

India's Air Defense System

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Manifest pedagogy: India's Air Defence System is getting robust by every new move. May it Mission Shakti or the new technologies being adopted. International opinions and the speculations on the same is also important for CSE.

In news: India's indigenous Ballistic Missile Defence (BMD) programme is completed.

Placing it in syllabus: Achievements in Indian defense sector

Dimensions:

- PAD and AAD air defence systems
- Mission Shakti
- S-400 Triumph deal for India's air defence



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Content:

PAD and AAD air defence systems:

India has several systems in place to defend against incoming aerial targets like fighter jets, cruise missiles and air-to-surface missiles. These are:

Akash mid-range surface-to-air missile (SAM) system: It is a medium range nuclear capable supersonic missile built by DRDO. The missile system can target aircraft up to 30 km away, at altitudes up to 18,000 m. It is in operational service with

the Indian Army and the Indian Air Force.

Ballistic Missile Defence (BMD) program:

BMD is a system that is designed to intercept and destroy an incoming ballistic missile on its trajectory much before it approaches the target. India's ballistic missile defence system provides a **two-layered shield – 'exo' and 'endo'**. The BMD system **consists of a Prithvi Air Defence (PAD) missile and an Advanced Air Defence (AAD) Missile** for high and low altitude interception.

Prithvi Air Defence (PAD) system:

- It is supposed to tackle incoming missiles at **ranges of 80-120 km (exo-atmospheric interception)**.
- **Also known as Pradyumna, PAD is a two stage missile based on the Prithvi missile.**
- **The first stage is liquid fuelled and the second stage is solid fuelled.**
- The missile is equipped with manoeuvre thrusters for lateral acceleration.
- It can engage the ballistic missiles (300km-2,000km range) at a speed of **can Mach 5**.
- It uses long range tracking radar for target acquisition and fire control.
- Trajectory optimisation enables interception at both higher and lower altitudes.

Advanced air-defence (AAD) system:

- AAD is a **single stage solid rocket propelled guided missile** which **consists of Akash Surface-to-Air missiles (SAM)**.
- It can intercept incoming ballistic missiles at **altitudes of up to 30km (endo-atmospheric interception)**.
- It is equipped with an inertial navigation system, advanced computer and an electro-mechanical activator.

- The AAD has a length of 7.5m, diameter less than 0.5m and weight of around 1.2t.
- The missile can be launched from an 8 x 8 Tatra transporter-erector.
- PAD and AAD are primarily to stop ballistic missiles which soar towards targets at supersonic speeds.

((The **two other major air defence systems with India are Spyder and Barak 8**. While Spyder has a range of just 15 kilometres, Barak 8, a joint project of the DRDO and the IAI, has a longer range of at least 70 kilometres)).

Mission Shakti:

- On March 27, 2019 DRDO successfully conducted Mission Shakti, **an anti-satellite missile test**.
- India has successfully demonstrated its capability to intercept a satellite in outer space based on indigenous technology thus **joining a select group of nations – USA, Russia and China** with a similar technology.
- India used the **Kinetic Kill space technology**.
- Test was done in a lower atmosphere to ensure **no space debris**.
- Whatever debris was generated will decay and fall on the earth within two weeks.
- The test was done to verify whether India has the capability to safeguard space assets.

((The principal international treaty on space is the 1967 Outer Space Treaty of which India is a signatory and ratified it in 1982)).



The capability achieved through the Anti-Satellite missile test **provides credible deterrence against threats to our growing space-based assets from long range missiles and proliferation in the types and numbers of missiles**.

S-400 Triumph deal for India's air defence:

- India is set to purchase S-400 Triumph air defence missile systems **from Russia** and by 2023 these systems would be delivered to India.
- The IAF's air defence missiles can currently only engage targets 40 km away.
- The S-400 more than quadruples the IAF's missile reach.
- The contract worth \$5.43 billion to acquire S-400 Triumph was signed during the visit of President Putin to India in 2018.
- S-400 Triumph is **one of the world's most advanced air defence systems.**
- The S-400 Triumph **integrates** a multifunction radar, autonomous detection and targeting systems, anti-aircraft missile systems, launchers and command and control centre.
- The highly automated S-400 has radars that can **pick up an incoming object up to a 1,000 kilometres away**, track several dozen incoming objects simultaneously, **distribute the targets to appropriate missile systems** and ensure a high success rate.
- The missiles can strike fast moving targets such as fighter aircrafts with a **high hit probability.**
- It can **also be used against ground installations.**
- The missiles are **resistant to electronic jamming.**
- Deploying one S-400 system allows one to **cover an entire spectrum of aerial threats.**