Indian Inventions

Ballistic Missile Defence System

A Shield in the Sky

Imagine a situation where a missile is launched towards a country. It travels at extremely high speed, faster than sound, and can reach its target in minutes.

Now imagine another system that can **detect, track, and destroy that missile in mid - air before it reaches its target.**

That powerful protective system is called the **Ballistic Missile Defence (BMD) System.**

India is among a few countries in the world developing such advanced defence systems through organisations Defence Research and Development Organisation

What is a Ballistic Missile?

A ballistic missile:

- Is launched into the atmosphere
- Travels in a curved path
- Falls towards the target due to gravity

What is a BMD System?

A **Ballistic Missile Defence System** is:

- A system that detects incoming missiles
- Tracks their path using radar
- Launches interceptor missiles to destroy them

It acts like a **shield protecting the country.**

Do you know?

BMD systems require split - second decisions

Why is BMD Important?

- Protects cities and people
- Prevents damage from enemy attacks
- Strengthens national security

India's BMD system shows:

- Advanced scientific capability
- Strong defence research
- Growth in technology.

Where is it used?

- Around important cities
- Strategic defence zones
- Military bases

Who Develops It?

India's BMD system is developed by scientists and engineers from **Defence Research and Development Organisation**

The Problem

Ballistic missiles:

- Travel at very high speeds
- Follow long - range trajectories
- Can carry dangerous payloads
- Difficult to detect early
- Very little time to respond
- High risk to cities and infrastructure

The Opportunity

Develop systems that can:

- Detect missiles early
- Track accurately
- Destroy them mid - air

This leads to innovations in:

- Radar technology
- Missile guidance systems
- Space and aerospace engineering.

DIY Activity: Trajectory Experiment

Throw a ball in an arc.

Observe projectile motion

Scientific Concepts in BMD

1. Radar Technology

Radar works by:

- Sending radio waves
- Detecting reflected signals
- Helps in locating missiles.

2. Interceptor Missiles

- Launched to destroy incoming missiles
- Use guidance systems to hit targets

3. Guidance Systems

- Track position and speed
- Adjust direction during flight

4. Exo-Atmospheric & Endo - Atmospheric Interception

- **Exo - atmospheric** → outside Earth's atmosphere
- **Endo - atmospheric** → inside atmosphere

Step - by - Step Working Procedure

1. **Detection:** Radar detects an incoming missile
2. **Tracking:** The system calculates speed and path
3. **Decision Making:** The command centre decides on interception
4. **Launch Interceptor:** A missile is launched to intercept
5. **Destruction:** The incoming missile is destroyed mid - air

Advantages of the BMD System

- Protects lives and infrastructure
- Reduces risk during attacks
- Enhances national security
- Encourages technological growth

Limitations & Challenges

- Extremely high cost
- Complex technology
- Requires precise timing
- Not 100% foolproof

Fun Fact

Only a few countries have advanced BMD systems.

Answer in your own words

- What is radar?
- Why is BMD important?
- List the countries with advanced BMD systems?

Conclusion

The Ballistic Missile Defence System is a powerful example of how science protects nations. They create a protective shield in the sky.