

**LEARNING CORNER**

# **DEFENCE FORCES OF INDIA**

## **(PART - III)**

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*In the third and last part of our series on the Defence Forces of India, we present a roundup of the missile armoury available in our country.*

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**I**n 1983, India launched the Integrated Guided Missile Development Programme (IGMDP) to develop and produce a variety of missiles. The missiles would cater to the need of surface-to-air and surface-to-surface roles. While the Defence Research and Development Organisation (DRDO) oversees the development of Prithvi, Trishul, Akash, Nag, and Astra missile systems, the Bharat Dynamics Limited (BDL) produces the Agni series.

### **Agni**

Agni means fire. The Agni family of strategic ballistic missiles is the backbone of the Indian missile-based nuclear deterrence. The following are the variants of the Agni missile:

- *Agni-TD / TTB* (Technology Demonstrator / Technology Test Bed)
- *Agni-I is a SRBM* (850 km range, 1000 kg payload)
- *Agni-II is an IRBM* (3300 km range, 1000 kg payload)
- *Agni-IIAT is a IRBM* (3900 km range, 1000 kg payload)
- *Agni-III is a IRBM* (5500 km range, 1200 kg payload)

The last two are in the development stage. As of now, Agni-I can reach the whole of Pakistan. To meet the Chinese threat, India is developing the

more sophisticated version of Agni-II. The Agni-II is designed to be launched from a rail-mobile launcher that can move on a standard broad-gauge rail system. On the other hand, the technology test-beds (TTDs) have been designed as a road-mobile system. There are advantages and disadvantages of this change. A rail- and / or road-based missile system reduces vulnerability and allows for greater operational flexibility, while critics feel that the cost of these mobile systems could be higher and that they greatly increase the time for moving from one place to another. Considering that except in some parts - for instance, India's north-eastern region - road infrastructure is available wherever rail tracks are available, the decision to become rail-mobile could mean, in strategic terms, that deployment in India's north-eastern region is to be considered a serious possibility. Since Agni-II is road and rail mobile, it lends flexibility and reduces vulnerability to strikes.

### **Akash**

Akash meaning sky, is a medium-range, theatre defence, surface-to-air missile (SAM). It operates in conjunction with the Rajendra surveillance & engagement radar. The Akash uses an integral ramjet rocket propulsion system to give a low-volume, low-weight (700 kg launch weight) missile configuration, and has a low reaction time - from detection to missile launch - of 15 seconds. This allows the missile to carry a heavier warhead (60 kg). Akash has a range of 27 km, with an effective ceiling of 15 km. It is capable of detecting and destroying aircraft flying at tree-top height. Current research focusses on ways to increase speed, maximum altitude and range to 60 km.

**LEARNING CORNER****Astra**

Astra is a state-of-the-art Beyond Visual Range Air to Air Missile (BVRAAM) designed for a range of over 80 km in head-on mode and 20 km in tail-chase mode. It can engage highly manoeuvring targets. The goal of this programme is to provide the Indian Air Force (IAF) with an indigenously-designed BVRAAM to equip the IAF's Mirage 2000, MiG-29, Su-30MKI and the Light Combat Aircraft (LCA). In June 2004, a Rs 1000-crore national project to develop a futuristic BVRAM missile 'Astra' was launched for delivery by 2009. The missile is expected to be at the high-end of tactical missiles, and propel India into the exclusive club of countries to possess such missiles. The US has a similar missile but heavier, while Israel also has a BVR missile, but the range is comparatively shorter. The Mirage 2000H has been designated as the first potential platform for the Astra when the weapon enters service at the end of this decade.

**BrahMos**

BrahMos, the world's fastest anti-ship missile, is the result of a Indo-Russia joint venture in missile development. It is a Supersonic Cruise Missile that can be launched from submarine, ship, aircraft and land-based Mobile Autonomous Launchers (MAL). The missile is launched from a Transport-Launch Canister (TLC), which also acts as storage and transportation container. Primarily BrahMos is an anti-ship missile. It has the capability to engage land-based targets also. The missile can be launched either in vertical or inclined position and can cover 360 degrees. The BrahMos missile has identical configuration for land, sea and sub sea platforms. The air-launched version has a smaller booster and additional tail fins for stability during launch.

**Prithvi**

Prithvi meaning Earth, is named so as it is a surface-to-surface missile (SSM). Defence experts

regard the Prithvi as among the most modern short-ranged battlefield missiles in the world. The Prithvi missile comes in four variants:

- *SS-150 / Prithvi-I* is a battlefield support system for the army (range 150 km, 1000 kg payload). It is a single stage, dual engine, liquid fuel, road-mobile, short-range surface-to-surface missile
- *SS-250 / Prithvi-II* is dedicated to the Indian Air Force (range 250 km, 500 - 750 kg payload). It is a single stage, dual engine, liquid fuel, road-mobile, short-range surface-to-surface missile.
- *SS-350 / Prithvi-III* is a solid fuelled version with a 350 km range and a 1000 kg payload. It is a two stage, solid fuel, road-mobile, short-range, surface-to-surface missile. Sagarika and Prithvi-III are two different acronyms for the same missile. The Government has launched a related programme known as Project K-15 that would enable the missile to be launched from a submerged submarine.
- *Dhanush* meaning bow, is a system consisting of a stabilisation platform (Bow) and the Missile (Arrow). The system can fire either the SS-250 or the SS-350 variants.

Project Devil and Project Valiant laid the foundation for the development of Prithvi. Prithvi has been supplied to the Army to form the 333 Missile Group based in Secunderabad. Since then, two additional units have been formed the 444 Missile Group and 555 Missile Group.

**Nag**

Nag (Cobra) is a third generation, all weather, top-attack, fire-and-forget anti-tank guided missile. The missile uses a tandem HEAT (High Explosive Anti Tank) warhead to penetrate ERA (Explosive Reactive Armour) or composite (Chobham type) armour that is found in the latest

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tanks. The system is expected to supercede Indian production of the Soviet origin 9K113 *Konkours* and Euromissile Milan M2 anti-tank missiles. The Nag is claimed to be first anti-tank missile which has a complete fiberglass structure.

**Trishul**

Trishul meaning Trident, is a short range, quick reaction, all weather surface-to-air missile (SAM) designed to counter a low-level attack. It has been flight tested in the sea-skimming role and also against moving targets. It has a range of 9 km and is fitted with a 5.5 kg HE-fragmented warhead. The missile can engage targets like aircraft and helicopters, flying between 300 m/s and 500 m/s by using its radar command-to-line-of-sight guidance. It operates in the K-band (20 - 40 GHz), which makes it difficult to jam. The Trishul missile

had been intended to be a multi-service design. The Indian Air Force, which had intended to adopt the Trishul for an airfield-defence role, recently turned against the project. The Army has also stated that the Trishul was unlikely to meet its requirements for a replacement for the Russian-designed OSA-AKM (SA-8b *Gecko*) self-propelled SAM system. The Indian Navy had designed recent warships to include the Trishul as their armament, so the decision not to make the system operational is likely to require selection of an alternative system and modification of the warships that were to use the Trishul missile. This led to an expansion of the Indian procurement of the Israeli-built Barak SAM system, of which seven systems have already been ordered, with a plan for procuring another 10 systems. □

**Do You Know?**

**Development Indicators 2005**

With 1.9 billion people **East Asia and the Pacific** is the largest of the World Bank's six developing regions and the fastest growing region in the world. Between 2002 and 2003, regional GDP grew by 8.1 percent, compared to an average of 7.6 percent for 1990-2003. Strong economic growth has lowered poverty rates faster than anywhere else in the world. Social indicators remain a matter of concern. The under-5 mortality rate has fallen from 59 per 1,000 in 1990 to 41 in 2003, but at this rate of progress the region will fall short of achieving a two-thirds reduction by 2015. And the region lags in infrastructure. At present only 78 percent of its population receives water from an improved source, 49 percent has access to improved sanitation facilities, and approximately a quarter of its roads are paved. But the region leads all developing country regions in high-technology exports, which are 33 percent of manufactured exports.

**South Asia** has the second lowest GNI per capita (\$510) and some of the highest levels of child malnutrition in the world, with 48 percent of children below the standards for weight by age. It has the highest rate of youth illiteracy—23 percent for males and 38 percent for females—and, at 35 percent, the lowest rate of access to sanitation facilities. The economy, which grew by 5.4 percent a year between 1990-2003, due in large part to growth in India, depends more heavily on agriculture than any other region. With only about 7 personal computers per 1,000 people, South Asia lags behind other regions in access to information and communications technology.

Source: [www.worldbank.org](http://www.worldbank.org)