



Multiple Independently Targetable Re-entry Vehicle Technology

[Source: IE](#)

Why in News?

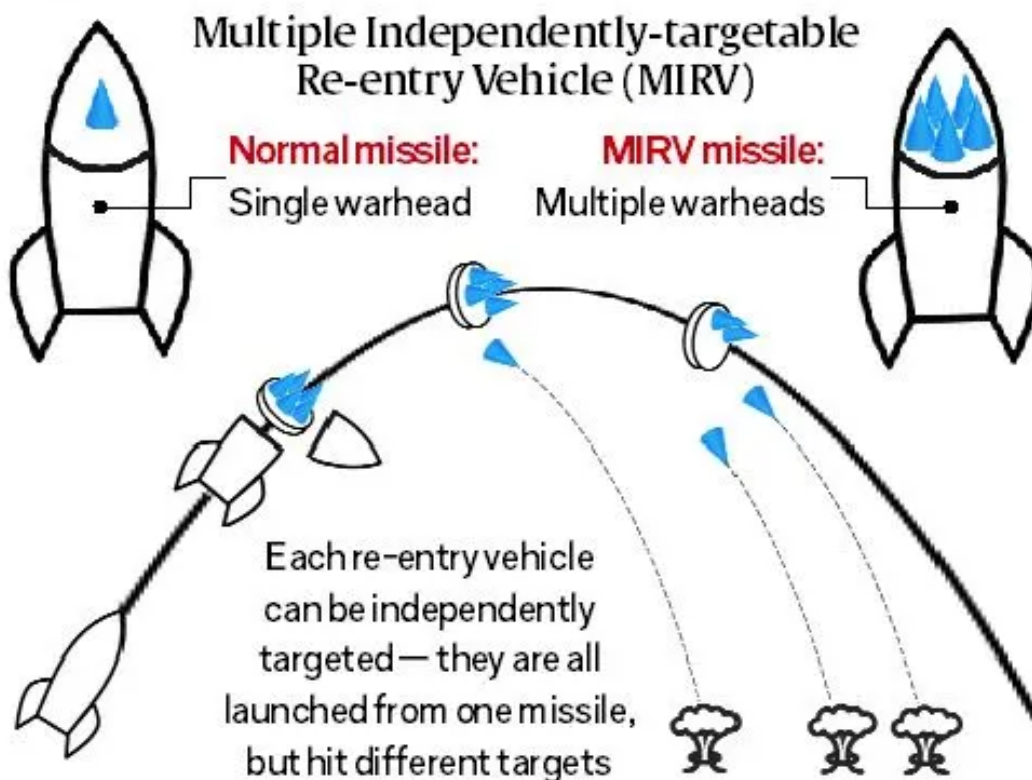
India has recently made a significant advancement in missile technology, joining the select group of nations possessing **Multiple Independently Targetable Re-entry Vehicle (MIRV) capabilities**.

- This milestone was achieved through the successful **flight test named Mission Divyastra**, conducted by the [Defence Research and Development Organisation \(DRDO\)](#). It marked the first time the indigenously developed [Agni-5 missile](#) integrated MIRV technology.

What are the Key Facts About MIRV Technology?

- **Inception:**
 - MIRV technology originated in the **United States**, with the deployment of a **MIRVed Intercontinental Ballistic Missile (ICBM) in 1970**.
 - MIRV allows a **single missile to carry multiple warheads (3-4)**, each capable of targeting different locations independently.
 - MIRV technology enhances the **missile's effectiveness by increasing the number of potential targets** it can engage.
 - MIRVs can be launched from both land-based platforms and sea-based platforms, such as submarines, expanding their operational flexibility and range.
- **Global Adoption and Proliferation:**
 - Nations possessing MIRV technology include major nuclear powers such as the **United States, the United Kingdom, France, Russia, China, and India**, while Pakistan tested the technology (Ababeel Missile) in 2017.
 - The test flight of **Agni-5** marked the **first time that the MIRV technology was tested in India**, which aims to deploy multiple warheads at different locations in a single launch.
 - The Agni-5 weapon system is equipped with indigenous avionics systems and high-accuracy sensor packages, which ensured that the re-entry vehicles reached the target points within the desired accuracy.
- **Strategic Significance:**
 - MIRVs were initially designed to **enhance offensive capabilities** rather than to defeat ballistic missile **defences**.
 - Their ability to deploy multiple warheads independently makes them significantly more challenging to defend against compared to traditional missiles.
- **Challenges:**
 - Deploying MIRV technology presents complex challenges, including the **miniaturisation of warheads**, the development of **advanced guidance systems**, and ensuring the reliability of individual re-entry vehicles.
 - Addressing these challenges is crucial for maintaining the effectiveness and reliability of MIRV systems in strategic operations.

ONE MISSILE, MANY WARHEADS



Agni-5 Missile

- Agni is an **Inter-continental ballistic missile (ICBM) developed indigenously** by the DRDO.
- It is capable of carrying nuclear warheads and has a target range of more than 5,000 km. It uses a three-stage solid-fuelled engine.
 - Agni-5 has been successfully tested several times since 2012. In December 2022, DRDO also tested the night-time capabilities of Agni-5.
- **Missiles in Agni Family:**
 - **Agni I:** Short-range ballistic missile (Range more than 700 km).
 - **Agni II:** Medium-range ballistic missile (Range more than 2000 to 3500 km).
 - **Agni III:** Intermediate-range ballistic missile (Range more than 3000 km).
 - **Agni IV:** Intermediate-range ballistic missile (Range more than 3500 km).
 - **Agni-P (Agni Prime):** A **nuclear-capable**, two-stage **canisterised** solid propellant ballistic missile (Range 1,000 to 2,000 km).
- The next upgrade of the Agni missile, **Agni-6**, is expected to be a full-fledged **intercontinental ballistic missile with a range well over 7,000 km**.

FORMIDABLE ARSENAL

SURFACE-TO-SURFACE MISSILES		
Short Range Ballistic Missiles		
Prithvi-I	150 km	1,000 kg
Prithvi-II	250 km	500 kg
Prithvi-III	350 km	1,000 kg
Dhanush	350 km	1,000 kg
Agni-I	700 km	1,000 kg
Shaurya	700 km	1,000 kg
Prahaar	150 km	200 kg
Intermediate Range Ballistic Missiles (IRBMs)		
Agni-II	2,000 km	1,000 kg
Agni-III	3,000 km	2,000-2,500 kg
Agni-IV	4,000 km	1,000 kg
Intercontinental Range Ballistic Missiles (ICBMs)		
Agni-V	5,000 km	1,500 kg ((3-10 MIRV))
Agni-VI (Under Development)	6,000 km	1,000 kg (10 MIRV)
Surya (Under Development)	10,000 km	1,000 kg (10 MIRV)

SUBMARINE LAUNCHED BALLISTIC MISSILES		
K-15 Sagarika (B-05)	750 km	500 kg
K-4	3,000 km	1,000 kg

SHORT RANGE SURFACE-TO-AIR MISSILES		
Trishul	9 km	5 kg
Akash	30 km	50 kg
Maltri	15 km	10 kg
Barak-8	70 km	60 kg

ANTI-TANK GUIDED MISSILES		
Nag Anti-tank guided missile	7 km	8 kg
Hellina (Helicopter launched Nag missile)	7 km	8 kg

ANTI-BALLISTIC MISSILES		
Prithvi Air Defence Missile (Exo-atmospheric at 50-80 km altitude)	2,000 km	DM (Proximity)
Advanced Air Defence Missile (Endo-atmospheric at 15-30 km altitude)	150-200 km	DM (Hit-to-kill)
Prithvi Defence Vehicle (Exo-atmospheric at more than 120 km altitude)	2,000-3,000 km	DM (Proximity)

CRUISE MISSILES		
Subsonic Cruise Missiles		
Nirbhay	750-1,000 km	500 kg
Supersonic Cruise Missiles		
BrahMos	290 km	300 kg
Hypersonic Cruise Missiles		
BrahMos-II	290 km	300 kg

AIR-TO-AIR MISSILE		
Astra	80-110 km	15kg

Read more: [Agni-5 Ballistic Missile](#)

UPSC Civil Services Examination, Previous Years Questions (PYQs)

Prelims:

Q1. What is "Terminal High Altitude Area Defense (THAAD)", sometimes seen in the news? (2018)

- (a) An Israeli radar system
- (b) India's indigenous anti-missile programme
- (c) An American anti-missile system
- (d) A defence collaboration between Japan and South Korea

Ans: (c)

Q2. With reference to Agni-IV Missile, which of the following statements is/are correct? (2014)

1. It is a surface-to-surface missile.
2. It is fuelled by liquid propellant only.
3. It can deliver one-tonne nuclear warheads about 7500 km away.

Select the correct answer using the code given below:

- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (a)

Mains:

Q. How is S-400 air defence system technically superior to any other system presently available in the world? (2021)

