

4. Methane-Powered Rocket Engine

Prelims: Science & Technology- Space Technology

Mains: GS-III- Awareness in the fields of Space

Why in News?

- ▶▶ ISRO is planning to develop methane-powered rocket engines.

LOX Methane Engines:

- ▶▶ The space agency is developing two 'LOx methane' engines (liquid oxygen oxidiser and methane fuel) engines.
- ▶▶ One of the two projects is trying to convert the existing cryogenic engine, which uses liquid hydrogen for fuel, into a LOx methane engine.
- ▶▶ The other is a smaller engine of 3 tonnes thrust, which will feature an electric motor.
- ▶▶ These are being developed at ISRO's Liquid Propulsion Systems Centre at Trivandrum.
- ▶▶ ISRO currently prefers to use a fuel called Unsymmetrical Di-Methyl Hydrazine, along with Nitrogen tetroxide for oxidizer, in its liquid fuel (Vikas) engines, which are used in the lower stages of its rockets, PSLV and GSLV.

Why Methane?

- ▶▶ Di-Methyl Hydrazine like all hydrazine-based fuels, is said to be highly toxic and cancer-causing.
- ▶▶ Globally, governments are keen on banning hydrazine.
- ▶▶ Besides, methane beats hydrazine on every other count.
- ▶▶ Apart from being non-toxic, it has a higher specific impulse which means one kg of the gas can lift one kg of mass for a longer time.
- ▶▶ Methane, which can be synthesized with water and carbon dioxide in space, is often described as the space fuel of the future.
- ▶▶ It is easy to store, does not leave a residue upon burning, less bulky, and, importantly, can be synthesized up in space.
- ▶▶ Methane-fired engines need an igniter to start the fire.
- ▶▶ Hydrazine fuels are hypergolic, which means they start burning on their own upon coming in contact with oxygen.

Rocket Engine Development:

- ▶▶ Mumbai-based start-up Manastu Space is developing a propulsion system that will use Hydrogen peroxide as fuel.

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- ▶▶ Currently, Manastu's engines are meant for steering satellites in orbit but they can be scaled up to power launch vehicles.
 - ▶▶ According to the company, the space industry started with Hydrogen peroxide, but moved to a 'better' hydrazine.
 - ▶▶ But Manastu has developed a chemical additive, which it is trying to patent — the additive will enable Hydrogen peroxide to elbow hydrazine out of the competition.

