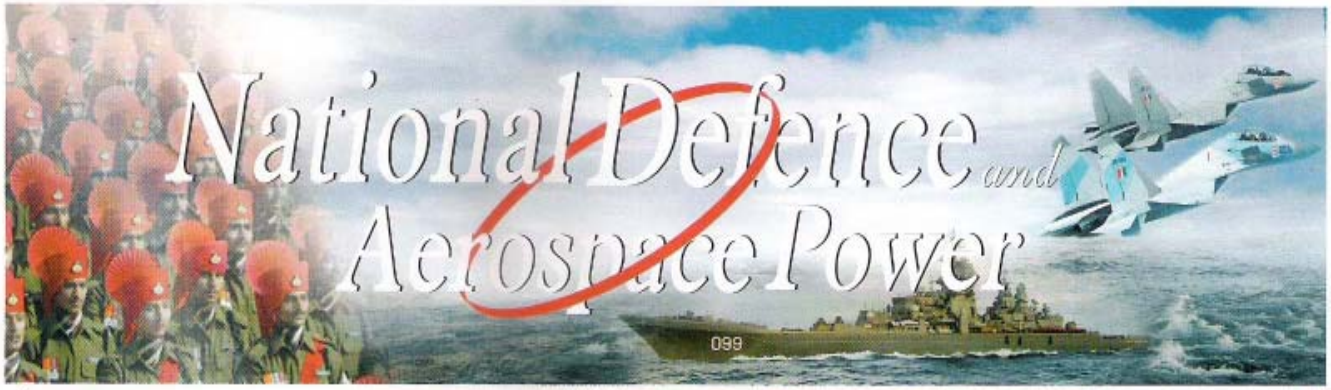

Centre for Air Power Studies ISSUE BRIEF
08\09 15 April 2009

Ballistic Missile Defence for India
Necessity, Imperatives and Implications

*Wg Cdr Anand Sharma**

On March 06, 2009 Defence Research and Development Organisation (DRDO) conducted its third successful anti-ballistic missile test. After achieving a hat-trick of successful tests of the ballistic missile defence (BMD) programme, DRDO announced that the first phase of development of missile defence shield would be through by 2011. Buoyed by the successful testing of its fledgling ballistic missile defence, India is pushing ahead with an ambitious phase–II of the missile defence project, capable of shooting down incoming ICBMs in the 5,000 km range.

India's ability to put in place a robust missile defense system on its own has been demonstrated with the tests conducted in November 2006 and December 2007, wherein, interception of an incoming missile was conducted in exothermic and endothermic modes, respectively. The test dated March 06, 2009 using Prithvi Air Defence (PAD) interceptor at 75 km altitude provides that the program has reached a sufficient maturity level to engage IRBMs up to 2,000 km. The new guidance system employed with the PAD interceptor provides it the capability to tackle the manoeuvers of enemy's missile of Russian Topol M class which move in a zigzag manner.

India's ability to put in place a robust missile defense system on its own has been demonstrated with the tests conducted in November 2006 and December 2007, wherein, interception of an incoming missile was conducted in exothermic and endothermic modes, respectively.

With this recent accomplishment, the DRDO has achieved its aim of developing a two-layered defensive system. Missile shield aims to engage and intercept incoming missile in space, such that the debris would burn up before reaching the earth's surface. However, if the attempt of engagement in space fails, the Advance Air Defence (AAD) missile would engage the target at about 20 km height.

Threat Perception and Necessity for Missile Defence

India faces a serious security threat from missiles in its neighbourhood armed with weapons of mass destruction (WMD), i.e. nuclear, biological and chemical warheads. India is besieged with its nuclear armed neighbours, i.e. China and Pakistan with whom it has border and territorial disputes that have resulted in overt and innumerable covert wars in last six decades. The ever growing missile and nuclear arsenal of both the countries adds to India's security concerns.

China's military modernisation as evident in the development of long range ballistic missile, sea based access denial capabilities and huge inventory of precision strike weapons alter the strategic balance. India is especially concerned that Chinese access to Myanmar port facilities would confront Indian naval forces in the Indian Ocean. Chinese ASAT lethality is a matter of additional concern for India. Its engagement with Pakistan makes the threat even more complex. China-Pakistan nexus, which renders Pakistan its nuclear and missile capabilities places India in a labyrinth of complex strategic challenges of balancing the regional power calculus.

As of 2008, Pakistan's nuclear-capable ballistic missiles include the Ghaznavi (Hatf-3, range 400km), Shaheen-I(Hatf-4,range 450km),and the Ghauri (Hatf-5,range 1,200km).Cruise missile 'Babur' has a range of 500-700 km and was first tested in August 2005.In August 2007, Pakistan tested a second nuclear-capable cruise missile, the air-launched Ra'ad (Hatf-8)[1].The intense bitterness over Kashmir, an on-going low-intensity conflict since the mid-1980s,crises over military exercises in

**Wg Cdr Anand Sharma is a Research Fellow at the Centre for Air Power Studies, New Delhi.*

1986-87, 1990, nuclear testing in 1998, armed conflict in the Kargil sector in 1999 and aggressive missile testing does not bode well for stability in the region.

India's 'No First Use' policy and its nuclear and long-range power projection programs as instruments for maintaining 'minimum deterrence' aim at achieving strategic stability by building a capacity to endure a first nuclear strike and still be able to respond with a force that could cause unacceptable damage. However deterrence failure can not be ruled out in its nuclear strategic relationship with Pakistan. The expectation of restraint from a military leadership controlling the missile and nuclear arsenal of Pakistan would be faulty judgment.

Post 26/11, Pakistan has been very vocal about its nuclear option against any Indian retaliatory action. This approach of Pakistan's nuclear strategy portrays a low nuclear threshold irrespective of the nature and scale of the conflict[2].

The chaos that is engulfing Pakistan appears to represent a frightening case of strategic blowback. Pakistan's nurturing of the Taliban and their brethren have grown too strong and seem to beyond the control of the civilian leadership. Pakistan's Swat Valley, where militant culture is taking root is neither tolerant nor passive in nature. The country has substantial arsenal of nuclear weapons. The tribal area, which harbours thousands of Taliban militants, are believed to be hosting Al Qaeda's senior leaders, including Osama bin Laden.[3] Al Qaeda's interest in procuring nuclear material is long established.[4] A Q Khan's secret nuclear supply network has compounded the precariousness of weapon's diversion in the hands of non-state actors for whom deterrence by threat of reprisal does not hold ground.

India's security concerns and objectives include the need to deter both Pakistan and China. The ballistic missile with a nuclear warhead is essentially a strategic weapon, employed for its deterrence value. Last six decades, demonstrate that ballistic missiles with conventional warheads have been used in regional conflicts. The 1980-88 Iran-Iraq war, Libyan attacks on Lampedusa Island, Operation Desert Storm and the war in Afghanistan demonstrated the capability of ballistic missiles to threaten a full range of targets for political and military purposes. Conventional missile strikes at airfields or key logistics hubs can influence the pace and scope of military operations. Ballistic missiles are clearly becoming common battlefield weapon that attain the same results against an adversary without escalating the conflict towards the use of nuclear weapon. Iraq demonstrated that missile armed only with conventional warheads were effective terror weapons. The Scud attacks on civilian population centers affected coalition military strategy and constrained US options for employing available allied forces in other operational missions. The capability to protect non-combatants becomes increasingly vital. Defending against such missile threats is a global challenge. It is not possible to distinguish whether these missiles are nuclear or conventional, but the response takes only several minutes, and can occur automatically. The use of ballistic missiles with conventional warheads could provoke a retaliatory nuclear strike.

India has become one of the fastest growing economies of the world. India with its vast military, huge manpower and economic prowess could become a regional power but economic priorities and growth need to be supported by corresponding military capability. A militarily weak nation will not be able to protect its economic strength. For India to achieve and maintain a continental status in the future, it needs to match or outdo adversary's capabilities.

Ballistic missile defence is not foolproof but a robust missile defence system buys time and blunts the political effects. Absence of a missile defence capability in such a security scenario will leave India vulnerable to potential nuclear blackmail.

No country can afford to keep its civilian and military assets and its population vulnerable to missile attack especially in the light of adversary's brinkmanship and obligated collapse of threshold due to non state actors despite availability of BMD technology which is reasonably capable against ballistic missile strike. Missile defence is also a moral issue because homeland defence, the physical security of country's territory and citizens is the prime national security priority and ultimate moral responsibility of every state.

Given the profound implications, it is of crucial significance that India should accord adequate attention to the issue. At present, ballistic missiles with nuclear warheads have a psychological impact to deter the adversary by threatening him with 'unacceptable damage' in case of any misadventure, but it is wise to develop and perfect missile defence. Though ballistic missile defence is not foolproof but a robust missile defence system buys time and blunts the political effects. Absence of a missile defence capability in such a security scenario will leave India vulnerable to potential nuclear blackmail.[5]

Indian Missile Defence Efforts and Options

In 1983, when New Delhi initiated an "Integrated Guided Missile Development Program", it included not only offensive missiles such as the nuclear-capable Prithvi and Agni, but also Akash, a surface-to-air missile for the air

defence role. Later in the 1990s, DRDO initiated conceptual missile defence studies.

Initially, India's BMD plans revolved around the evaluation of three distinct systems: the Israeli Arrow, American PAC-3 missile defence system, Russian S-300VM and the Russian S-300 PMU-1/2. India has received presentations from the three countries which have operational BMD or anti-ballistic missile systems. All of these systems have advantages and disadvantages that are worth considering, even though, it would be more beneficial to have an indigenous system catering to India specific security needs.

The DRDO has laid the foundation of India's BMD architecture, having carried out three successful flight tests of its new interceptor missiles, named PAD for the exo-atmospheric version and AAD for the endo-atmospheric variant. Dr V.K. Saraswat, chief controller, R&D and programme director (air defence) DRDO, said that Indian BMD would be better than the American PAC-3 anti-missile system which is now 'outdated'. However, he, acknowledged the Indian BMD programme has received help from countries like Israel (LRTRs), France (fire-control radars) and Russia (seekers) for "bridging technology gap and accelerating technology development." [6] The third successful test-firing of India's new BMD system on March 06, 2009 has reinforced the claim of DRDO that the system will offer an initial operating capability by 2011, with hit-to-kill probability of 99.8 percent[7]. The BMD system would be declared operational after six more test-firings, including an integrated trial in which two interceptors will be launched at an incoming ballistic missile. One, to destroy it at an altitude of 40 km and the other to annihilate falling debris at a height of 15 km.[8]

India's missile defence requirements will be more oriented towards lower tier threats; however it would be practical to have a comprehensive architecture that can meet all realistic threats including air-breathing cruise missiles.

While India has resolved to build BMD indigenously, it would be advisable to enter into collaborative development programs with carefully selected private Indian and foreign firms. India must gain access to already proven or developed systems available with friendly countries in order to reduce the timeline of the development of its own systems. Israel collaborated with US for its Arrow program which benefited Israel financially and US gained technological inputs and spin offs for development of its own systems. MEADS program, is also an example of cooperation amongst the countries for the development of BMD. The difficulty may not be in the development of interceptors themselves but building up the network of sensors and a command and control system to make the whole system credible.

India had earlier imported two Green Pine Israeli radars for its own use which is the critical component of Israel's Arrow missile defence system. The third BMD test also involved testing of the indigenously developed "Swordfish" long-range tracking radar. This radar is an acknowledged derivative of the Israeli Green Pine long range radar and has been developed by DRDO in collaboration with Israel and France. Its production is being taken up concurrently by the Electronics and Radar Development Establishment (LRDE) in Bangalore in association with the private sector.

Space based early warning systems to supplement the powerful long-range radars especially in the western Himalayan Mountains is an utmost necessity. The powerful radar could cover most of the possible launch sites of the adversary. But, satellites would still be needed to cover the whole of Pakistan and to provide a secure and unambiguous warning of a launch event. The IRS (Indian Remote Sensing) and Cartosat series of remote sensing spacecraft have provided some of the capability required to build an equivalent of the space defence support program (DSP). Though India could gain access to the US DSP and SBIRS (Space Based Infra Red System) information the same way as NATO, Israel, Japan, and South Korea, however, it would be reasonable to develop the capability of space based surveillance, detection and tracking through home grown technology. This is not an impossible proposition given the technical expertise already attained by ISRO.

India's missile defence requirements will be more oriented towards lower tier threats; however it would be practical to have a comprehensive architecture that can meet all realistic threats including air-breathing cruise missiles. India's existing air defence capabilities enabled by acquisition of Aerostats radar, the Akash surface-to-air missile operating in conjunction with the indigenous Rajendra surveillance & engagement radar needs to be integrated especially against low-flying cruise missiles, aircraft and unmanned aerial vehicles. Indigenous 'Integrated Air Command and Control System (IACCS)' being operationalised by this year end would integrate the ADGES (Air Defence Gound Equipment System) with airborne platforms, Aerostats radars, UAVs and other terminal air defence weapon system radars. The Phalcon AWACS acquisition and its integration into the air defence

set up would immensely enhance the capability of low level detection which is singularly a major issue for cruise missile and UCAVs detection.[9]

Hezbollah's rocket rain provides a scary example where an adversary may opt for short range missiles and rockets launched with a view to saturate the defences. The next priority of India's missile defence programme should be to counter enemy missile salvos in concentrated attacks. Accordingly, Indian missile defence system would need to attain multiple target interception capability.

One cheap and effective method to defeat missile defence is the use of countermeasures. Therefore, it is imperative for a BMD to cater for numerous countermeasures. Boost phase interception (BPI) offers several advantages in this regard. Firstly the interception challenge is significantly simplified as the destruction of incoming missile is at a time when it is most vulnerable. Secondly, the BPI takes place over enemy territory.

Sea-based, theatre missile defences (TMD) provide tactical and strategic leverage given the vulnerability of the long Indian coastline and growing trade through the Indian Ocean. Sea-based assets can be forward deployed on areas of potential conflict and represent a powerful peacetime message. Sea based BMD has advantage of the attributes of naval forces including overseas presence, mobility, flexibility, quick response and sustainability in order to provide lower tier protection to ports, coastal airfields, amphibious objective areas, own forces ashore, and other high value sites.

Deployable directed energy weapons (High energy laser) will present a new capability to destroy ballistic missiles, but more importantly, a foundation to build entirely new defence architecture. DRDO has announced that directed energy missile defence system is also under development.

Is BMD a Panacea?

Missile defence is no silver bullet and does not offer foolproof guarantee of interception of every missile and survivability of innocent non-combatants. Any amount of sophistication can not provide 100% safety from a missile attack and the possessor of missile defence will always be vulnerable, may be with lesser risk but potentially high consequences.

Active defenses can never be considered in and of themselves a panacea still, missile defence has value in limiting the damage. It adds uncertainty to the calculation of any potential attacker. Some missile defence is evidently better than no missile defence. BMD is yet to be proven in an actual battle scenario nevertheless, the advancement in technology provides that the system is viable and whether or not it is a new mantra in present strategic context.

High cost of missile defence will be a significant factor for India. On the other hand, nothing can justify remaining exposed to the risk. The political cost of lacking a missile defence is unimaginable. The financial constraint for not developing missile defence cannot be the argument for a rational state. Indeed, it is a moral imperative. Further, for any growing economy like India the BMD has intrinsic merit in projecting a sovereign image.

Conclusion

Spectacular progress in computers, propulsion systems and space science has improved accuracy, speed, lethality, agility and survivability of missiles manifolds. Their operational characteristics make them an appealing instrument to which states willingly devote their scarce resources in order to cater for their regional security concerns. In operational employment ballistic missiles essentially fit in as suitable weapons in tactical as well as strategic planning.

India has announced its plan to develop a two tier BMD system capable of intercepting both inside (endo-atmospheric) and outside (exo-atmospheric) the earth's atmosphere. Also, India is moving forward in developing the necessary infrastructure to develop missile defence systems including space based detection capabilities.

Combating ballistic missile threat even in conventional conflict situation is a formidable task and this puts acquisition of BMD in perspective. India has announced its plan to develop a two tier BMD system capable of intercepting both inside (endo-atmospheric) and outside (exo-atmospheric) the earth's atmosphere. Also, India is moving forward in developing the necessary infrastructure to develop missile defence systems including space based detection capabilities. Though, planned for deployment by 2011, it would be more hard work now to develop a credible comprehensive architecture, especially catering for low level air breathing threats.

There are multiple implications of Indian BMD: India has to develop its capabilities in boost phase as well as in terminal phase interception. Sea based and land based mobile system would provide effective theatre defences capable of responding in a timely manner. Indian missile defence program has entered in to Phase-II with the challenge of providing defence against ICBMs of range up to 5,000 km with interceptor having speed 6-7 Mach,

thus somewhat reducing India's vulnerabilities. Another interesting spin-off of the indigenous two-tier BMD system will give India a potent anti-satellite (ASAT) weapon since the technology required for neutralisation of a ballistic missile or a satellite is somewhat similar.

With the India-US nuclear deal coming to fruition, BMD cooperation also represents a new avenue for enticing India into further strategic alignments with Washington. The growing recognition by US, that the partnership with a democratic, secular, militarily strong and economically prosperous India could be a force of stability and balance in South Asia. US willingness to assist India in building an anti-missile defense capacity is a cause for concern for both China and Pakistan. In case, these efforts commence to succeed, Pakistan could see the credibility of its nuclear deterrent meaningfully degraded. [10]All these developments will have negative fallout in South Asian security context, and thus Indian effort to acquire a hedge against capability of China and Pakistan, individually as well as collectively, is an utmost necessity.

Notes:

1 www.nti.org/e-research/profiels/index.html

2 Manpreet sethi, 'Pakistan's Flamboyance', *Nuclear Security,* Vol. 3, no.7, February 01,2009.

3 Dexter Filkins, "The long road to chaos in Pakistan', *International Herald Tribune,* September 29, 2008.

4 Thomas Omestad, 'Nuclear Weapons for All?, *US News,* January 15, 2009.

5 'Pak's N-bomb prevented Indian retaliation after 26/11', *Indian Express,* March 9, 2009.

6 'Indian Ballistic Missile better than American: DRDO scientist', *Zee News.com: Indian edition,* March 09 <http://www.zeenews.com/nation/2009-03-09/513782news.html>

7 Rahul Singh, 'DRDO claims to better US, Russias missile defence', *Hindustan Times,* New Delhi, March 09, 2009.

8 Rahul Bedi, 'Indian BMD shield could be in service by 2011' *Janes News,* 17 March 2009 <http://www.janes.com/news/defence/idr/idro90317_1_n.shtml>

9 Group Captain Atul Kumar Singh, 'Deficiency in Air Defence Radar Cover,' National Defence and Aerospace Power, *Centre for Air Power Studies, Issue Brief: 03/08,* December 10, 2008.

10 "India, US: The Potential for Ballistic Missile Defence Cooperation", *Sratfor*, January 18, 2008, <www.stratfor.con/analiys's\india_us_military_potenyial_missile_defence_cooperation.

Centre for Air Power Studies

The Centre for Air Power Studies (CAPS) is an independant, non-profit think tank that undertakes and promotes policy related research, study and discussion on defence and military issues, trends, and development in air power and space for civil and military purposes, as also related issues of national security. The Centre is headed by Air Cmde Jasjit Singh, AVSM, VrC, VM (Retd) Centre for Air Power Studies.

P-284, Arjan Path, Subrota Park, New Delhi 110010
Tel: +91 11 25699130/32, Fax: +91 11 25682533

Editor: Ms Shalini Chawla e-mail: shalini@aerospaceindia.org