

GSLV-D1 / GSAT-1 Mission

18 April, 2001

THE MISSION

GSLV-D1 carrying on-board the GSAT-1 Satellite lifted-off from Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota on April 18, 2001. GSLV-D1 placed GSAT-1 successfully in the Geo-synchronous Transfer Orbit of 181 km perigee (nearest point to Earth) and 32,051 km apogee (farthest point to Earth) with an inclination of 19.2° with respect to Equatorial plane. GSAT-1 is used for conducting communication experiments like digital audio broadcast, internet services and compressed digital TV transmission. Several new spacecraft elements like improved reaction control thrusters, fast recovery star sensors and heat pipe radiator panels were also tested on this satellite.

G S L V - D 1 THE LAUNCH VEHICLE

GSLV-D1 was the 1st developmental flight which was primarily intended to validate the vehicle design and evaluate flight performance parameters. GSLV-D1 is designed to place satellites in Geo-synchronous Transfer Orbit (GTO). It adopts the flight-proven solid and liquid stages of ISRO's Polar Satellite Launch Vehicle (PSLV) and a Cryogenic Upper Stage.

GSLV is a three stage vehicle. The first stage, GS1, comprises a solid propellant motor (S125) and four liquid propellant strap-on stages (L40). The second stage (GS2) is powered by a single liquid propellant engine (L37.5). The third stage (GS3) is a cryogenic stage (C12) with re-startable engines.

SPECIFICATIONS

Height	49 m
Lift-Off Mass	414.75 t
No of Stages	3
Payloads	GSAT-1
Inclination (deg)	19.2°
Apogee	32,051 km
Perigee	181 km



STAGE CHARACTERISTICS

Parameters	GS1 Stage (First Stage)		GS2 Stage (Second stage)	GS3 Stage (Third stage)
	S125 Booster	L40 Strap-on		
Length (m)	20.3	19.7	11.6	8.7
Dia (m)	2.8	2.1	2.8	2.8
Total Mass (t)	156	46	42.8	15
Propellant Mass (t)	129	40	38	12.5
Case/Tank material	M250 Steel	Aluminium Alloy	Aluminium Alloy	Aluminium Alloy
Propellant	HTPB	UDMH & N ₂ O ₄	UDMH & N ₂ O ₄	LH ₂ & LOX
Burn time (s)	100	160	150	720
Max. Vac. Thrust (kN)	4700	680	720	73.5
Specific Impulse (Ns/kg)	2610	2750	2890	4510
Control System	Multi-port SITVC	EGC single plane gimbaling.	EGC two plane gimbaling for pitch & yaw control. Hot gas RCS for roll control.	2 steering engines for thrust phase control & cold gas RCS for coast phase control.



GSAT-1

THE SATELLITE

GSAT-1 was an experimental satellite carrying two C-band transponders employing 10 W Solid State Power Amplifiers (SSPAs), one C-band transponder using 50 W Travelling Wave Tube Amplifier (TWTA) and two S-band transponders using 70 W TWTA. GSAT-1 was used for conducting communication experiments like Digital Audio Broadcast, Internet Services and compressed Digital TV Transmission. It employed the standard INSAT 2A configuration without VHRR but with small common payload complement, and a number of technology experiments like indigenous heat pipe radiator panel, 10 N thrusters, fast recovery star sensors, improved reaction and momentum wheels, improved solar sail and pyro electrical Earth sensors.

Several new communication satellite technologies have been evaluated using GSAT-1. These include:

1. Fast Recovery Star Sensor (FRSS) which provides enhanced accuracies of measuring satellite orientation and for quick Earth-lock recovery in case of loss of lock.
2. A new Earth sensor using pyro electric detectors.
3. A new technique of using 22 Newton thrusters in a combination of four as an alternate strategy for orbit raising.
4. A new technology for thermal control of satellites using heat pipes.
5. New technique of power management through charger arrays for improving the overall efficiency of power systems.
6. Optimal orbit raising using perigee firing strategy.

SPECIFICATIONS

Weight	1530 kg
Power	1500 W
Stabilisation	3-axis body stabilised using Momentum / Reaction Wheels, Magnetic Torques, Sensors and Thrusters
Type of Satellite	Communication
Payloads	<ul style="list-style-type: none">• 3 C-band Transponders• 2 S-band Transponders
Mission Life	3 months

