerent language on Russia and China as pivotal rivals laid bare the political underpinnings of this BMDR in identifying the key threats, as also the technological direction of the BMD mission. That Putin's unleashing of his new arsenal had also alarmed the DoD is inherently echo in these sentiments.

The decision to revive the idea of an aircraft platform for missile interception could stoke memories of the ABL programme, and Obama's decision to terminate it, which, incidentally, Trump also seems to endorse even while reinforcing the directed-energy projects of his predecessor, including on newer aerial platforms. While much focus of the coming years will be on these projects and also fulfilling the quest for a boost-phase interceptor, Trump's decision to give life to space basing of sensors (and subsequently interceptor platforms) has the potential to aggravate the currently torpid space race into a frenzy for the weaponisation of that domain. The return of SDI-era Brilliant Pebbles and Smart Rocks in newer incarnations could, for a change, produce different outcomes than what was envisioned in the 1980s. With more great powers, including China and India, making inroads in these domains and indulging in their own local competitions, the US space basing will provide a cue to further their quests as well.

Two key concepts that echo throughout in Trump's BMDR are: (a) "beyond geography", which embodies the global reach and imprint of the US BMD network; and (b) "jointness", which now entails the US BMD mission stretching from MDA to the space force and the joint forces. The latter implies not just a seamless integration of existing air–missile defence framework but also employing BMD into offensive missions, thus realigning the offence–defence balance as also its postural dimensions. The global imprint transcending borders and regions, in fact, is an attempt to reinforce the US supremacy, and also posturing, that missile defence, despite being defensive systems, will complement the existing American might and hegemonic reach. While it has clear messages for Washington's primary rivals, the reference to Indo-Pacific as a priority region for improved coverage is a significant assuring posture to allies as well, especially in the light of the geopolitical churning in this region.

The specific reference to India, howsoever limited in exposition and detail, can yet be considered as an expression of the current nature of India–US relations, especially the deepening defence ties. Yet, this reference holds much significance if one considers the fact that the great advancement of this relationship has not been translated into gains in the BMD domain, which, in fact, has remained as the odd man out. It is owing to this particular factor that this paper has devoted substantial space to understand the evolution of India–US interactions on this front. With the support of documents made available through Wikileaks, this volume has reconstructed the anatomy of the dialogue which was initiated since the NSSP, though the narrative culminates without identifying how and where the dialogue ended, seemingly inconclusively. This narrative, nonetheless, could help readers to not just understand this evolution but also to contextually place the (absent) role of missile defences in this flourishing relationship while postulating on its probable direction hereafter. When viewed from the current strategic milieu, it would be discernible to the reader how transformations had come about in this domain and how technological partnerships and acquisition constructs considered hypothetical or unrealistic some years or a decade ago are now manifesting into new dimensions of political interplay and strategic affiliations.

Finally, no matter how promising or discouraging Trump's BMDR has turned out to be, it offers one fundamental conclusion at this point: the American military technological mission will continue to roll on like a juggernaut irrespective of which dispensation is in power. The politician in the White House can change its political colour and character, but not the quest for military–technological supremacy.

The Ballistic Missile Defence Review (BMDR) of the US Department of Defence is a one-of-its-kind document that provides a multi-dimensional picture on the American BMD programme, its technological trajectory as well as the vision of the incumbent administration on the role of missile defences in its national security strategy and architecture. The first BMDR of 2010 had spelt out the Obama administration's 'austere' approach towards ongoing projects by emphasizing on financial viability and technological feasibility. In contrast, the Trump administration's BMDR, released in early 2019 as the second of the series, can be described as the most proactive BMD plan since SDI days with fillip given to areas like directed-energy, addressing gaps in boost-phase interception and harnessing the space frontier. Trump's BMDR also enhances the strategic role of BMD by pushing for greater jointness and offence-defence integration through their operational synchrony with offensive forces. This Occasional Paper dissects the BMDR threadbare and analyses its significance for global missile defence dynamics, particularly for India, which has notable mention in the Review. In doing so, the Volume devotes considerable space to trace the course of India-US dialogue on BMD, and the proposed partnership that failed to take off. Using a hitherto unexplored cache of US State Department cables, the Volume reconstructs the anatomy of these interactions and tries to ascertain what the Review augurs for India and its BMD programme.

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