ISRO making green propellant

ISRO is taking efforts to replace the conventional hydrazine rocket fuel, a highly toxic and carcinogenic chemical, with a greener propellant for future missions. File | Photo Credit: PTI

Scientists at the Indian Space Research Organisation (ISRO) have reported progress in the development of an environment-friendly propellant to power satellites and spacecraft.

The effort is to replace the conventional hydrazine rocket fuel, a highly toxic and carcinogenic chemical, with a greener propellant for future missions. Initial tests by a research team at the Liquid Propulsion Systems Centre (LPSC) here have shown promising results in the formulation and associated tests of a propellant blend based on hydroxylammonium nitrate (HAN).

Due to its high performance characteristics, hydrazine has dominated the space industry as the choice of propellant for over six decades, despite its environment and health hazards and the challenges faced in its manufacturing, storage, ground handling and transportation.

The LPSC team comprising Arpita Dash, B. Radhika and R. Narayan formulated the HAN-based monopropellant and carried out a variety of tests to investigate its characteristics, like thermal and catalytic decomposition and compatibility with different materials. A monopropellant is a chemical propulsion fuel which does not require a separate oxidizer. It is used extensively in satellite thrusters for orbital correction and orientation control.

The in-house formulation consists of HAN, ammonium nitrate, methanol and water. While methanol was added to reduce combustion instability, the choice of AN was dictated by its capacity to control the burn rate and lower the freezing point of the propellant.

In a paper presented at the national conference on Future Directions in Propulsion organised by the Aeronautical Society of India here, the researchers said the propellant formulation was tested for compatibility with four metal samples over a period of six months.

The LPSC is planning further tests in flight configuration.

The survival of the Tower can be attributed to a phenomenon known as dynamic soil-structure interaction.

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