



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution



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DEPARTMENT OF AEROSPACE ENGINEERING

19AST101 – INTRODUCTION TO AEROSPACE ENGINEERING I YEAR II SEM

UNIT-II SPACE VEHICLE TOPIC: History of Space Flight

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Indian space launch vehicle classified

- Sounding rocket
- SLV
- ASLV
- PSLV
- GSLV



SOUNDING ROCKET

- Sounding rockets are one or two stage solid propellant rockets used for probing the upper atmospheric regions and for space research.
- They also serve as easily affordable platforms to test or prove prototypes of new components or subsystems intended for use in launch vehicles and satellites.
- Currently, three versions are offered as operational sounding rockets, which cover a payload range of 8-100 Kg and an apogee range of 80-475 km

Vehicle	RH-200	RH-300-Mk-II	RH-560-MK-II
Payload (in kg)	10	60	100
Altitude (in km)	80	160	470
Purpose	Meterology	Aeronomy	Aeronomy
Launch Pad	Thumba Balasore	SDSC-SHAR	SDSC-SHAR



SOUNDING ROCKET





Satellite Launch Vehicle

- Satellite Launch Vehicle-3 (SLV-3) was India's first experimental satellite launch vehicle.
- which was an all solid, four stage vehicle weighing 17 tonnes with a height of 22m and capable of placing 40 kg class payloads in Low Earth Orbit (LEO).
- SLV-3 was successfully launched on July 18, 1980 from Sriharikota Range (SHAR), when Rohini satellite, RS-1, was placed in orbit,

SN	Title	Launch Date	Payload	Remarks
1	SLV-3	Apr 17, 1983	Rohini Satellite RS-D2	
2	SLV-3D1	May 31, 1981	Rohini Satellite RS-D1	
3	SLV-3E2	Jul 18, 1980	Rohini Satellite RS-1	
4	SLV-3E1	Aug 10, 1979	Rohini Technology Payload (RTP)	Mission Unsuccessful



Satellite Launch Vehicle





Augmented Satellite Launch Vehicle

- With a lift off weight of 40 tonnes, the 24 m tall ASLV was configured as a five stage, all-solid propellant vehicle, with a mission of orbiting 150 kg class satellites into 400 km circular orbits.
- The Augmented Satellite Launch Vehicle (ASLV) Programme was designed to augment the payload capacity to 150 kg, thrice that of SLV-3, for Low Earth Orbits (LEO).
- While building upon the experience gained from the SLV-3 missions, ASLV proved to be a low cost intermediate vehicle to demonstrate and validate critical technologies.
- **Under the ASLV programme four developmental flights were conducted.**
- The first developmental flight took place on March 24, 1987 and the second on July 13, 1988.
- The third developmental flight, ASLV-D3 was successfully launched on May 20, 1992, when SROSS-C (106 kg) was put into an orbit of 255 x 430 km.
- ASLV-D4, launched on May 4, 1994, orbited SROSS-C2 weighing 106 kg. It had two payloads



PSLV

- Polar Satellite Launch Vehicle (PSLV) is the third generation launch vehicle of India.
- It is the first Indian launch vehicle to be equipped with liquid stages.
- After its first successful launch in October 1994, PSLV emerged as the reliable and versatile workhorse launch vehicle of India with 39 consecutively successful missions by June 2017.
- During 1994-2017 period, the vehicle has launched 48 Indian satellites and 209 satellites for customers from abroad.
- Besides, the vehicle successfully launched *two spacecraft – Chandrayaan 1 in 2008 and Mars Orbiter Spacecraft in 2013* – that later traveled to Moon and Mars respectively.

Vehicle Specifications:

Height	: 44 m
Diameter	: 2.8 m
Number of Stages	: 4
Lift Off Mass	: 320 tonnes (XL)
Variants	: 3 (PSLV-G, PSLV - CA, PSLV - XL)
First Flight	: September 20, 1993



GSLV

- Geosynchronous Satellite Launch Vehicle Mark II (GSLV Mk II) is the largest launch vehicle developed by India, which is currently in operation.
- This fourth generation launch vehicle is a three stage vehicle with four liquid strap-ons. The indigenously developed cryogenic Upper Stage (CUS), which is flight proven, forms the third stage of GSLV Mk II.
- From January 2014, the vehicle has achieved four consecutive successes.
- <https://www.isro.gov.in/launchers/gslv>

Height	: 49.13 m
Number of Stages	: 3 With four liquid strap-on
Lift Off Mass	: 414.75 tonnes
First Flight	: April 18, 2001



GSLV MK III

- GSLV Mk III is a three-stage heavy lift launch vehicle developed by ISRO.
- The vehicle has two solid strap-ons, a core liquid booster and a cryogenic upper stage.
- GSLV Mk III is designed to carry 4 ton class of satellites into Geosynchronous Transfer Orbit (GTO) or about 10 tons to Low Earth Orbit (LEO), which is about twice the capability of GSLV Mk II.
- The two strap-on motors of GSLV Mk III are located on either side of its core liquid booster. Designated as 'S200', each carries 205 tons of composite solid propellant and their ignition results in vehicle lift-off. S200s function for 140 seconds.
- During strap-ons functioning phase, the two clustered Vikas liquid Engines of L110 liquid core booster will ignite 114 sec after lift-off to further augment the thrust of the vehicle. These two engines continue to function after the separation of the strap-ons at about 140 seconds after lift-off.
- <https://www.isro.gov.in/launchers/gslv-mk-iii>