

GSLV Mk III-D1 / GSAT-19 Mission

05 June, 2017

THE MISSION

GSLV Mk III-D1 carrying on-board the GSAT-19 Satellite lifted-off from the Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota at 5:28 PM (IST) on June 05, 2017. After a twenty five and half an hour countdown, the mission began with the launch of the 640 ton GSLV Mk III. This was the first orbital mission of GSLV Mk III which was mainly intended to evaluate the vehicle performance including that of its fully indigenous Cryogenic Upper Stage during the flight.

About 16 minutes after lift-off, GSAT-19, a high throughput communication satellite was successfully placed in orbit. It is the heaviest satellite launched from the Indian soil. GSAT-19 orbit was raised from its present Geosynchronous Transfer Orbit (GTO) to the final circular Geostationary Orbit (GSO) by firing the satellite's Liquid Apogee Motor (LAM) in stages. The satellite was commissioned into service after its positioning in the designated slot in the GSO following in-orbit testing of its payloads.

G S L V M k I I I - D 1

THE LAUNCH VEHICLE

GSLV Mk III-D1 is the first developmental flight of GSLV Mk III, a heavy lift launch vehicle, capable of lifting payloads up to 4,000 kg into Geosynchronous Transfer Orbit and 10,000 kg into Low Earth Orbit.



This fourth generation launch vehicle is a three stage vehicle with two Solid Strap-on Motors S200, a Core Liquid Booster L110 and a Cryogenic Upper Stage C25. The vehicle is configured with a 5 m Ogive Payload Fairing (OPLF) and slanted strap-on nose cone to provide aerodynamic robustness.

S200 are located on either side of its core liquid booster.



Each carries 205 tons of composite solid propellant and their ignition results in vehicle lift-off. S200s function for 140 seconds and during strap-ons functioning phase, the two clustered Vikas Engines of L110 core liquid booster will ignite 114 seconds after lift-off to further augment the thrust of the vehicle. These two engines continue to function after the separation of the strap-ons. The ignition of C25 stage takes place 2 seconds after the separation of the L110 stage about 322 seconds after lift-off. The functioning duration of C25 is 643 seconds and this will facilitate the GSAT-19 carried on-board to reach the intended GTO.

The upper stage of GSLV Mk III vehicle is a new cryogenic stage C25. The cryogenic stage used liquid Hydrogen and liquid Oxygen as propellants with a total loading of 28 tons stored on-board at very low temperatures. The stage is powered by a 20 ton thrust cryogenic engine CE-20 operating on 'gas generator cycle'. The performance of the engine and stage during the mission was as predicted.

Besides these systems, the other advanced systems that constitute GSLV Mk III include Navigation, Guidance and Control system and stage separation systems. The vehicle performance and its flight status are closely monitored by S-band telemetry and C-band transponder respectively.



SPECIFICATIONS

Height	43.43 m
Lift-Off Mass	640 t
No of Stages	3
Payloads	GSAT-19
Inclination (deg)	21.5°
Apogee	35,975 km
Perigee	170 km
Launch Pad	Second Launch Pad (SDSC, SHAR)



STAGE CHARACTERISTICS			
Parameters	Stages		
	Two S200	L110	C25
Length (m)	26.2	21.39	13.545
Diameter (m)	3.2	4	4
Propellants	Composite solid	Hypergolic liquid	Cryogenic
Propellant Mass (t)	2 x 205	116	28
Stage Mass at Lift-off (t)	472	125	33



GSAT-19

THE SATELLITE

GSAT-19 is a Geostationary Communication Satellite of India, configured around the ISRO's standard I-3K bus. The main structure of the satellite is cuboid in shape built around a CFRP central cylinder. The two solar arrays of GSAT-19 consisting of Ultra Triple Junction Solar Cells generate about 4500 W of electrical power. Sun, Earth and Star sensors as well as gyroscopes provide orientation reference for the satellite. The Attitude and Orbit Control System (AOCS) of



GSAT-19 maintains the satellite's orientation with the help of momentum wheels, magnetic torquers and thrusters. The satellite's propulsion system consists of a 440 N Liquid Apogee Motor (LAM) and eight 10 N and eight 22 N Chemical thrusters using liquid propellants for initial orbit raising and station keeping.

GSAT-19 carries Ka / Ku-band high throughput Communication Transponders. Besides, it carries a Geostationary Radiation Spectrometer (GRASP) payload to monitor and study the nature of charged particles and the influence of space radiation on satellites and their electronic components. The satellite also features certain advanced spacecraft technologies including miniaturised heat pipe, fibre optic gyro, Micro Electro-Mechanical Systems (MEMS) accelerometer, Ku-band TTC transponder, as well an indigenous Lithium-ion battery. GSAT-19 will use its own propulsion system to reach its Geostationary Orbital home, after it's separation in GTO.

SPECIFICATIONS

Weight	3136 kg
Power	4500 W, one 100 Ah Li-Ion battery
Stabilisation	3-axis stabilised Orientation reference from Sun, Earth and Star Sensors and Gyros Orbit and orientation control through Momentum Wheels, Magnetic Torquers and Chemical thrusters
Antennas	1.4 m reflector on Earth viewing face Two 2.0 m deployable reflectors
Type of Satellite	Communication
Payloads	<ul style="list-style-type: none">• Ka / Ku-band high throughput Transponders• Geostationary Radiation Spectrometer (GRASP)
Mission Life	10 Years

