

FFSC Rocket Engine

Prelims: Current events of national and international importance | Science and Technology

Why in News?

Recently, Bengaluru-based Astrobase Space Technologies unveiled India's first privately built FFSC Rocket Engine.

- **EVEREST** - India's first privately built 800 kN Full-Flow Staged Combustion (FFSC) LOX-Methane rocket engine.

800 kN equals 800,000 Newtons, giving 80-tonne thrust, enough to power medium-lift rocket stages.

FFSC Rocket Engines

- Advanced **liquid rocket engines** where both fuel and oxidiser pass through separate pre-burners before entering the main combustion chamber.
- **Staged Combustion** - Propellants burn in two stages; gases generated drive turbines and are then fed back into the chamber, ensuring no wastage.
- **Efficiency** - All propellants contribute to thrust, enabling high propulsion efficiency and precise throttle control.
- **Suitability** - Ideal for reusable launch systems; LOX-methane (liquid oxygen and liquid methane) propellants ensure cleaner combustion and faster turnaround.

FFSC vs Conventional Engines

- **Conventional Engines** - Only part of propellants used to drive turbopumps; some gases wasted.
- **FFSC Engines** - Both fuel and oxidiser fully utilised; turbopumps operate more efficiently.

- **Advantages** - Higher efficiency, cleaner combustion, better reusability, precise control.
- **Challenge** - Very complex to design and execute compared to conventional cycles.

Significance

- **Global Context** - Only 3 commercial companies have developed high-thrust FFSC engines: SpaceX and Stoke Space (USA), Land Space (China).

India thus became the 4th nation with FFSC technology after Russia, USA, and China.

- **Capability** - Unlocks reusable launch systems up to 30 tonnes to Low Earth Orbit (LEO); potential medium-lift platform for commercial and strategic missions.
- **Manufacturing** - Built using advanced methods including **India's largest industrial 3D printer**.

Reference

[The Hindu | FFSC](#)

