Solid Fuel Ducted Ramjet Booster

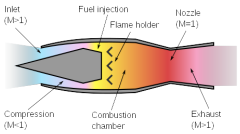
Why in News?

Recently, India successfully flight tested **Solid Fuel Ducted Ramjet (SFDR) Booster**, a missile system, at the Integrated Test Range (ITR) in Chandipur off the Odisha coast.

- The **Defence Research and Development Organisation (DRDO)** began developing SFDR first in 2017 and had conducted successful tests in 2018 and 2019 as well.

What is SFDR?

- **About:**
  - It is a missile propulsion technology jointly developed by **India and Russia.**
  - SFDR technology is a missile propulsion system based on the concept of **Ramjet Engine** principle.
    - 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.
    - In a ramjet, the **high pressure is produced by "ramming" external air into the combustor** using the forward speed of the vehicle. The external air that is brought into the propulsion system becomes the working fluid.
    - Ramjets **produce thrust only when the vehicle is already moving**, ramjets cannot produce thrust when the engine is stationary or static. //



  - 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.
  - The SFDR has been developed by **Defence Research and Development Laboratory, Hyderabad** in collaboration with other **DRDO laboratories** such as Research Centre Imarat, Hyderabad and **High Energy Materials Research Laboratory, Pune.**

- **Significance:**
  - It enables the **missile to intercept aerial threats at very long range** at supersonic speeds.
  - 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.**

What is the Defence Research and Development Organisation?

- **About:**
    - 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 the 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 the** 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**

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Q. 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)

- Agni-IV is a nuclear-capable long-range ballistic missile of India, with a strike range of 4,000 km.

Source: IE