



# Solid Fuel Ducted Ramjet Technology

## Why in News

The [Defence Research and Development Organisation \(DRDO\)](#) has successfully conducted the test of the **Solid Fuel Ducted Ramjet (SFDR) technology**, which is crucial for the indigenous development of long range air-to-air missiles.

## Key Points

### ▪ Solid Fuel Ducted Ramjet (SFDR) Technology:

- SFDR technology is a missile propulsion system based on the concept of [Ramjet Engine](#) principle.
- The system utilises a **solid fuelled** air-breathing ramjet engine.
  - Unlike solid-propellant rockets, the Ramjet takes up oxygen from the atmosphere during flight. Thus, it is light in weight and can carry more fuel.
- DRDO began developing SFDR first in 2017 and had conducted successful tests in 2018 and 2019 as well.

### ▪ Significance:

- Successful demonstration of SFDR technology will enable DRDO to **develop indigenous long range air-to-air missiles**.
- At present, such technology is available only with a **handful of countries in the world**.
- Air-to-air missiles which use SFDR technology can **achieve longer ranges** as they **do not require oxidisers** (take oxygen from the atmosphere).
- The missile based on SFDR **fly at supersonic speeds and high manoeuvrability ensures** the target aircraft cannot get away.

### ▪ Defence Research and Development Organisation:

- Defence Research and Development Organisation (DRDO) works under the administrative control of the **Ministry of Defence, Government of India**.
- It is working to establish a world class science and technology base for India and provides Defence Services decisive edge by equipping them with internationally competitive systems and solutions.
- It was established in 1958 after combining **Technical Development Establishment (TDEs) of the Indian Army** and the **Directorate of Technical Development & Production (DTDP)** with the **Defence Science Organisation (DSO)**.
- It is responsible for carrying out **Integrated Guided Missile Development Programme (IGMDP)**.
- Some of the recent tests conducted by DRDO:

- [Helina and Dhruvastra: Anti-tank Guided Missile](#)
- [Smart Anti Airfield Weapon](#)
- [Army Variant of MRSAM](#)
- [Land-attack Version of BrahMos Missile](#)
- [Quick Reaction Surface-to-Air Missile System](#)

- [Enhanced Version of Pinaka Mk-1 Missile](#)
- [NAG Missile: Anti Tank Guided Missile](#)

## Ramjet

- A ramjet is a form of air-breathing jet engine that uses the vehicle's forward motion to compress incoming air for combustion without a rotating compressor.
- Ramjets work most efficiently at supersonic speeds but they are not efficient at hypersonic speeds.

## Integrated Guided Missile Development Programme

- IGMDP was the brainchild of renowned scientist [Dr. APJ Abdul Kalam](#).
- It was intended to **attain self-sufficiency** in the field of missile technology.
- After keeping in mind the requirements of various types of missiles by the defense forces, the program recognized the need to develop five missile systems.
- The IGMDP formally got the approval of Indian government on 26<sup>th</sup> July, 1983.
- The missiles developed under IGMDP are:
  - Short-range surface-to-surface ballistic missile - **Prithvi**
  - Intermediate-range surface-to-surface ballistic missile - **Agni**
  - Short-range low-level surface-to-air missile - **Trishul**
  - Medium-range surface-to-air missile - **Akash**
  - Third generation anti-tank missile - **Nag**

[Source: PIB](#)

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