PSLV-C40

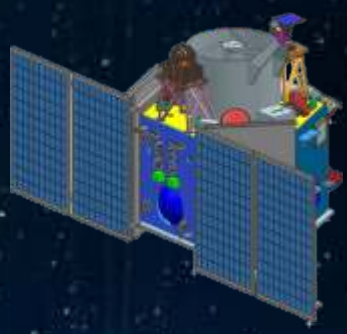
CARTOSAT-2 Series Satellite

Microsatellite

INS-1C

International co-passenger Satellites

- Telesat Phase-1 LEO
- POC-1
- PICSAT
- CANYVAL-X
- CNUSAIL-1
- KAUSAT-5
- SIGMA
- STEP CUBE LAB
- CBNT-2
- Flock-3P' (4 no.)
- LEMUR (4 no.)
- DemoSat-2
- Micromas-2
- Tyvak-61C
- SpaceBEE (4 no.)
- Fox-1D
- Corvus BC3
- Arkyd-6
- CICERO-7



PSLV-C40/CARTOSAT-2 SERIES SATELLITE

PSLV-C40 at the First Launch Pad

PSLV-C40

India's Polar Satellite Launch Vehicle, in its forty second flight (PSLV-C40), will launch the 710 kg Cartosat-2 Series Satellite for earth observation and 30 co-passenger satellites together weighing about 613 kg at lift-off.

The co-passenger satellites comprise one microsatellite and one nanosatellite from India as well as 3 microsatellites and 25 nanosatellites from six countries, viz., Canada, Finland, France, Republic of Korea, UK and USA. The total weight of all the 31 satellites carried onboard PSLV-C40 is about 1323 kg.

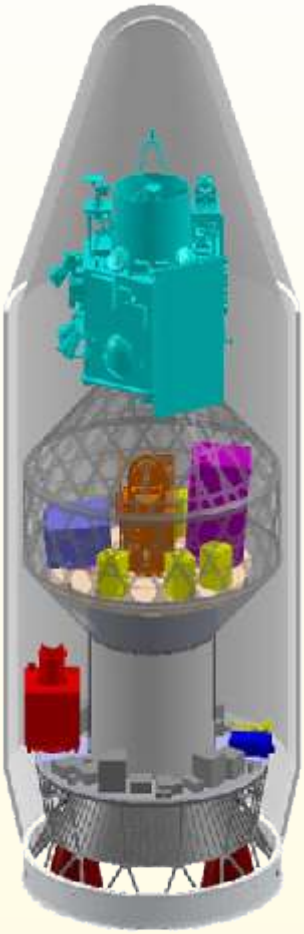
30 of 31 satellites carried by PSLV-C40 will be first launched into a 505 km polar Sun Synchronous Orbit (SSO) while Microsat built by ISRO will be placed in a 359 km polar SSO after bringing down the orbital height by twice restarting the PSLV-C40 fourth stage. PSLV-C40 will be launched from the First Launch Pad (FLP) of Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota.

The 28 International customer satellites are being launched as part of the commercial arrangements between Antrix Corporation Limited (Antrix), a Government of India company under Department of Space (DOS), the commercial arm of ISRO and the International customers.

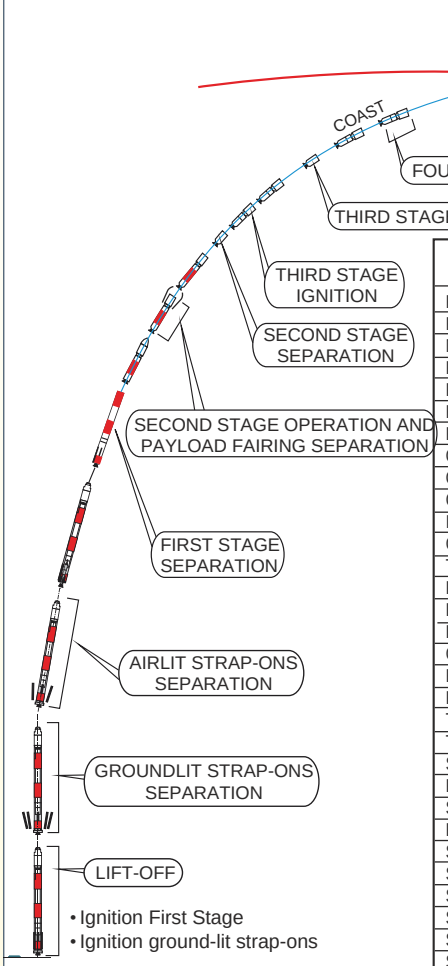
PSLV-C40 at a glance (lift-off Mass: 320 tonne Height: 44.4 m)

	Stage-1	Stage-2	Stage-3	Stage-4
Nomenclature	Core Stage PS1 + 6 Strap-on Motors	PS2	PS3	PS4
Propellant	Composite solid	Earth Storable Liquid	Composite solid	Earth Storable Liquid
Propellant Mass(T)	138.2 (Core), 6 x 12.2 (Strap-on)	42.0	7.6	2.5
Stage Dia (m)	2.8 (Core), 1 (Strap-on)	2.8	2.0	1.34
Stage Length (m)	20 (Core), 12 (Strap-on)	12.8	3.6	3.0

PSLV-C40/CARTOSAT-2 SERIES SATELLITE



Payload Accommodation details of PSLV-C40



Height: 505 km
Inclination: 97.47 deg

Event Name	Time after lift-off	Altitude (kilometre)	Velocity (metre per second)
Fourth Stage Shut OFF - 3	2 hr 21.62 sec	374.978	7681.12
Fourth Stage ENGINE RESTART 3	2 hr 8.02 sec	374.783	7688.08
Microsat Separation	1 hr 45 min 35.74 sec	359.584	7691.32
Fourth Stage Shut OFF - 2	1 hr 44 min 58.74 sec	359.367	7698.04
Fourth Stage ENGINE RESTART 2	1 hr 44 min 54.02 sec	359.352	7731.73
Fourth Stage Shut OFF - 1	58 min 18.24 sec	505.335	7578.23
Fourth Stage ENGINE RESTART 1	58 min 13.52 sec	505.328	7608.63
QP-2.2 SEPARATION (Last QP satellite)	23 min 56.8 sec	519.049	7605.20
QP-1.1 SEPARATION (First QP Satellite)	20 min 41.8 sec	514.696	7607.30
CICERO-7 Separation	19 min 46.8 sec	513.442	7607.92
INS-1C Separation	19 min 36.8 sec	513.216	7608.02
CBNT-2 Separation	19 min 26.8 sec	512.991	7608.13
Tyvak-61C Separation	19 min 16.8 sec	512.767	7608.24
POC-1 Separation	17 min 49.02 sec	510.846	7609.17
LEO Prototype-1 Separation	17 min 48.8 sec	510.841	7609.17
DLA-U Separation	17 min 33.8 sec	510.525	7609.32
Cartosat-2 Series Satellite Separation	17 min 18.8 sec	510.213	7609.48
Fourth Stage Cut-off (Injection)	16 min 36.8 sec	509.365	7605.49
Fourth Stage Ignition	8 min 21.72sec	440.605	5871.32
Third Stage Separation	8 min 11.72 sec	434.362	5880.39
Third Stage Ignition	4 min 22.54 sec	230.492	4060.74
Second Stage Separation	4 min 21.34 sec	229.224	4063.60
Payload Fairing Separation	2 min 31.72 sec	115.633	2423.45
Second Stage Ignition	1min 48.82 sec	67.831	2164.78
First Stage Separation	1min 48.62 sec	67.599	2165.63
Strap-on 5, 6 (Airlit) Separation	1 min 32.0 sec	48.223	1907.66
Strap-on 3, 4 (Groundlit) Separation	1 min 10.1 sec	27.473	1345.34
Strap-on 1, 2 (Groundlit) Separation	1 min 9.9 sec	27.313	1340.61
Strap-on 5,6 (Airlit) Ignition	25.0 sec	2.869	581.76
Strap-on 3,4 (Groundlit) Ignition	0.62 sec	0.0238	451.89
Strap-on 1,2 (Groundlit) Ignition	0.42 sec	0.0238	451.89
First Stage Ignition	0	0.0238	451.89

PSLV-C40 Typical Flight Profile

Hoisting of PSLV-C40 core stage nozzle end segment during vehicle integration

PSLV-C40 integrated upto fourth stage inside Mobile Service tower

Primary Satellite

The Cartosat-2 Series Satellite is the primary satellite being carried by PSLV-C40. This remote sensing satellite is similar to the earlier six satellites of the Cartosat-2 series and is intended to augment data services to the users. After its injection into a 505 km polar Sun Synchronous Orbit by PSLV-C40, the satellite will be brought to operational configuration, following which it will begin providing regular remote sensing services using its Panchromatic and Multispectral cameras.

The imagery sent by the satellite will be useful for cartographic applications, urban and rural applications, coastal land use and regulation, utility management like road network monitoring, water distribution, creation of land use maps, change detection to bring out geographical and manmade features and various other Land Information System (LIS) as well as Geographical Information System (GIS) applications.

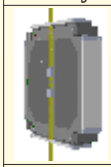
CARTOSAT-2 Series Satellite at clean room

Salient features

Satellite mass	710 Kg
Orbit type	Circular polar Sun Synchronous
Orbit height	505 km
Orbit inclination	97.47 degree
Orbit period	94.72 min
Local time of Equator crossing	9:30 am
Power	Solar arrays generating 986 Watts; Two Li-Ion batteries
Attitude control	Reaction wheels, Magnetic torquers and Hydrazine thrusters
Design life	5 years

PSLV- C40/CARTOSAT-2 SERIES SATELLITE
International co-passenger Satellites

Satellite	Country	Objective
 **Telesat Phase-1 LEO**	Canada	Ka-band communication satellite meant for demonstrating the capability of satellite and customer terminal for delivering low latency broadband experiences
 **POC-1**	Finland	SAR Payload Proof-of-Concept demonstration
 **PICSAT**	France	Measurement of exoplanetary transits
 **CANYVAL-X**	Republic of Korea	To demonstrate astronomy with virtual telescope
 **CNUSAIL-1**		To demonstrate solar sail technology
 **KAUSAT-5**		Infrared imaging of the Earth
 **SIGMA**		To demonstrate probing of space radiation
 **STEP CUBE LAB**		To demonstrate thruster, radiator and heat pipe technologies
 **CBNT-2**	UK	CBNT-2 is an Earth observation technology demonstration mission, to test and validate a high definition imagery and video system

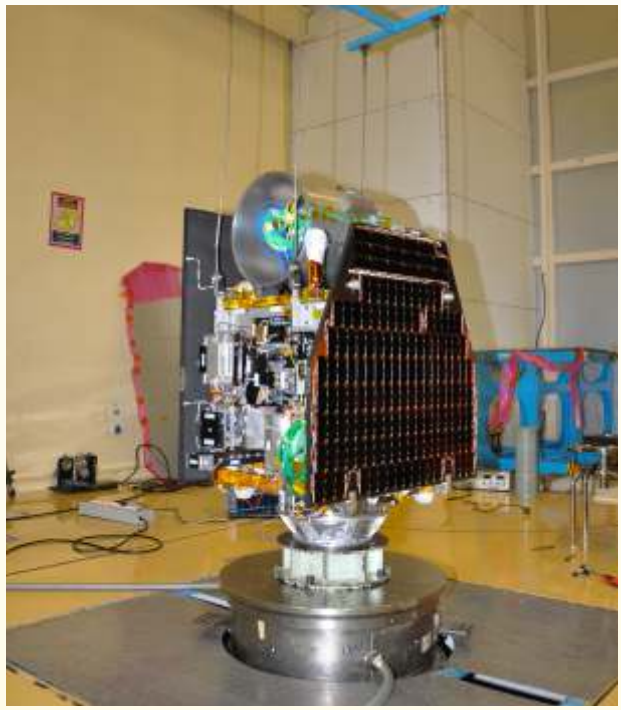
Satellite	Country	Objective
 **Flock-3P' (Four)**	USA	Earth Observation
 **LEMUR (Four)**	USA	Automatic Identification System (AIS) for Vessel monitoring
 **DemoSat-2**	USA	UHF radio test
 **Micromas-2**	USA	Microwave radiometer test
 **Tyvak-61C**	USA	To catalog variability of luminous stars
 **SpaceBEE (Four)**	USA	2-way satellite communications and data relay
 **Fox-1D**	USA	Amateur radio communications
 **Corvus BC3**	USA	Multi-spectral remote sensing
 **Arkyd-6**	USA	Demonstration of core technology for use in asteroid exploration
 **CICERO-7**	USA	To measure global weather patterns with high accuracy using a GPS radio occultation sensor

28 International Customer Satellites together weigh 470 kg.

PSLV-C40/CARTOSAT-2 SERIES SATELLITE
Indian co-passenger Satellites

Microsatellite

PSLV-C40 carries a Microsat built by ISRO as a co-passenger payload. Microsat is a small satellite in the 100 kg class that derives its heritage from IMS-1 bus. This is a technology demonstrator and the fore runner for future satellites of this series. The satellite bus is modular in design and can be fabricated and tested independently of payload.



Microsat during prelaunch testing

Indian Nano Satellite-1C (INS-1C)

Indian Nano Satellite-1C is another Indian co-passenger payload of PSLV-C40. It is the third satellite in the Indian Nanosatellite series. The first two satellites of this series were carried as co-passenger payloads by PSLV-C37 in February 2017. INS-1C will be carrying Miniature Multispectral Technology Demonstration (MMX-TD) Payload from Space Applications Centre (SAC). Data sent by this camera can be utilised for topographical mapping, vegetation monitoring, aerosol scattering studies and cloud studies.

Indian Nano Satellite (INS) is a versatile and modular Nano satellite bus system envisioned for future science and experimental payloads. With a capability to carry up to 3 kg of payload and a total satellite mass of 11 kg, it offers immense opportunities for future use. The INS system is developed as a co-passenger satellite to accompany bigger satellites on PSLV launch vehicle. Its primary objectives include providing a standard satellite bus for launch on demand services and providing opportunity to carry innovative payloads.

INS-1C with its panels in deployed condition

Major Specifications of INS-1C

Parameter	Specifications
Mass	11 kg
Overall Size	245 x 227 x 217 mm^3
Structure	Milled aluminium decks
Thermal control	Passive (OSR, MLI, Paints etcs.) & Battery Heaters
Mechanisms	Solar panels & Antenna deployment
Power	Solar Panels generating about 27W 11.2 Ah Lithium Ion battery
Attitude and Orbit Control System (AOCS)	Attitude sensors: Star Sensor, MEMS IMU, Micro Sun sensors, Digital Magnetometer Actuators: Four Reaction wheels, Magnetic Torquers
Control accuracy	<0.5 about each axis
TM and TC links	Telecommand: (VHF) Telemetry: (UHF), S - Band
Data Transmission and storage	One Mbps in S-band On-board Micro SD of 8 GB capacity
Mission life	6 months
Payload	MMX-TD

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