

STUDY FOR CIVIL SERVICES

MISSILES OF INDIA – EVERYTHING

YOU WANT TO KNOW !!

History :-

In 1970s, the Defence Research & Development Laboratory (DRDL) undertook the Project Devil and Project Valiant.

The **Project Devil** was aimed to produce short range surface-to-air missile.

The **project Valiant** was aimed to produce **long-range** ballistic missile. **Both Projects were considered failures**. Project Valiant was terminated in 1974 and Project Devil ended in 1980.

Then Came IGMDP

Integrated Guided Missile Development Program (**IGMDP**) was **launched in 1983 to develop five missile systems** in the country viz.

Trishul, Akash, Nag, Prithvi and Agni-I (intermediate-range surface-to-surface missile).

In **1990s**, the program was **expanded to develop the long range Agni Missile, Sagarika** (ballistic missile), **Surya** (medium-range version of the Agni ballistic missile) and **Dhanush** (naval version of the Prithvi).

In 2008, the DRDO announced the **successful completion of the program**.

Difference b/w Ballistic and Cruise Missile :-

A ballistic missile follows a ballistic trajectory, a cruise missile doesn't.

I.e. **one is powered on its way "up"** and the **other is powered throughout its journey**. Cruise missiles also normally have **on-board guidance and can follow pre-set paths to the target**, including offset approaches.

A ballistic missile is **fired into the air and once it's run out of fuel, continues to its target using an unpowered, ballistic path**.

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A cruise missile is **fired and continues toward the target under its own power** until it strikes its target.

Cruise missile are **smaller** & slower with wings.

Ballistic missiles are **larger** & faster with no wings.

A cruise missile is an unmanned, self-guided (usually) turbine-powered airplane that depends on aerodynamic lift:



A ballistic missile is a (usually) rocket-powered booster that propels its warhead on ballistic (i.e. not aerodynamic) trajectory:



Trishul

It is a **short-range surface-to-air** missile developed by DRDO with an operational range of **9 km**.

Akash

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It is a medium-range surface-to-air missile designed by DRDO with a range of 30 km.

It can reach an altitude of 18 km. It can be fired from both tracked and wheeled platforms.

Nag

It is a third-generation "fire and forget" anti-tank guided missile.

NAG will be produced in two basic variants: land version and air launched version.

Originally Nag would have been available with 3 types of guidance: a wire guided version, an infra-red version and a millimetric wave (mmW) active radar homing version.

But DRDO failed to develop a wire guided system.

The missile is launched from 3 platforms:

NAMICA (NAG missile carrier),

HAL Dhruv Helicopter and

HAL Light Combat Helicopter.

HeliNa, the much awaited Helicopter launched version of 'Nag', the Anti-Tank Guided Missile (ATGM)

HELINA (HELicopterNAG) is an advanced variant of NAG and is based on 'lock-on after launch' system extending its range to 7 km.

Prithvi Missile Series

Prithvi missiles are tactical short range surface-to-surface ballistic missiles. There are 3 variants of it.

Prithvi-I is an Army Version with 150km range and 1,000kg payload capacity.

Prithvi-II is an Air Force Version with 250-350 km range and 500kg payload capacity.

Prithvi-III is a Naval Version with 350km range and 1000kg payload capacity.

Agni missile series

Agni missile are medium to intercontinental range ballistic missiles.

Agni-I is a medium range (700 km to 1,200 km) missile with one stage.

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Agni-II is an intermediate range (2,000 km to 2,500 km) missile with two stages.

Agni-III is an intermediate range (3,000 km to 5,000 km) missile with two stages.

Agni-IV is an intermediate range (2,500 km to 3,700 km) missile with two stages.

Agni-V is an intercontinental (5,000 km to 8,000 km) missile with three stages.

Agni-VI is an intercontinental (10,000 km to 12,000 km) missile with three stages.

The Agni-I, Agni-II, Agni-III and Agni-IV are in service with Indian Army.

Agni-V is under testing. Agni-VI is under development.

K Missile Series

The K family of missiles is a submarine-launched ballistic missile (SLBM).

They are being developed to provide second-strike capabilities and thus the nuclear deterrence.

There are three variants:

K-15 (Sagarika), K-4 and K-5.

K-15 has 750km range.

K-4 missile has two sub-variants, one with 3,500km range and the other with 5,000km range.

K-5 is under development with a range of 6,000km.

The K family of missiles are used with nuclear powered Arihant class submarines.

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Shaurya

It is a **short range surface-to-surface** ballistic missile developed for Indian Army.

Its range is 700km and is **capable of carrying a payload of one ton conventional or nuclear warhead.**

NOTE:-

The rate at which objects **travel faster than the speed of sound is expressed** in terms of supersonic and hypersonic speeds.

Such speeds are measured in terms of Mach.

Mach number is defined as the **ratio of speed of the aircraft to the speed of sound.**

Supersonic speed ($> \text{Mach } 1$) is the rate of travel which exceeds the speed of sound, also referred to as Mach 1 speed

Hypersonic speeds ($> \text{Mach } 5$) correspond to very high supersonic speeds. They are basically Mach 5 speeds or five times the speed of sound

BrahMos

BrahMos **supersonic cruise missile** is designed and developed by BrahMos Aerospace, a **joint venture of India and Russia.**

It is **capable of being launched from land, sea, sub-sea and air against sea and land targets.**

It is **capable of carrying a warhead of 300 kilogram** and **can be launched from ships, land and submarines.**

It **has top supersonic speed of Mach 2.8.** It can strike a target at maximum range of 290-km.

It **is two-stage** missile, the first one being solid and the second one ramjet liquid propellant.

BrahMos II

It is a **hypersonic cruise missile** and it is the second of the BrahMos series of cruise missiles. It is expected to have a range of 290 km and a speed of **Mach 7.** It will be **powered by a scramjet engine instead of a ramjet one.**

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SCRAMJET = variant of a ramjet airbreathing jet engine

Subsonic <speed of sound

Nirbhay

It is **long range subsonic cruise missile**. The **low altitude flying missile** can evade detection by radars by flying at tree top level.

It **can strike targets that are more than 700 km away** also and is **capable of carrying nuclear warheads**.

It **can also hover over targets**, unlike other missile.

It **also has a "fire and forget" system** which **cannot be jammed by the enemy**.

Prahaar

It is a **solid fuelled surface-to-surface guided short-range ballistic missile**.

It would be equipped with omni-directional warheads and could be **used for strike both tactical and strategic targets**. Its operational range is 150km.

Astra

It is **India's first beyond-visual-range air-to-air missile** designed and developed indigenously by DRDO.

It is **capable of attacking targets with varying range and altitudes allowing for engagement of both** short-range targets (up to 20 km) and long-range targets (up to 80 km) using alternative propulsion modes. Its test flights are launched from Su-30Mki.

Barak-8

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It is a long-range anti-air and anti-missile naval defence system jointly developed by India and Israel.

It is a surface-to-air missile.

Anti-Radiation Missile

It is designed to detect and home in on an enemy radio emission source.

Anti-Satellite Missile

It is under consideration for development.

Indian Ballistic Missile Defense Program

The program aims to develop and deploy a multi-layered ballistic missile defence system

to protect from ballistic missile attacks.

It is a double-tiered system consisting of the Prithvi Air Defence (PAD) missile for high altitude interception, and the Advanced Air Defence (AAD) Missile for lower altitude interception.

Prithvi Air Defence (PAD)

It is an anti-ballistic missile developed to intercept incoming ballistic missiles outside the atmosphere (exo-atmospheric).

PAD is a two-stage missile with a maximum interception altitude of 80 km.

Advanced Air Defence (AAD)

It is an anti-ballistic missile developed to intercept incoming ballistic missiles in the endo-atmosphere at an altitude of 30 km

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Prithvi I	SRBM	Surface to Surface	150 Km	4.4 Ton	1 Ton	Not in service
Prithvi II	SRBM	Surface to Surface	350 Km	4.6 T	0.5 T	In service
Prithvi III	SRBM	Surface to Surface	600 Km	5.6 T	0.5 T	In service
Dhanush	Naval variant of Prithvi II	Sea to Sea/Surface	350 Km	4.6 T	0.5 T	In service
Akash	Short Range	Surface to air	30 Km	720 Kg	60 Kg	In service
Trishul	Short range for Navy	Surface to air	9 Km	130 Kg	5 Kg	Not in service
Astra	Beyond visual range,	Air to Air	80 Km	154 Kg	15 Kg	In service
Nag	Fire and forget, anti tank, guided	Surface to surface, Air to surface	4 Km	42 Kg	8 Kg	In service
Brahmos	Cruise missile	Land, Naval, Air	300 Km	3 T	200 Kg	In service
Nirbhay	Stealth, subsonic, Cruise	Land, Naval, Air	1000 Km	1 T	100 Kg	In Production stage
Agni I	MRBM, Single Stage	Surface to Surface	1250 Km	12 T	1 T	In service
Agni II	IRBM, Two Stage	Surface to Surface	3000 Km	16 T	1 T	In service
Agni III	IRBM, Two Stage	Surface to Surface	5000 Km	22 T	2.5 T	In service
Agni IV	IRBM, Two Stage	Surface to Surface	4000 Km	17 T	2 T	In service
Agni V	ICBM, 3 stage	Surface to Surface	8000 Km	50 T	1.5 T	In service
Agni VI	ICBM, 4 stage	Surface to Surface	12000 Km	70 T	3 T	Development stage
Shaurya	Hypersonic, Canister launched	Surface to Surface	700-1900 Km	6.2 T	1 T	In service
Prahaar	Tactical Ballistic Missile, Quick reaction, Omnidirectional warhead	Surface to surface	150 Km	1280 Kg	200 Kg	In service
K4	SLBM (Submarine launched ballistic missile)	Under water to surface	3500 Km	17 T	2 T	In Development

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Sagarika (K15)	SLBM	Under water to surface	700 Km	6 T	1 T	In service
Barak 1	SRSAM, (short range surface to air missile) , Ship Defense	Ship to air, Ship to surface	12 Km	98 Kg	22 Kg	In service, fitted on Shivalik class frigates
Barak 8	SRSAM, Ship Defense	Ship to air, Ship to surface	90 Km	275 Kg	60 Kg	In service, fitted on Kolkata class destroyers

Defence Missile

Prithvi Air Defence (PAD)	India	Exo-atmospheric Anti-ballistic missile	Altitude-80km	Mach 5+
Advanced Air Defence (AAD)	India	Endoatmospheric Anti-ballistic missile	Altitude-30km	Mach 4.5
Prithvi Defence Vehicle (PDV)	India	Exo-atmospheric Anti-ballistic missile	Altitude-120km	

Cruise Missiles

Nirbhay	India	Subsonic cruise missile(Ship, submarine, aircraft and land)	1,000 -1500 km	Mach 0.8
BrahMos	Russia & India	Supersonic cruise missile(Ship, submarine, aircraft and land)	290 km	Mach 2.8 to 3
BrahMos II	India	Hypersonic cruise missile(Ship, submarine, aircraft and land)	300km	Mach 7

Anti-Tank Missile

Nag	India	Anti-Tank Guided Missile	4km	230 m/s
Helina(HELICOPTER launched NAg)	India	Anti-Tank Guided Missile	7-8km	
Amogha-1	India	Anti-Tank Guided Missile	2.8 km	

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Submarine Launched Ballistic Missiles

Sagarika (K-15)	India	Ballistic Missile	700 – 1900Km	Mach 7+
K-4	India	Ballistic Missile	3,500– 5,000 km	Mach 7+
K-5	India	Ballistic Missile	6,000 km	
Ashwin	India	Ballistic Missile	150- 200km	Mach 4.5

Surface-To-Air Missiles

Akash	India	Medium-range surface-to-air missile	30- 35km	Mach 2.5 to 3.5
Barak 8	Isreal/India	Long Range surface to air Missile	100 km	Mach 2
Trishul	India	Short Range surface to air missile	9km	