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New Year Cheer for Indian Space Technology!

The new year brought some great news for India's space programme. Learning and building up on its past failures, the Indian Space Research Organisation (ISRO) crossed a major milestone when it demonstrated its mastery of the cryogenic engine technology with the launch of the Geosynchronous Satellite Launch Vehicle-Development 5 (GSLV-D5) on 7th January 2014. GSLV-D5 successfully placed the GSAT-14 communications satellite into the orbit.

After 20 years of sustained work and faced with two back-to-back failures in 2010, the successful launch of GSLV-D5 catapulted India into the elite club of nations – United States, Russia, France, Japan and China – possessing the cryogenic engine technology.

This is a crucial milestone as it gives the country's space agency the capability to launch heavier satellites, especially telecommunication satellites, that need to be put in a 36,000 km geosynchronous orbit. In the past two decades, India has successively demonstrated its ability to launch smaller satellites – up to 2 tonnes – to a low-earth orbit with 25 consecutive successes of its Polar Satellite Launch Vehicles (PSLVs). But launching heavier satellites required the services of a GSLV.

ISRO's efforts at launching a GSLV rocket using cryogenic engines supplied by the erstwhile USSR came a cropper. After the USSR broke up, under severe international pressure Russia denied cryogenic engine technology to India. So, mastering cryogenic engine technology indigenously was the only way out. But a false case foisted on the man who headed ISRO's cryogenic engine project not only destroyed the organisation's morale, it also put back India's indigenous cryogenic engine development project by more than ten years.

The technology that involves using liquid hydrogen at -253°C and oxygen at -183°C is a tricky feat. A cryogenic engine is more efficient and provides more thrust for every kilogram of propellant it burns compared with solid and earth-storable liquid propellant rocket stages. It is employed at the last stage to launch heavy communication satellites.

ISRO scientists and technologists continued working on the nuts and bolts of cryogenic engine technology. They effected several design changes after studying its past failures. The changes were especially effected in its aerodynamics, heat shield, fuel booster in cryogenic engine, and engine's ignition sequence. Eventually, last month's successful launch of the 49.13 metre tall GSLV-D5 weighing 414.75 tonnes gave ample testimony of the ingenuity and hard work of ISRO's scientists and technologists. It is the culmination of yet another fascinating saga in India's space journey.

The significant event signals the beginning of a new era of commercial viability for Indian space missions. It will help save precious foreign exchange that India had been spending on putting into orbit its communication satellites riding on foreign rockets.

ISRO is already gearing up for a series of GSLV launches, including those for GSAT-6, GSAT-7A, GSAT-9 and Chandrayaan-2 – the second Moon mission.

Hasan Jawaid Khan

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