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BALLISTIC MISSILE DEFENCE: A STRATEGIC COMPULSION FOR INDIA

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Abstract :-

India is confronted by China and Pakistan, bothholding a large inventory of nuclear weapons and missiles. There is, therefore a strategic compulsion for India to acquire a BMD System. The Indian Ballistic Missile Defenceis a two tiered system consisting of two interceptor missiles, Prithvi Air Defence (PAD) and Advanced Air Defence (AAD). India is the fourth country to have developed an Anti-ballistic missile system, after United States, Russia and Israel. PAD is a two stage missile. The first stage is liquid fuelled while second stage is solid fuelled. Guidance is provided by inertial navigation system and mid-course updates from long range tracking radar. PAD can engage incoming ballistic missilesin exo atmosphere at an altitude of 50-80 Km. Prithvi Air Defence missile has been named as Pradyumna. AAD is an anti-ballistic missile system designed to intercept incoming ballistic missiles in endo atmosphere at an altitude of 30 km. AAD is single stage, solid fuelled missile. Guidance is similar to that of PAD. Anti- Cruise Missile Barak-8 is a long-range anti cruise missile defence system being developed jointly by Israel and India. Anti-Radiation Missile.India is also developing an Anti-Radiation Missile which will destroy enemy advance warning systems. Anti-Satellite Missile.In 2013 DRDO confirmed that India has the building blocks in place for an anti-satellite system. Testing will be done electronically without actual destruction of a satellite to avoid the risk of space debris.

ORIGINAL ARTICLE

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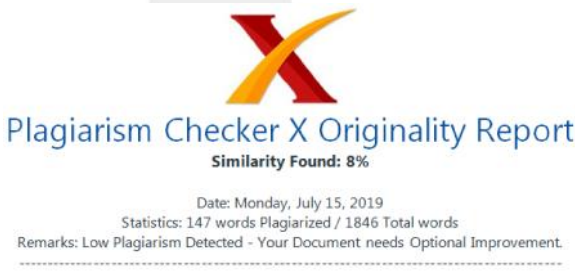

Key Words :-

Missiles, Nuclear Doctrine, BMD System

Introduction :-

India finds itself in a unique security dilemma – confronted by two nuclear neighbors: China with an inventory of about 270 nuclear weapons and hundreds of sophisticated ballistic missiles; and Pakistan with an arsenal of around 140 nuclear weapons, which is rapidly growing (as against India's 130 nuclear weapons). Further, Pakistan has developed new nuclear capable, short-range nuclear ballistic missile, the HATF- IX (also referred to as Nasr). Not only has it declared the possession of tactical nuclear weapons but conveyed its intended first use in the battlefield to offset India's conventional superiority. An accidental launch or an inadvertent launch based on strategic miscalculations by Pakistan should be considered by India as a realistic threat assessment. With the proliferation of terrorist organizations in Pakistan, supported by its own military or ISI, the probability of nuclear weapons falling into the hands of terrorist organization or even to Jihadi or radical elements within the Army cannot be ruled out. Between 2007 and 2012 terrorists carried out six attacks against Pakistan's sensitive military installations, some of which are believed to house nuclear components, and the terrorists demonstrated an ability to penetrate progressively deeper. India has in place its declared Nuclear Doctrine to counter nuclear threat by other nations. But challenge lies in countering ballistic missile attacks by non-state actors or even an accidental launch as described above.

There is, therefore a strategic compulsion for India to acquire a selective or limited BMD System for the following reasons :-

- In the event of an accidental or an inadvertent launch, BMD capability will allow space and time for India to evaluate Pakistan's intent and may also provide an opportunity to resolve and reconcile, rather than escalate.
- The deterrence effect of BMD is also applicable when non-state actors target state actors. For example, if Pakistan based non-state actors or rogue elements from Pakistan's armed forces target India with nuclear weapons, New Delhi will be able to neutralize it and get a breathing space and time to comprehend the situation before an appropriate response.
- BMD system strengthens public and government confidence in own deterrence capability.
- BMD system increases stability and gives India the choice of keeping its nuclear weapons at lower state of readiness, with a belief that its second-strike capability will remain intact.

Description :-

The Indian Ballistic Missile Defence Program is an initiative to develop and deploy a multi-layered Ballistic missile defence system to protect India from hostile missile attacks. It is a two tiered system consisting of two interceptor missiles, namely Prithvi Air Defense (PAD) missile for high altitude interception at exo-atmospheric altitudes of 50-80 km, and the Advanced Air Defense (AAD) Missile for lower altitude interception at endo-atmospheric altitudes of up to 30 km. PAD was tested in November 2006, followed by AAD in December 2007. Thus, India became the fourth country to have successfully developed an Anti-ballistic missile system, after United States, Russia and Israel.

Prithvi Air Defence (PAD) :-

It is an anti-ballistic missile developed to intercept incoming ballistic missiles outside atmosphere (Exo atmosphere). Based on the Prithvi missile, PAD is a two stage missile. The first stage is a liquid fuelled motor that uses two propellants and oxidizers while second stage is solid fuelled. Guidance is provided by inertial navigation system, mid-course updates from long range tracking radar (LRTR) and active radar homing in the terminal phase. PAD has capability to engage 300km class of ballistic missiles at a speed of Mach 4.The Prithvi Air Defence missile has been named as Pradyumna.

Prithvi Air DefenceSystem was tested on November 2006 in which PAD Missile successfully intercepted a modified Prithvi-II Missile at an altitude of 50 km. Prithvi-II Ballistic Missile was modified successfully to mimic the trajectory of M-11 missiles.On 6 March 2009 DRDO carried out a second successful test of the PAD interceptor missile. The target used during the test was a ship launched Dhanush missile which followed the trajectory of a missile with range of a 1,500 km (930 mi). The target was tracked by Swordfish (LRTR) radar and destroyed by the PAD at 75 km altitude.

PrithviDefence Vehicle (PDV) :-

In 2009, the DRDO started developing a new exo-atmospheric interceptor missile named the PrithviDefence Vehicle (PDV) interceptor missile. It is a two-stage missile and both the stages are powered by solid propellants. It has an innovative system for controlling the vehicle at an altitude of more than 150 km. The PDV is intended to replace the existing PAD in the PAD/AAD combination. It has an Infinite Impulse Response (IIR) seeker for its kill vehicle as well. The PDV will replace the PAD with a far more capable missile and will complete the Phase 1 of the BMD system. Whereupon Phase 2 development will take over for protection against missiles of the 5,000 km (3,100 mi) range class. On 27 April 2014 first PDV was successfully test conducted by DRDO. On 11 February 2017, DRDO successfully conducted second test for PDV missile.

Advanced Air Defence (AAD) :-

It is an anti-ballistic missile designed to intercept incoming ballistic missiles in endo atmosphere at an altitude of 30 km. AAD is single stage, solid fuelled missile. Guidance is similar to that of PAD- Inertial Navigation System, based on midcourse updates from ground based radar and active radar homing in terminal phase. It is 7.5 meters tall, weighs around 1.2 ton and a diameter of less than 0.5 meters.

On 6 December 2007, AAD successfully intercepted a modified Prithvi-II missile acting as an incoming ballistic missile enemy target. The endo-atmospheric interception was carried out at an altitude of 15 km. The target information was sent to Mission Control Centre (MCC) for further processing. MCC classified the target, calculated the trajectory of the missile and assigned the target to AAD Battery located on Wheeler Island, 70 km across the sea from Chandipur. AAD hit the target at an altitude of 15 km and at a speed of Mach 4. After two successful interceptor missile tests carried out by India, the scientists have planned that the AAD missile could be modified into a new extended range (up to 150 km (93 mi)) surface-to-air missile.

On 26 July 2010, and 6 March 2011, India successfully test-fired its interceptor missile which destroyed a 'hostile' target ballistic missile, a modified Prithvi, at an altitude of 16 km over the Bay of Bengal. The interceptor, Advanced Air Defence (AAD) missile positioned at Wheeler Island, about 70 km across sea from Chandipur, received signals from tracking radars installed along the coastline and travelled through the sky at a speed of 4.5 Mach to destroy it.

In February and November 2012, India again successfully test fired its home-made supersonic Advanced Air Defence (AAD) interceptor missile and successfully destroyed mid-air, an incoming ballistic missile launched from the Integrated Test Range in Chandipur.

On 6 April 2015 an improved AAD in terms of bigger warhead, improved maneuverability and reduced mis-distance was tested. The missile was launched from a canister and the composite rocket motor fired successfully.

On 28 Dec 2017, DRDO successfully carried out AAD missile test in which an incoming modified Prithvi ballistic missile was intercepted and destroyed with a direct hit. On 3 August 2018, a successful test was carried out from Abdul Kalam Island where one of multiple incoming targets simulating 1500 km class ballistic missiles was destroyed.

DefenceAgainst Cruise Missile :-

Defending against an attack by a cruise missile on the other hand is similar to tackling low-flying manned aircraft and hence most methods of aircraft defence can be used for a cruise missile defence system. Barak-8 is a long-range anti-air and anti-missile naval defence system being developed jointly by Israel Aerospace Industries (IAI) and the Defence Research and Development Organisation (DRDO) of India. The naval version of this missile has the capability to intercept incoming enemy cruise missiles and combat jets targeting its warships at sea. It would also be inducted into the Indian Air Force, followed by the Army. India has a joint venture for this missile with Israel.

Deployment :-

The strategic thinkers are of the opinion that the Indian BMD System should be employed to provide protection to nuclear assets, command and control centers and the political leadership so as to ensure survivability of the second-strike retaliatory capability and thereby strengthen India's stance of 'No First Use'. However, technologically Indian BMD System may not be in a position to undertake such an extensive task. Subsequent to India's latest successful test launch of PDV on 12 February 2017, DRDO in confident that this interceptor missile defence system gives multi-layered capability, both for medium and short range missiles. For India, this means protection primarily on the Western front against Pakistan. This helps India create a credible defence system against rogue attacks. In fact, the first choice for a Theatre Missile DefenceSystem is for the defence of troops, command centres and even population centres; as being followed by the United States and NATO. Reportedly, India is contemplating to deploy its initial BMD system in the Western Sector of Rajasthan. According to DRDO the missiles will work in tandem to ensure a hit probability of 99.8 percent. However, the cost is the most prohibitive factor. As per present estimates the missile shield of Delhi alone will cost approximately Rs 5000.00 crore.

Future Developments :-

Phase 2 Missile Defence System :-

In phase 2, two new anti-ballistic missiles are being developed. This system will be based on the AD-1 and AD-2 hypersonic interceptor missiles with speeds of Mach 6 to 7, hence they will take lesser times to intercept. These interceptors will be capable of intercepting IRBM/ICBMs missiles, with ranges greater than 5,000 km, which follow a distinctly different trajectory than a missile with a range of 2000 km or less. This will involve integration of multiple sensors, combining of various interceptors, and the ability to discriminate between warheads and decoys and ultimately a computerized command and control system. The software

and communication challenges of this system are massive - linking in real time the many distributed sensors, the command and control systems, the interceptors and their guidance systems.

Anti-Radiation Missile :-

India is developing an Anti-Radiation Missile (ARM) that will help destroy enemy advance warning systems. Production of the ARM is being done on a priority basis by the Defence Research and Development Laboratory (DRDL), which specialises in missile development. Such missiles can be mounted on the Sukhoi Su-30 MKI fighter planes.

Anti-Satellite Missile :-

India is also developing anti-satellite weapons. Following the successful Agni-V ICBM test, this looks all the more achievable. In 2013 DRDO confirmed that India has the building blocks in place for an anti-satellite system. A little fine tuning may be required but that will be done electronically without a physical test (actual destruction of a satellite) because of the risk of space debris affecting other satellites. According to some researchers, in space, the probability of debris hitting a satellite is more than an adversary taking your satellite down.

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