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 26th 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