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MARIA SULTAN

Cornell Caspian Consulting
STOCKHOLM ANKARA BAKU BOSTON DUSHANBE ISLAMABAD
LONDON TASHKENT TBILISI TEHRAN UFA WASHINGTON

Head Office: Topeliusv. 15
SE-16761 Bromma
Sweden

Tel. +46-70-7440995
Fax. +46-8-266873
Fax. +1-253-5504390

http://www.cornellcaspian.com

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Through the contours of its development today, the US National Missile Defence (NMD) programme, challenges not only the prevalent international security order but also the very basis of the non-proliferation regime. It has become an issue of international focus in the post-Cold War era, as it is feared that the NMD will provide the basis of the new imbalanced, global security order because of the expected missile proliferation.

Alongside ballistic missile proliferation in the post-Cold War era, there has been a significant degree of nuclear proliferation by other means (i.e the increased number of civilian nuclear power plants, and easy availability of fissile material), which has had a discernible effect on the global and the regional security matrixes. The easy access and the degree of development in the ballistic missile technologies have led to a situation where global arms trade has steadily expanded. Increased access to information, technological developments, coupled with enhanced research and development facilities have made the proliferation of ballistic missile technology almost a self-sustaining phenomenon, given the ambitions of the emerging missile powers.

Moreover, the new trends in the arena of international arms control are being shaped by the current US views and concepts aimed at achieving unilateral technological advantages. Therefore, it is not the disarmament and arms-control agenda, which is shaping missile developments, but the other way round.

The US decision to deploy an NMD system is likely to bring about a qualitative and quantitative shift in the future force postures of states. It has already triggered off reactions throughout the world. The expected domino effect in South Asia would be a worrisome development, especially with reference to the transfer of the Theatre Missile Defence (TMD) systems, a component of the NMD, which has remained in a continuous state of development, despite the limitations imposed by the ABM treaty.

It is thus necessary to examine the following questions: a) what exactly the NMD/ TMD stands for in the South

Asian context? b) What would be the repercussions of the transfer of anti-ballistic missile technologies in the India–Pakistan context? c) What type of defences would be used or deployed in South Asia? d) How would the relationship between defence and deterrence, in the face of the ABM, affect stability in the region based on deterrence?

THE SOUTH ASIAN CONTEXT

The continued state of military rivalry between the two key players, India and Pakistan, dominates the South Asian strategic scene. An accelerated pace of missile proliferation can only lead to catastrophic results for any future balance of power arrangements in the region. It would involve additional tests by the two nuclear states (India and Pakistan). Hence, in order to understand the nature of relations within the South Asian security complex, it is necessary to analyse how the US attempts to build its NMD; and how the transfer of an anti-ballistic missile capability in the region would affect the regional security milieu; and what impact it will have on the India-Pakistan military rivalry?

In the case of South Asia, the US NMD plans would have an effect at the policy levels; it is the technological development of Russia and Israel that has the most direct impact at the operational levels of the countries that acquire their technologies from them. This paper shall focus on the NMD and TMD systems of Russia and Israel and their relevance to the South Asian security, together with a brief overview of the impact of the US NMD in the realm of policy.

US NATIONAL MISSILE DEFENCE PLAN

Over the past fifty years, the US has tested, and prototyped generations of missile defence-related technologies, components and system concepts.[1] The technological advancements made with the technological competitive edge provided by the Strategic Defence Organization (SDO) and its successor, the Ballistic Missile Defence Organization (BMDO) have enabled the US to initiate a unilateral global balance of power. The US new concept of deterrence, based on a balance between strategic offense and defence, is a distinct change from the earlier policy of deterrence of the Cold War period, based on the concept of Mutual Assured Destruction (MAD).[2]

Since 1984, the efforts to build a viable NMD system in the US have focused on developing three major elements of ballistic missile defences: sensors, weapons and control systems. The US desire to create a world that is dominated by the preponderance of US power has paved the way for the transfer of ABM technologies for short and intermediate range ballistic missiles, to 'responsible' states throughout the world, based on political expediency.

RUSSIA'S MISSILE DEFENCE SYSTEM

Moscow began its missile defence as early as the late 1940s and early 1950s, when Stalin ordered the creation of a network of a radar-directed, air defence missiles' system to protect the capital from a massive air attack. It was known as the Berkut strategic air defence system, commonly referred to as the Moscow system.[3] By 1964, Russia had the world's first viable anti-ballistic missile defence system, which was deployed by 1968.[4] However, when the USSR and the US signed the 1972 ABM treaty, it constrained the development of the NMD, but not development of TMD technologies, by both the super powers.[5]

During the mid-1970s, Russia replaced its existent system with the improved ABM–1b version.[6] That missile system was followed by a

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1 See also, 'Anti Ballistic Missile Treaty Chronology', see http.fas.org/nuke/control/abmt/chron.htm

2 See also, *Harnessing the Power Technology: The Road to Ballistic Missile Defense from 1983-2007*, US Department of Defence Report, September 2000.

3 Steven J Zaloga, 'Defending the Kremlin: The First Generation of Soviet Strategic Air Defence System 1950-1960,' http://www.libraryautomation.com/nymas/defendingthekremlin.htm

4 James T, Hackett, 'Moscow's Overlooked Missile Defences,' *Missile News*, September 1999, http://www.cdisss.org/co100may17.htm

5 In late 1970s the system was deactivated from four sites to two sites and than to one site, according to the ABM treaty. Nevertheless up gradation was maintained on the two existent systems.

6 Supplemented by the Gazelle ABM-3, it provides for lower tier defences, and has been operational since 1984.

number of modifications and developments made in the interceptor technologies. Unlike the US, Russia all along had remained focused on developing a viable ABM system, with or without a nuclear warhead capability.

In this regard, the most successful attempt has been the development and deployment of the S-300 ABM system that is the most crucial development from the point of view both of proliferation and their impact.[7] The S-300 Theatre Missile Defence had first become operational with the SA-10 version in 1980. By 1996, Russian technological developments were well underway to replace all the older strategic SAM systems with the SA-10 and SA-10b.[8]

What is significant is the fact that the new generation of Russian missiles will create major problems for air-strike planning, as these are destined to become widespread both inside and outside Russia, considering the Russian arms trade patterns in the last decade or so. If mass-produced, these systems could provide an ABM cover to countries in the Middle East and South Asia, depending upon who is buying them. Currently, the ABM Antey battalion module has been exported to India, alongside some variants of the S-300 system. The Antey ABM module, operating within an integrated air defence system, can engage simultaneously up to eight Intermediate Range Ballistic Missies (IRBMs) from a distance of 2500 km, or 16 Tactical Ballistic Missiles (TBMs) launched from approximately 3000 km away. Backed by the Phalcon and Green Pine radars, it can provide India with an effective ABM cover for key Command and Control installations and nuclear facilities.

ISRAELI MISSILE DEFENCE CAPABILITIES.

The US laid the basis for the development of the Israeli ABM system, Arrow. This was done as early as 1986 under a memorandum of understanding signed between the two countries. The United States agreed to co-finance and co–develop an indigenously produced Israeli TMD, which could later be incorporated within the broader US Missile Defence programme. As a result, Israel began work on a potential Arrow Theatre Missile Defence (TMD) system and to-date remains focused on developing the intercepting short and medium range ballistic missiles.[9]

Currently, the Arrow anti-tactical ballistic missile project, largely supported with US funding, has entered into its fourth development phase. Interception testing for the Arrow-II missile, which began as early as 1995, was successful in its first operational test. As a result, the first battery of the Arrow TMD system was deployed by Israel in March 2000.[10] The Arrow is one of the most advanced anti-tactical ballistic missile defence systems in the world. The system is based on high altitude interceptor-like Arrow, which has a range of reaching a 30 miles height at nine times the speed of sound, making it possible for hostile missiles to be intercepted high enough so that any weapons of mass destruction they carry will not be dispersed at lower altitudes, thereby reducing the radiation fallout.[11] This technique also allows time for a second arrow missile to be fired, if it is determined that the first had not intercepted the missile.

Since 1990, Arrow–I had been tested approximately nine times. This laid the basis for a viable anti-tactical ballistic missile project *Homa*.[12] In 1997, Israel got increased US funding of approximately 200 million dollars for

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[7] This system has two competing versions the S-300PMU and the S-300PMU-I. See for further details www.fas.org

[8] The SA-10B mobile missile battery comprises of three batteries. The battery takes only five minutes to deploy and when it comes to the halt. It can engage up to six targets simultaneously. For further details see, http://www.iemz.ru/sam.

[9] The purpose of the bilateral development and testing is twofold. First, enable Israel to deploy, as rapidly as possible, an anti-tactical ballistic missile system for its own use and provide defence capability against conventional and chemical tactical ballistic missiles and secondly help US in the development of ABM technologies.

[10] 'The Military Balance in the Middle East–Part III,' *Bint Jbeil*, August 18, 1998.

[11] See for further details, http://www,us-israel.org/jsource/US-Israel/Arrow.html

[12] In the February 1996 Arrow-II test, it intercepted a simulated missile of the scud type.

continuing the work on the Tactical High Energy Laser (THEL), a transportable laser weapon system designed to destroy Katysha rockets (i.e short range rockets).[13] This system gives Israel a multi- layered, ABM area defence system and an ABM capability against short range missiles, especially when put in collusion with the Arrow TMD systems.[14]

IMPACT OF ANTI–MISSILE DEFENCE (AMD) TECHNOLOGIES ON INDIA-PAKISTAN

The US NMD plans will set the pace for the proliferation of TMD technologies worldwide and will redraw the map of strategic capabilities of missile capable states. It is the ABM capability, and in particular the strides made in the TMD capabilities and systems developed by Russia and Israel, that pose the most significant threat to the South Asian nuclear stand off. In this context, nothing looms as large as the Indian desire and intentions to acquire a BMD capability and expand its deterrence on the basis of a draft nuclear doctrine, which guarantees a credible first and second strike capability from the land, air and sea. Moreover, India is vigorously pursuing the acquisition of ABM technologies under a three-pronged strategy, aimed at

- Neutralising the deterrence value of Pakistan's missile arsenal and engaging Pakistan in a costly missile race, which will have deeper political and economic implications.
- To ensure a credible second-strike capability.
- To secure international political clout on the basis of missile strength.

Here, it would be pertinent to look at the Indo–Russian and Indo–Israeli defence collaboration.

INDO-RUSSIAN COOPERATION

As early as 1995, reports had surfaced that India planned to acquire a TMD system from Russia, either the S-300 PMU/S-300PMU-I,[15] or S-300V systems. It was reported that by 1996-97, under a deal, which both countries did not make public, Russia had given some of the S-300 systems to India.[16] An Indian delegation, led by the Indian Defence Minister, had witnessed the August 1995 test of the S-300 system at the Russian Kapustin Yar testing range, following which the deal for the purchase of the S-300 system was finalised.[17] By June 2001, Russia again offered to help India in creating a TMD system that would be expanded to provide India with a national defence shield.[18] This system is to combine missiles and radars from the two countries i.e. India and Russia, in keeping with the recent efforts to co-produce hi-tech military hardware with India.[19]

On August 2, 2001, India signed a contract with Russia's state-owned Rosoboronexport for the supply of a modified version of the mobile Antey 2500, low-to-high altitude, and surface-to- air missile system, capable of intercepting missiles having a range of 2500 km.[20] The Antey 2500's primary

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13 The Tactical High-Energy Laser (THEL/ACTD), ground-based, short-range air defence system, uses a high-energy chemical laser to protect civilians, friendly forces and military assets against rocket attacks. It had successfully intercepted a short range rocket in 1996.

14 The interception rate is twice as much as that of the S-300 system. The next system to make a break trough in the Russian ABM systems is the S-300PMU-2. See e.g. Gregory Koblentz, 'Viewpoint: Theatre Missile Defence and South Asia: A Volatile Mix', *Non-Proliferation Review*, (Spring /Summer1997).

15 S-300PMU-1, identified as the third generation of the S-300P missile lineage and is the export variant of the S-300 series of the Russian ABM systems. This is the most significant from the point of view of proliferation of ABM technologies as it can be upgraded with the new versions of the S-400 triumph series. This is all weather, missile system that is able to engage multiple targets, including aircraft & missiles simultaneously at all altitudes. In mid-1980's Soviet Union had started work on this design and its variants.

16 Gregory Koblentz, op.cit.

17 'Deployment of Missile Umbrella System All Set,' *Indian Express*, December 20, 1996; in *Periscope: Daily Defence News Capsule*, December 20,1996.

18 Russian Deputy Prime Minster Illya Kelbanov had announced on June 6 after having talks with the Indian Foreign Minster Jaswant Singh that Russia would help India to build a defence shield and help develop other high tech weapons , see *The Dawn* , June 7, 2001

19 *The Hindu*, June 29, 2000.

20 The Indian contract marks the first export of the system, which analysts believe will be integrated into India's anti-tactical ballistic missile capability. http://www.lanceurs.aeromatra.com/actualites/actu_inter_en.asp?contenu_id=1185.

role is anti-ballistic missile defence. It uses two vertically-launched, two-stage solid-fuel missiles. The system is primarily a mobile, land-based ABM system, which can intercept ballistic missiles with launch ranges up to 2500 km. Other versions of the system, such as S-300 V/ PMU have been reportedly leased to India. The Antey system supplied to India has been newly built, and therefore might have been upgraded to include certain components of the S-300PMU-2 system.[21]

The Indian Department of Defence has also been working on increasing the range of its Akash short-range missile from 40 to 60 km with the help of technology inputs from abroad. Akash, which is a multi-target, command-guided, medium-range surface-to-air missile, was expected to be inducted in the Indian army. However, due to technical and financial constraints, it was not sent for serial production and more tests were planned, the latest of which was conducted in early 2002. However, with its present capability, it provides an adequate base and is expected to be a major component of the Indian ABM capability. Connected to a fire control, higher resolution, multi-target, multi-function, phased array radar system called Ranjendra (with a 60-km range, and range resolution of 30m), it can track up to 64 targets of which it can engage four.[22] It can be easily upgraded to form an ABM component, alongside the S-300PMU-1 and the S-300V, to provide defence against short and intermediate range ballistic missile. The S-300 PMU-1 has a target interception capability of engaging 6 missiles simultaneously. This system integrated with an AWAC capability and India's surface-to-air missiles and air defence base units could enable India to expand the cover of the ABM systems to major portions of its territory, enabling India to have layered anti-ballistic missile capability, vis-a vis Pakistani and Chinese surprise attacks.[23]

As stated above, India has reportedly leased two of the S-300PMU systems from Russia in April 2001 at the cost of $50 million for one year.[24] These systems can provide an effective replacement to India's obsolete surface-to-air missiles. If India and Russia are able to come to an agreement on the construction of an air defence system for India, this would lead to replacing of the earlier defence systems such as SA-12 missiles and 12 battalions of SA-3 missile systems, with new systems having components of long-and short-range ABM systems from Russia. For India to have viable rudimentary anti-ballistic capability, it is necessary that they have at least six to nine S-300PMU systems, but since the cost runs as high as $ 1.25 billion, and the fact that India wants to utilise the system with components from other systems, such as the Arrow and its own homegrown technologies, only two systems have been leased by India.

India wants the Russians to help India in integrating these units into a complex system with Indian Rajendar phased array radar and Akash missiles. During tests, the S-300 V has reportedly shot down over 60 tactical ballistic missiles with ranges of up to 600 kilometers and has demonstrated a single-shot probability of 40 to 70 percent, which according to other experts is close to 80 percent.[25] According to another report, India has imported six cryogenic engines from Russia on January 24, 2002. These would invariably increase India's capacity to manufacture ICBMs in the future.[26] In short, the Indo-Russian strategic cooperation in anti-tactical ballistic missile defence systems would bring about a qualitative difference in the deterrence potential of India, vis-a-vis Pakistan and China.

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[21] The S-300PMU2 *Favorit* variant, is a new missile with larger warhead and better guidance with a range of 200 km. Unveiled at the MAKS'97 exhibition in August 1997, it represents a thorough modification of the S-300PMU1. It can effectively neutralize the attack of missiles having approximately 1500 to 2000 km range. The first tests were performed on August 10, 1995, at the Kapustin Yar firing range.

[22] Anupam Srivastava, 'Strategic Import of Missiles in the Indian Security Policy: Can They Deliver the Goods,' see http//www rediffonthenet.com, August 18, 1999.

[23] ' India and Russia sign 10 bn arms deal,' *BBC NEWS*, June 6, 2001

[24] ' India to lease anti missile systems from Russia', *Defence News*, April 2, 2001.

[25] Afzal Mahmood, 'New threat to South Asian Security', *Globe*, (February March, 1999).

[26] The development of India's indigenous cryogenic upper stage engine was expected to be completed by March 2002, according to Hindustan Aeronautics Ltd. Chaiman and managing director C.G. Krishnadas Nair, quoted in the *Deccan Herald* Newspaper.

The repercussions of India acquiring an ABM capability would be far reaching and would have certain implications for the South Asian security complex.

- Presently, the Indian missile induction at the operational level suffers from lack of a well-developed command and control system. An ABM capability would create an active and robust command and control system, based on battlefield command and communication centres, linked to early warning capabilities and weapon systems. However, recently India has placed its Command and Control system under a new Strategic Nuclear Command (SNC). The new Command will function under the Integrated Defence Staff (IDS) setup. There are other structures being set up in the army, air force and navy for the handling of Indian strategic assets. This integrated command and control structure will be enhanced with the induction of ABM system- related technologies.

- Provide real time battlefield information, allowing India advance time to alert and activate its air, naval and land-based defences and forces in the case of a surprise attack, and to mitigate the incoming threat and to launch a counter strike.

- Currently, the Indian missile programme suffers from various technological snags. Technology diffusion through the ABM missiles would allow India to have an enhanced missile capability for Indian offensive missiles.

- It would allow India to launch pre-emptive strikes, rendering Pakistan's limited ballistic missile capability ineffective.

- Since the S-300 system is Russian and most of the Indian military hardware is also Russian, it would be cost effective for New Delhi to upgrade this system and link it with its other surface-to-air missile systems.

- Another facet of the Indo-Russian military cooperation in the 1990s has been the shift from buyer-seller relations to a more sustained relationship involving joint cooperation and production. This cooperation could, in future, lead to serial production of the systems for wide-scale use in a shorter time frame, and would in turn also enable India to further indigenise its missile technology. [27]

- Joint collaboration in missile technology would enable India to boost up the scale of its military modernization at an affordable cost. Similarly, India has proposed to Russia that it should help her integrate advance ABM systems with its locally developed Akash[28] and Trishul.[29]

INDO-ISRAELI DEFENCE COLLABORATION

India has been seeking Israeli defence cooperation since the 1990s. India has shown interest in Israeli anti-ballistic missile technology, particularly, the Green Pine radar system and the Phalcon Airborne Early Warning (AEW) aircraft. In the last two decades, the two countries have built an extensive military collaboration, involving arms sales, equipment upgrades, transfer of technology and joint weapons development programmes. In this regard, the latest development had been the $2 billion defence deal between the Indian Defence Ministry and the Israeli Aircraft Industries (IAI) signed in July 2001.

From the point of view of the ABM technologies, the Green Pine radar

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27 Alexei Mouraviev, 'Indo-Russian Military–Technological Cooperation: The Backbone of a Strategic Alliance,' *The Indian Ocean Review*, Vol. 10, No.4, (December, 1997).

28 Akash is a medium range surface to air missile, with a range of 25km. The missile is currently being built to have similar qualities such as the US Patriot system.

29 Trishul is a short range all weather surface-to-air, anti- missile with an effective range of 9km. It is highly manoeuverable. The naval version of the short-range surface-to-air missile, Trishul, was successfully flight-tested twice on January 28 and 29, at Kochi 2002. This is a defensive anti-missile capable of destroying attacking missiles, and can also hit airborne targets. Though India has been involved in its user trials, the system has suffered from delays and unsatisfactory development. Hence in order to give an impetus to development of the indigenous Trishul, India has imported seven Israeli Barak anti-missile systems for the Navy, which have given the Indian navy their first effective anti-missile capability. See. *The Hindustan Times*, January 31, 2002.

system is the most crucial component as it provides an early-warning alert, impact point prediction and launch point location of incoming threats. Furthermore it is designed to handle simultaneous interceptions of 14 ballistic missiles with a typical range of 1500 km, and also be able to discriminate between real threats and decoys. There has been a controversy as to whether Israel could sell components of the Arrow system or not, since it began as a US-Israel joint project. America is of the view that it cannot be sold to third parties without the prior approval of the US; Israel has insisted that the Green Pine radar is an indigenous system, and not subject to US export control law. Recent press reports and releases from the Indian Department of Defence have indicated that India may be trying to acquire other components of Arrow technology from Israel in order to upgrade its Akash missiles with an advanced ABM capability.[30]

It is expected that both India and Israel may merge their ABM technologies in the future, depending upon the American approval. [31] The US has until now exerted pressure on Israel not to sell the Arrow technology to India, as it claims that it is a joint project, and hence Israel does not have exclusive rights on the sale of the technology and is in violation of the MTCR guidelines. But these reservations have been raised against the missile or the interceptor component of the system only.[32] On its part, Israel has claimed that the Arrow missile technology is basically a defensive system and that the size of its payload and its range are much smaller than what is regulated by the MTCR, and that it is designed for travelling shorter distances, though it could reach the 300 km landmark.

The ELTA[33] Electronics Industries Limited subsidiary of Israel Aircraft Industries, (IAI), which has developed active, phased array radar technologies and modified early warning and control systems, has proposed further co-development of this technology with the India's Defence Research and Development Organisation (DRDO)'s state-owned Electronics & Radar Research and Development establishment. In an ABM system, radars play the most crucial role and if the deal goes as planned, India would be able to upgrade its ground-based and ship-borne versions of the precision phased array radars and would be in a position to modify them for an ABM role.

Another area in the field of ABM, that might be taken up by the Israelis and Indians jointly, is the development of directed energy weapons that can disable short-range missiles, especially in the field of magneto-hydrodynamics for ground-based electro-thermal guns and laser projectors designed to destroy incoming aircrafts, armoured vehicles and ballistic warheads.

Since 1992, Indian defence links with the Israelis have grown considerably, especially in the military field. However, under the Israel-India defence industrial accord, in the next two to three years, the thrust in Indo-Israeli defence cooperation is likely to include cooperation in the field of missiles, space technology, multi-mode radars, electronic warfare, stand-off guided missiles, unmanned aerial vehicles (UAVs), avionics upgrades for 400 existing IAF fighters, anti-tank missiles called Spikes, Barak missiles and most importantly the Arrow system.

IMPACT OF THE NMD TECHNOLOGIES ON PAKISTAN

The Indian ABM assets, actual and projected, impact upon Pakistan's missile capabilities in a variety of ways. First and foremost is the undermining of its present deterrent capabilities. The Indian ground radars (Green Pine), if and when deployed, would have the capability to pick up the deployment of Pakistan's missile assets at a range of

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30 Shawn l.Twing , 'Special Report, US .,Israel at Odds Over Israeli Defence Sales and Technology Transfers to India and China,' ***Washington Report on Middle Eastern Affairs*** , (January /Feburary,1999), P 54.

31 India interested in buying Arrow anti missile system, *Haretz*, December 25, 2001.

' US Trying to Stop Arrow Sale to India,' ***The Jerusalem Post***, January 16, 2002.

33 ELTA - a division of IAI Electronics Group is a leading aerospace and defense electronics systems house of Israel. The Company's expertise is applied in radars, many of which are among the most advanced in the world. The leading edge technologies incorporated in Elta's systems are also used in para-military systems and in commercial spin-offs. See http://www.iai.co.il/iai/dows/Serve/item/English/1.1.2.3.1.html

300 km of Pakistani territory and thus provide surveillance over the entire territory of Pakistan.

An over-confidence in the deterrent value of the Indian missile shield can prompt her to consider launching a pre-emptive, decapitating strike, even with conventional weapons.

India possesses a comprehensive surveillance system based on ABM radar systems, Remotely Piloted Vehicles, UAVs and satellites. For Pakistan, it would mean two things: an Indian ability to effectively disrupt and jam Pakistan's command and control systems and delivery vehicles. This could possibly result in further military adventurism by India.

The mainstay of Pakistan's first strike and deterrent capability is based on two inter-linked systems. One is the Hatf and Shaheen series with a range of 80-600 kms and 700-1000 kms, respectively. The Indian Antey 2500 and Akash ABM systems could intercept these. The second is the Ghauri series of intermediate range ballistic missiles having a range of 1500-2500 kms. These can be intercepted by the S-300 series of the Indian ABM systems.

Options for Pakistan

India's acquisition of the anti-ballistic missile capability, alongside its pursuit of acquiring a nuclear triad could seriously affect Pakistan's capacity to maintain a minimum level of deterrence based on its strategic ballistic missile capability. Presently, the nuclear deterrence between India and Pakistan is seen as non-deployed, or as recessed deterrence, as it is based on the capability of the two sides to manufacture nuclear weapons and to operationalise them. In the future, this would entail that India could have a capability which could, if combined with the ABM capability, allow it to neutralise a first strike by Pakistan, whether it is launched through an air attack or through missiles.

Effects of the strategic asymmetry would be felt foremost on Pakistan's first nuclear-use option and its nuclear doctrine. Considering where India would base its ABM systems, the strike options from Pakistan's side would have to focus on counter value targets, i.e. if the ABM capability is used by New Delhi to protect Command and Control centres, major cities or strategic assets such as nuclear installations, etc. Considering the fact that in the coming decade India might have a limited ABM capability, Pakistan's nuclear planners would have to focus on counter value targets. From the point of view of counter value targeting, there are six Indian cities with populations greater than 500,000 but only five, (Amritsar being too close to Pakistan's border), that could be considered as possible targets of a first strike of Pakistani missiles,[34] as they are within the 1500-2000 kms range of Ghauri. [35]

In order to have a credible first strike, and to overwhelm the ABM capability of India, Pakistan 's strike options would rely heavily on Pakistan's Hatf series of short-range, solid-fuel propulsion ballistic missiles and the Shaheen ballistic missile series with ranges of 700-1000 kms. The S-300, S-300PMU and Arrow–system not only provide an ABM capability against missiles, combined with lower tier defences such as Tunguska, they can be lethal against aircraft. Their presence could seriously reduce Pakistan's airforce capability to act as a viable first strike force.

However, given the state of rapid transitions in the strategic landscape of South Asia, Pakistan's ability to penetrate Indian defences cannot be quantified at this moment. The uncertainty lies on the relative balance of forces between the two sides, the number of launchers Pakistan has and would have, the number of anti-ballistic systems India shall acquire and deploy, and most importantly where they shall be deployed.

The deployment scenarios of the Indian ABM capability will have a consequential effect on Pakistan's options. In the absence of signing an ABM treaty, India is free to deploy an ABM system anywhere on its soil. Four possible scenarios for an Indian deployment can be envisioned: a) ABM systems deployed alongside the India–Pakistan border in an arch at 100 km distances from locations within central and southern Punjab; b) defending key cities most importantly the Capital; c)

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[34] Gregory Koblentz, op cit , p56.

[35] Tested in 1998 and 1999, it is a liquid-propellant medium range ballistic missile, which forms the core of Pakistan's nuclear deterrent capability.

for the defence of strategic command and control centres; d) for the defence of strategic offensive forces so that it has credible second-strike capability.

However, before India can have a nation-wide area defence, it would have to invest in battlefield communication centres, satellites, early-warning capabilities, high precision interceptors and fail-safe command and control systems, as well as an effective coordination between the offensive and defensive delivery systems. In the near future it is not likely that India would have a satisfactory command and control system, or a widely-deployed ABM capability. Therefore, given this fact and the vast territory of India that makes it difficult to have nation-wide area defence capability in the near future, the nature of threat faced by Pakistan in this period may be limited. However, even the Indian capacity to deploy a limited ABM capability to counter with a limited Pakistani nuclear capability would require certain counter measures by Islamabad, both at the strategic level and at the tactical level for the operational success of its deterrence vis-à-vis India.

Quantitative Approach

In order to override the ABM capabilities of India, Pakistan has a number of options which can be further subdivided on the kind of approach Pakistan might adopt to neutralise the threat faced by a widely deployed ABM capability and to maintain an effective deterrent vis-à-vis India. The options can be widely grouped into two categories: quantitative options and qualitative options.

Given below are the quantitative options available to Pakistan:

1. Increase the number of nuclear and conventional warheads.
2. Introduce simultaneous launches under combat conditions from dispersed sites.
3. Increase the mobility of launchers.
4. Creation of independent strategic force directly under centralized command.
5. Increase the number of decoys.
6. Improve the delivery capability of the missiles as well as shift focus to truck-mounted mobile launchers.
7. Keep Pakistan's nuclear capabilities in a near deployment phase i.e in an assembled form to reduce Pakistan's reaction time to an Indian preemptive attack.
8. Go for complete deployment. However, this would increase the risks for Pakistan if India also chooses to go in for full deployment.
9. Increase its fissile material stockpile - this would require time.
10. Aim for counter value targeting by an overwhelming first strike based on more than one or two nuclear warheads. However, such an action could lead to mutual assured destruction, especially if India's strategic offensive weapons are kept safe. Hence targeting would have to be diversified to include also counter force targets.
11. Acquire second strike capability through improved air-capability and sea-based assets.
12. Alternatively, in order to overwhelm the Indian defences, Pakistan could keep its nuclear warheads on a hair trigger alert, but this could cause accidental war.
13. Creation of hardened silos.

The quantitative options relate to the expansion of the existing arsenals, nuclear and missile capabilities. These options are aimed at saturating the Indian defences, while keeping the deterrent value of offensive systems alive. This kind of approach, if chosen as a policy option, would not relate to the modification of the existing technologies in terms of research and development or acquiring new technologies; rather it would argue for expanding the total number of the existing systems. Considering the fact that this policy option would not necessitate new research, these can be adopted in a short time frame to meet the immediate deterrence needs. However, given the unique geographical characteristics of Pakistan's territory, the lack of strategic depth, numerous population centres and related problems, these options, after a certain point in time, could become counter productive. These options would necessitate and highlight the questions relating to Command and Control, accidental launches and to the question of how many nuclear weapons would be sufficient to override the defence capabilities of India.

This approach would also require a change in the doctrinal planning of Pakistan's nuclear war fighting strategy, especially as to how and when it would use its nuclear weapons. Primarily, by opting for these options, South Asia will automatically move on the escalation ladder changing not only the amount of time available to the decision makers in crises but would also see a change from non-weaponised deterrence to weponisation or full deployment. The adoption of this approach by Pakistan would automatically solicit a reaction from India, leading to action-reaction phenomenon. This would in turn, increase the pace of the arms race between the two South Asian rivals. All these options will depend upon on the economic costs and resources.

Hence, in order to maximize Pakistan's options, effort and care would have to be taken to make correct assessments on the numbers question as to what would be enough to have a robust deterrent capability in the face of an Indian ABM capability. This would automatically impact on the doctrinal and war fighting options available to us.

Qualitative Approach

While the quantitative approach, if adopted by Pakistan, would not put strains on the research and development side, it would have a major economic fallout and drag Pakistan into an open ended nuclear race with India. The other approach is the qualitative approach to increase deterrence stability. This approach would relate to the policy option of making choices based on vertical upgradation of the systems. Advance technologies adding effective counter measures to the delivery systems and electronic warfare capabilities may be out of league for Pakistan, given the economic and technical restraints for the short-term period. However, there are a number of options that can be adopted by Pakistan in the medium-term and long-term that would allow it to mitigate the threat to its deterrent capabilities. These options, if adopted, would not result in additional strains to the existing command and control system nor would they necessitate doctrinal changes associated with a move towards full deployment. These options would include improvements in the technical base of the delivery systems and associated technologies. These can be further grouped into two strands: one, technologies relating to fogging the enemy ABM systems and early warning capabilities such as electronic warfare and associated technologies and, two, technologies geared to improving the penetration capacity of the delivery systems of Pakistan.

In order to penetrate the defences and disrupt the enemy systems, various counter-measures based on the qualitative approach are listed below:

1. Improvement in electronic warfare capacity so that disruption can be caused in the Indian radars ability to home-in on incoming targets

2. Use of rudimentary stealth technology/techniques to reduce warhead radar and ifra-red signatures.

3. Reduce the observabilty of warheads to the missile radar networks by techniques such as the ability to create large clouds that obscure the trajectory of the missile or warhead.[36]

4. Encapsulating warheads with balloons upon reentry, thereby obscuring their precision target location.

5. Reduce exo-atomspheric interceptor's signatures by cooling warheads so those ifra-red seekers and interceptors cannot distinguish between a decoy and a warhead.

6. Manouvering warheads. By adding this counter measure, problems can be created for the interceptors, as it makes it difficult for the interceptors to follow the missile trajectory.

7. Electronic counter measures that jam radar-homing interceptors that can reduce endo-atmospheric, Single–Shot Kill Probability (SSPK) and thus alter the interception potential of an ABM system.

8. Add decoys to the delivery systems.

9. Efforts can be made to use cruise technology as a countermeasure.[37] Work on this is already in progress, at a very early stage.

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[36] Dean A. Wilkening, 'Ballistic–Missile Defence and Strategic Stability,' op. cit, pp 25-26

[37] Though Pakistan currently does not possess the advance variants of this technology but it is estimated that it might be having access to/devlope this technology in a period of 3-4 years.

For optimal leverage and for Pakistan to outmanoeuver the Indian defences, in the short-term efforts would have to relate to a mix of both qualitative and quantitative approaches. Nevertheless, focus on measures such as increased mobility of launchers and electronic counter measures such as the use of stealth technology, change in doctrinal planning - perhaps to launch-on-warning (LOW) procedures, leading to hair trigger alert - and consolidating the command and control system would be the obvious choices by Pakistan in the short term. However, some of these may be highly destablising, especially LOW. Till a qualitative improvement can be made in the delivery systems, the focus would remain on the quantitative approach. But since a mix of both is required for optimum results certain qualitative countermeasures to deceive the adversary, accompanied by opaque nuclear forces to deter the launching of a preemptive strike, would also have to be adopted. In the long term Pakistan would have to seriously look at acquiring advance technologies, such as perfecting cruise technology, and reducing the gap of the conventional asymmetry between Pakistan and India, to neutralise the effect of Missile Defence systems. However, simultaneously Pakistan can also pursue a diplomatic course to bring about a strategic understanding between India and Pakistan by suggesting an ABM treaty between India or Pakistan, or effectively negotiating a zero missile regime between the two States.

CONCLUSION

The US decision to withdraw from the ABM treaty, and its efforts to put in place a limited National Missile Defence in the United States as well as placing TMD systems, has impacted the international debate on missile proliferation. The unhindered transfer/ induction of ABM technologies or the missile technologies in South Asia, would lead to the stability-instability paradox, where the cleavages in the robust deterrence at the strategic level would raise not only the threshold of one side to initiate low intensity conflicts, under the concept of limited war, but would also increase the risk of an unintended war, as counter measures would include changes in the deployment patterns of the two sides, alongside a transformation from recessed deterrence to active deterrence.

With Kashmir being a live issue, the threshold for nuclear use in the region would be lowered much more than what prevails presently. Similarly, the expansion of offensive and defensive technologies in countries such as Pakistan and India would require a robust command and control system to reduce the threat of the accidental launches; the threat of nuclear terrorism i.e sub-national groups taking control of or attacking the numerous nuclear facilities in the region; the threat of a knee jerk reaction to launch a counter strike against the other. With delivery systems and nuclear weapons existing in the state of full deployment, which would be the natural fallout if the TMD systems were transferred to India. Given the very short missile flight time between Pakistan and India, the risk of pre-emptive nuclear strikes by the two nuclear neighbours would increase significantly. The implications would be destabilising for regional security, as the presence of ABM technologies in a nuclearised South Asian environment would automatically raise the level of threat, insecurity and misperceptions in the region.

This will be the obvious fallout of the US decision to deploy NMD systems, as this would automatically mean the creation of an international environment where the transfer of advance missile technologies would be transferred to political allies under the garb of defensive technologies, while keeping strict control on export to other countries facing these threats.

In the final analysis, at least in the short and the medium-term, the Indian missile shield and its accompanying systems can only upset the equation of deterrence, depending upon what route India follows for the acquisition of ABM technology. Given the variety and the versatility of different means available, missiles, technologies, and its vast territory, India cannot attain a nation-wide credible defence against Pakistani missile attack. However, coupled with India's developments in enhancing India's offensive capability and the operationalisation of its draft nuclear doctrine, the prospect of instability in the region has greatly increased.

In the changed milieu, after the post September 11, 2001 period, nuclear powers like Israel, Russia, China and the US would have more flexibility to engage in the proliferation of missile-related technologies. The changing security structures at the regional levels will, therefore, see a greater instability in terms of the balance of power. This would lead to a horizontal proliferation of missile technology, at the cost of the international arms control agenda. The rapid rate of technology transfer has increased the threat of missile proliferation worldwide.

As a result of the US decision to continue its tests of the Ballistic Missile Defence (BMD) systems, the global focus has shifted towards the development of offensive weapons. Hence efforts are required to be made, not only at the international level, but also at the regional level, to limit the fallout effects of the transfer of Missile Defence technologies.

AUTHOR BIO: Maria Sultan, is a Senior Associate and Pakistan Representative of Cornell Caspian Consulting.

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