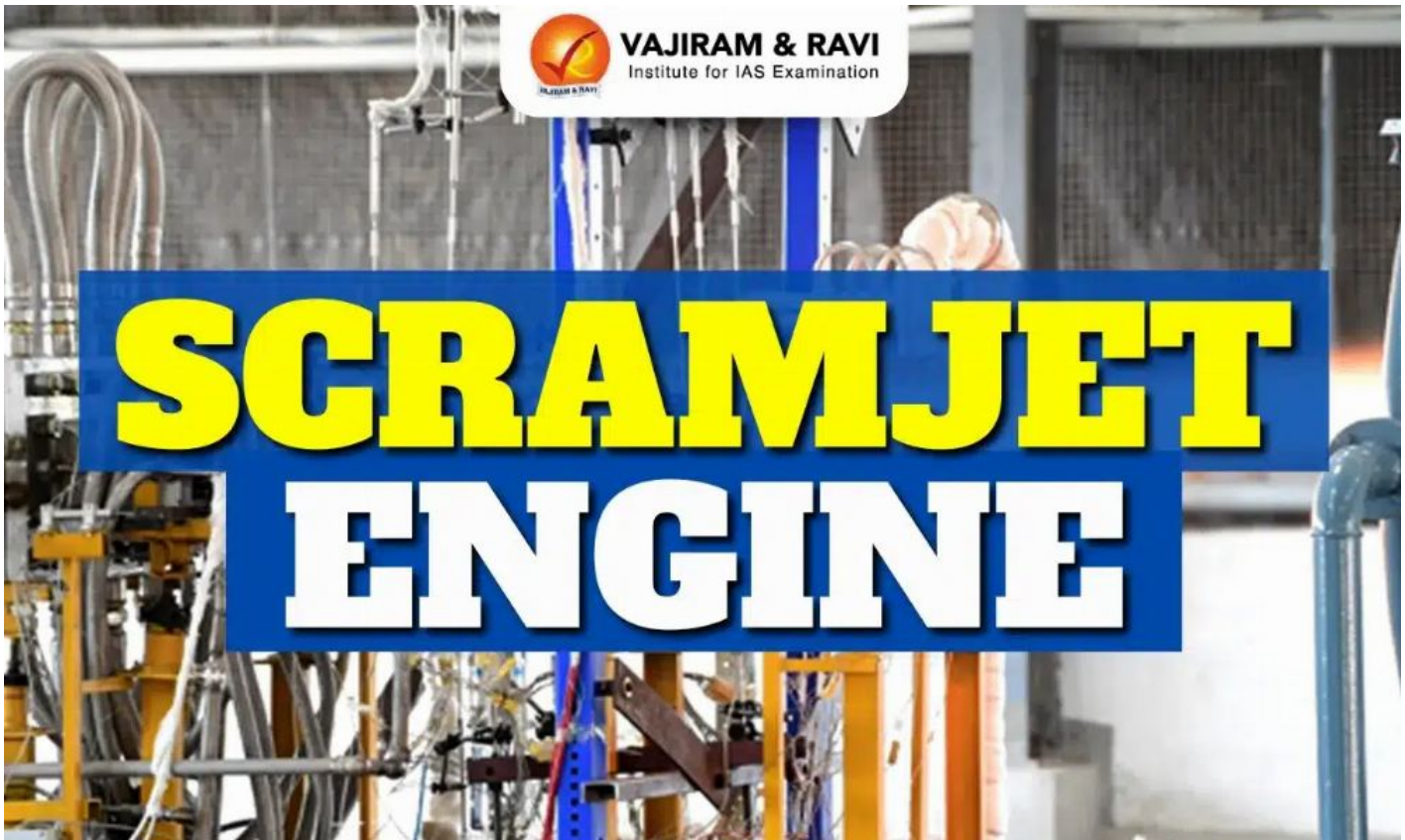


Scramjet Engine

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Scramjet Engine Latest News

Recently, the Defence Research and Development Organisation (DRDO) conducted successful ground testing of full scale actively cooled long duration Scramjet Engine for Hypersonic Missile Programme.

About Scramjet Engine

- A Scramjet (Supersonic Combustion Ramjet) is **an air-breathing engine** designed to operate **efficiently at hypersonic speeds** (Mach 5 and above).
- It does **not use rotating compressors**, relying instead on the vehicle's high speed to compress air.
- Scramjets enable **supersonic combustion**, making **them suitable for Hypersonic Cruise Missiles (HCMs)**.
- It carries **liquid Hydrogen as fuel** and **liquid Oxygen for combustion** (oxidiser) to generate thrust.
- **India is the fourth country** to demonstrate the flight **testing of a Scramjet Engine**.

Working Principle of Scramjet Engine

- **Air intake:** Vehicle must already be flying at supersonic speeds (Mach 3+).
- **Compression:** High-speed movement compresses the incoming air.
- **Combustion:** Hydrogen fuel is injected and ignited while air remains supersonic.
- **Thrust Generation:** Expanding gases create thrust (based on Newton's Third Law).
- Scramjets **need rocket-assisted takeoff** as they **can't generate thrust at zero speed**.
- The **fuel efficiency** of the scramjets tends to be **significantly better** than that of traditional turbojets and ramjets.

What are Hypersonic Missiles?

- It refers to one which **travels faster than Mach 5**, or five times the speed of sound (330 m/s).
- **There are two types:**
 - **Hypersonic Glide vehicles (HGV):** These are launched from a rocket, similar to regular ballistic missiles, before gliding to a target.
 - **Hypersonic Cruise Missiles:** They are powered throughout their flight via air-breathing engines called Scramjets, after acquiring their target.

Source: PIB

Source: <https://vajiramandravi.com/current-affairs/what-is-a-scramjet-engine/>

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