Reusable Launch Vehicle – Technology Demonstrator (RLV-TD) Mission

23 May, 2016

THE MISSION

Reusable Launch Vehicle – Technology Demonstrator (RLV-TD) is one of the most technologically challenging endeavours of ISRO towards developing essential technologies for a fully Reusable Launch Vehicle to enable low-cost access to space.

In this experimental mission, the HS9 solid rocket booster carrying RLV-TD lifted-off from the First Launch Pad at Satish Dhawan Space Centre, Sriharikota at 07:00 AM (IST) on May 23, 2016. After a successful flight of 91.1 seconds, HS9 burn out occurred, following which both HS9 and RLV-TD mounted on its top coasted to a height of about 56 km. At that height, RLV-TD separated from HS9 booster and further ascended to a height of about 65 km.

From that peak altitude of 65 km, RLV-TD began its descent followed by atmospheric re-entry at around Mach 5 (five times the speed of sound). The vehicle's Navigation, Guidance and Control system accurately steered the vehicle during this phase for safe descent. After successfully surviving a high temperatures of re-entry with the help of its Thermal Protection System (TPS), RLV-TD successfully glided down to the defined landing spot over Bay of Bengal at a distance of about 450 km from Sriharikota, thereby fulfilling its mission objectives. The vehicle was successfully tracked during its flight from ground stations at Sriharikota and a shipborne terminal. Total flight duration from launch to landing of this mission of the delta winged RLV-TD, lasted for about 770 seconds.

These technologies will be developed in phases through a series of experimental

flights. The first in the series of experimental flights is the Hypersonic Flight Experiment (HEX) followed by the Landing Experiment (LEX), Return Flight Experiment (REX) and Scramjet Propulsion Experiment (SPEX). Reusable Launch Vehicle Technology Demonstrator Hypersonic Experiment (RLV-TD HEX1), wherein the hypersonic aerothermodynamic characterization of winged re-entry body along with autonomous mission management to land at a specified location, and characterization of hot structures are planned to be demonstrated.

RLV-TD – THE LAUNCH VEHICLE

RLV-TD is the first unmanned flying testbed developed for ISRO's Reusable Launch Vehicle Technology Demonstration Programme. The configuration of RLV-TD is similar to that of an aircraft and combines the complexity of both launch vehicles and aircraft. The winged RLV-TD has been configured to act as a flying testbed to evaluate various technologies, namely, hypersonic flight, autonomous landing and powered cruise flight. In future, this vehicle will be scaled up to become the first stage of India's reusable two stage orbital launch vehicle.

RLV-TD consists of a fuselage (body), a nose cap, double delta wings and twin vertical tails. It also features symmetrically placed active control surfaces called Elevons and Rudder. This technology demonstrator was boosted to Mach 5 by a conventional solid booster (HS9) designed for low burn rate. The selection of materials like special alloys, composites and insulation materials for developing an RLV-TD and the crafting of its parts is very complex and demands highly skilled manpower. Many high technology machinery and test equipment were utilised for building this vehicle.

Objectives of RLV-TD

- Hypersonic Aerothermodynamics Characterisation of wing body
- Evaluation of autonomous Navigation, Guidance and Control (NGC) schemes
- Integrated Flight Management
- Thermal Protection System Evaluation and Re-entry Mission Management

Achievements

RLV-TD was successfully flight tested from SDSC SHAR, Sriharikota validating the critical technologies such as autonomous Navigation, Guidance & Control system, Reusable Thermal Protection System and Re-Entry Mission Management.

ISRO acknowledges the support of Indian Coast Guard and National Institute of Ocean Technology (NIOT) for the mid sea wind measurement and shipborne telemetry respectively in this mission.

Misssion Parameters	Targeted	Achieved
Peak Altitude (km)	65±6	64.8
Peak Mach No.	4.8±0.6	4.78
Re-entry Mach No.	3.95±0.8	3.9
Splash Down Point (km)	425±100	412