



# PSLV-C34 CARTOSAT

**SATHYABAMASAT**

**SWAYAM**

**LAPAN-A3 [Indonesia]**

**BIROS [Germany]**

**M3MSat [Canada]**

**SkySat Gen2-1 [USA]**

**GHGSat-D [Canada]**

**Dove Satellites (Twelve) [USA]**



# PSLV-C34



PSLV-C34 at the Second Launch Pad

India's Polar Satellite Launch Vehicle, in its thirty sixth flight (PSLV-C34), will launch the 727.5 kg Cartosat-2 series satellite for earth observation and 19 co-passenger satellites together weighing about 560 kg at lift-off into a 505 km polar Sun Synchronous Orbit (SSO). PSLV-C34 will be launched from the Second Launch Pad (SLP) of Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota. It will be the fourteenth flight of PSLV in 'XL' configuration (with the use of solid strap-on motors).

The co-passenger satellites are from USA, Canada, Germany and Indonesia as well as two satellites from Indian University/Academic Institute. The total weight of all the 20 satellites carried onboard PSLV-C34 is about 1288 kg.

## PSLV-C34 at a glance (Vehicle 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	Solid (HTPB based)	Liquid (UH25 + N <sub>2</sub> O <sub>4</sub> )	Solid (HTPB based)	Liquid (MMH + MON-3)
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	1.3
Stage Length (m)	20 (Core), 12 (Strap-on)	12.8	3.6	3.0

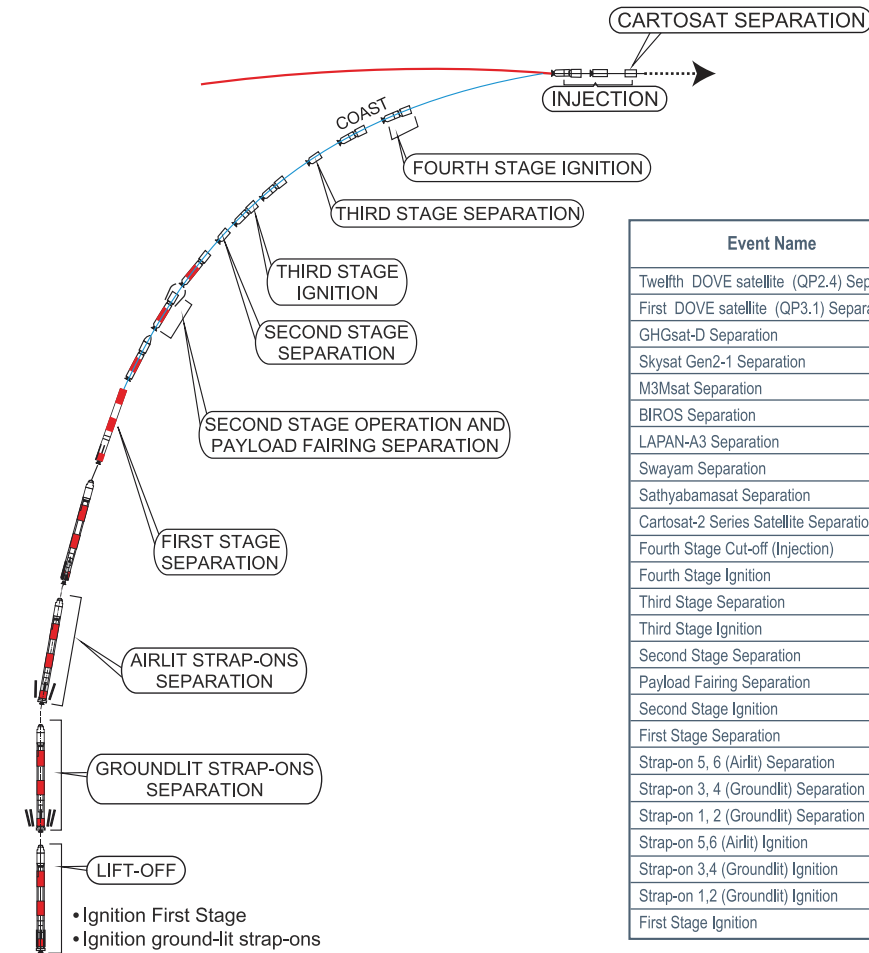
HTPB : Hydroxyl Terminated Poly Butadiene

UH25 : Unsymmetrical Dimethyl Hydrazine + 25% Hydrazine Hydrate

N<sub>2</sub>O<sub>4</sub> : Nitrogen Tetroxide

MMH : Mono Methyl Hydrazine, MON-3: Mixed Oxides of Nitrogen

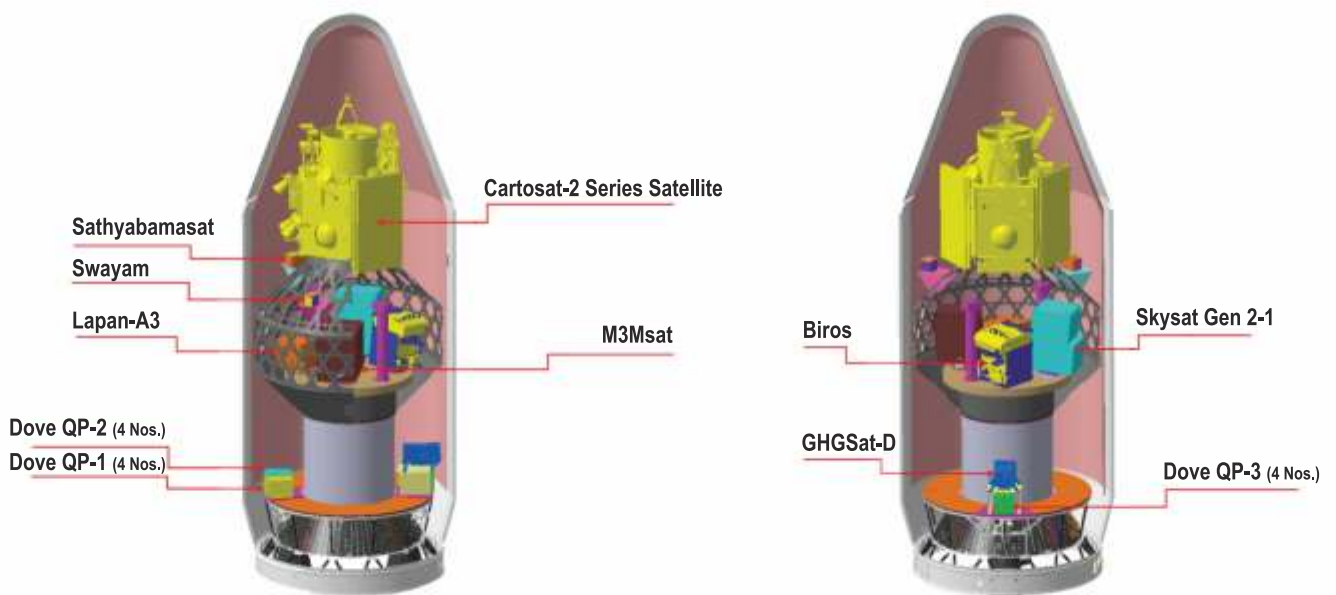
# PSLV-C34



Height: 505 km  
Inclination: 97.48 deg

Event Name	Time after lift-off	Altitude (kilometre)	Velocity (metre per second)
Twelfth DOVE satellite (QP2.4) Separation	26 min 30.36 sec	526.877	7601.11
First DOVE satellite (QP3.1) Separation	20 min 20.36 sec	519.202	7604.70
GHGSat-D Separation	19 min 20.36 sec	517.859	7605.34
Skysat Gen2-1 Separation	19 min 0.58 sec	517.422	7605.54
M3Msat Separation	19 min 0.36 sec	517.417	7605.55
BIROS Separation	18 min 22.58 sec	516.593	7605.94
LAPAN-A3 Separation	18 min 22.36 sec	516.588	7605.94
Swayam Separation	17 min 42.80 sec	515.748	7606.25
Sathyabamasat Separation	17 min 42.36 sec	515.739	7606.26
Cartosat-2 Series Satellite Separation	17 min 7.36 sec	515.021	7606.61
Fourth Stage Cut-off (Injection)	16 min 30.36 sec	514.289	7602.69
Fourth Stage Ignition	8min 17.22 sec	423.779	5925.82
Third Stage Separation	8min 7.22 sec	417.233	5935.29
Third Stage Ignition	4min 22.46 sec	217.235	4125.13
Second Stage Separation	4min 21.26 sec	216.043	4127.79
Payload Fairing Separation	2min 35.02 sec	115.457	2468.68
Second Stage Ignition	1min 48.92 sec	66.087	2170.96
First Stage Separation	1min 48.72 sec	65.862	2171.78
Strap-on 5, 6 (Airlit) Separation	1min 32.0 sec	46.906	1897.75
Strap-on 3, 4 (Groundlit) Separation	1min 10.1 sec	26.762	1331.96
Strap-on 1, 2 (Groundlit) Separation	1min 9.9 sec	26.606	1327.26
Strap-on 5,6 (Airlit) Ignition	25.0 sec	2.748	576.40
Strap-on 3,4 (Groundlit) Ignition	0.62 sec	0.025	451.92
Strap-on 1,2 (Groundlit) Ignition	0.42 sec	0.025	451.92
First Stage Ignition	0.00	0.025	451.92

## PSLV-C34 Typical Flight Profile



Two cross sectional views of PSLV-C34 payload fairing

# Primary Satellite

The Cartosat-2 series satellite is the primary satellite carried by PSLV-C34. This satellite is similar to the earlier Cartosat-2, 2A and 2B. After its injection into a 505 km polar Sun Synchronous Orbit by PSLV-C34, 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, precision study, change detection to bring out geographical and manmade features and various other Land Information System (LIS) and Geographical Information System (GIS) applications.



## Salient features

<b>Satellite mass</b>	727.5 Kg
<b>Orbit type</b>	Circular polar Sun Synchronous
<b>Orbit height</b>	505 km
<b>Orbit inclination</b>	97.48 degree
<b>Local time of Equator crossing</b>	9:30 am
<b>Power</b>	Solar arrays generating 986 Watts; Two Li- Ion batteries
<b>Attitude control</b>	Reaction wheels, Magnetic torquers and Hydrazine thrusters
<b>Design life</b>	5 years



# Co-passenger Satellites

## International Customer Satellites

### LAPAN-A3 [Indonesia]

Mass: 120 kg

LAPAN-A3 is an Indonesian microsatellite for Earth observation (multi-spectral remote sensing) for land use, natural resource and environment monitoring.



### BIROS [Germany]

Mass: 130 kg

BIROS (Berlin Infrared Optical System) is a small scientific satellite from the German Aerospace Center (DLR). The main mission objective is the remote sensing of high temperature events.



### M3MSat [Canada]

Mass: 85 kg

M3MSat (Maritime Monitoring and Messaging Micro-satellite) is a technology demonstration mission jointly funded and managed by Defense Research and Development Canada (DRDC) and the Canadian Space Agency (CSA).

The satellite's primary mission is the collection and study of Automatic Identification System (AIS) signals from low-Earth orbit.

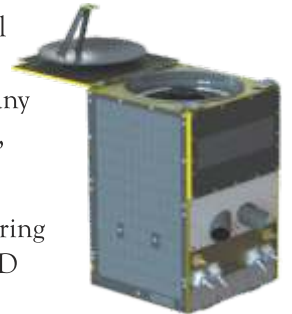


### SkySat Gen2-1 [USA]

Mass: 110 kg

SkySat Gen2-1 ("SkySat-3") is a small Earth imaging satellite designed and built by Terra Bella, a Google company based in Mountain View, California, USA.

The satellite will be capable of capturing sub-meter resolution imagery and HD video.

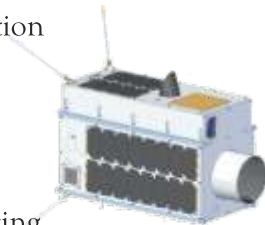


### GHGSat-D [Canada]

Mass: 25.5 kg

GHGSat-D is an Earth observation Satellite built by Space Flight Laboratory at the University of Toronto Institute for Aerospace Studies.

GHGSat-D is meant for measuring atmospheric concentration of greenhouse gases (Carbon Dioxide and Methane).



### Dove Satellites [USA]

Mass: 4.7 kg each

The Planet Labs Dove Satellites (Flock-2P) are Earth imaging satellites. A total of **twelve** Dove satellites are carried in this mission inside three QuadPack dispensers.



## University/Academic Institute Satellites from India

### SATHYABAMASAT

{from Sathyabama University, Chennai}

#### Mission objectives:

To collect data on green house gases (Water vapor, Carbon monoxide, Carbon dioxide, Methane and Hydrogen fluoride).

Mass: 1.5 kg



### SWAYAM

{from College Of Engineering, Pune}

#### Mission objectives:

To provide point to point messaging services to the HAM Community.

Mass: 1 kg



# Satellites of other countries launched by PSLV

SL. NO.	NAME	COUNTRY	DATE OF LAUNCH	MASS (kg)	LAUNCH VEHICLE
1	DLR-TUBSAT	GERMANY	26-05-1999	45	PSLV-C2
2	KITSAT-3	REPUBLIC OF KOREA	26-05-1999	110	PSLV-C2
3	BIRD	GERMANY	22-10-2001	92	PSLV-C3
4	PROBA	BELGIUM	22-10-2001	94	PSLV-C3
5	LAPAN-TUBSAT	INDONESIA	10-01-2007	56	PSLV-C7
6	PEHUENSAT-1	ARGENTINA	10-01-2007	6	PSLV-C7
7	AGILE	ITALY	23-04-2007	350	PSLV-C8
8	TECSAR	ISRAEL	21-01-2008	300	PSLV-C10
9	CAN-X2	CANADA	28-04-2008	7	PSLV-C9
10	CUTE-1.7	JAPAN	28-04-2008	5	PSLV-C9
11	DELFI-C3	THE NETHERLANDS	28-04-2008	6.5	PSLV-C9
12	AAUSAT-II	DENMARK	28-04-2008	3	PSLV-C9
13	COMPASS-I	GERMANY	28-04-2008	3	PSLV-C9
14	SEEDS	JAPAN	28-04-2008	3	PSLV-C9
15	NLS5	CANADA	28-04-2008	16	PSLV-C9
16	RUBIN-8	GERMANY	28-04-2008	8	PSLV-C9
17	CUBESAT-1	GERMANY	23-09-2009	1	PSLV-C14
18	CUBESAT-2	GERMANY	23-09-2009	1	PSLV-C14
19	CUBESAT-3	TURKEY	23-09-2009	1	PSLV-C14
20	CUBESAT-4	SWITZERLAND	23-09-2009	1	PSLV-C14
21	RUBIN-9.1	GERMANY	23-09-2009	1	PSLV-C14
22	RUBIN-9.2	GERMANY	23-09-2009	1	PSLV-C14
23	ALSAT-2A	ALGERIA	12-07-2010	116	PSLV-C15
24	NLS6.1 AISSAT-1	CANADA	12-07-2010	6.5	PSLV-C15
25	NLS6.2 TISAT-1	SWITZERLAND	12-07-2010	1	PSLV-C15
26	X-SAT	SINGAPORE	20-04-2011	106	PSLV-C16
27	VesselSat-1	LUXEMBOURG	12-10-2011	28.7	PSLV-C18
28	SPOT-6	FRANCE	09-09-2012	712	PSLV-C21
29	PROITERES	JAPAN	09-09-2012	15	PSLV-C21
30	SAPPHIRE	CANADA	25-02-2013	148	PSLV-C20
31	NEOSSAT	CANADA	25-02-2013	74	PSLV-C20
32	NLS8.1	AUSTRIA	25-02-2013	14	PSLV-C20
33	NLS8.2	AUSTRIA	25-02-2013	14	PSLV-C20
34	NLS8.3	DENMARK	25-02-2013	3	PSLV-C20
35	STRAND-1	UNITED KINGDOM	25-02-2013	6.5	PSLV-C20
36	SPOT-7	FRANCE	30-06-2014	714	PSLV-C23
37	AISAT	GERMANY	30-06-2014	14	PSLV-C23
38	NLS7.1(CAN-X4)	CANADA	30-06-2014	15	PSLV-C23
39	NLS7.2(CAN-X5)	CANADA	30-06-2014	15	PSLV-C23
40	VELOX-1	SINGAPORE	30-06-2014	7	PSLV-C23
41	DMC3-1	UNITED KINGDOM	10-07-2015	447	PSLV-C28
42	DMC3-2	UNITED KINGDOM	10-07-2015	447	PSLV-C28
43	DMC3-3	UNITED KINGDOM	10-07-2015	447	PSLV-C28
44	CBNT-1	UNITED KINGDOM	10-07-2015	91	PSLV-C28
45	De-OrbitSail	UNITED KINGDOM	10-07-2015	7	PSLV-C28
46	LAPAN-A2	INDONESIA	28-09-2015	76	PSLV-C30
47	NLS-14 (Ev9)	CANADA	28-09-2015	14	PSLV-C30
48	LEMUR	USA	28-09-2015	*	PSLV-C30
49	LEMUR	USA	28-09-2015	*	PSLV-C30
50	LEMUR	USA	28-09-2015	*	PSLV-C30
51	LEMUR	USA	28-09-2015	*	PSLV-C30
52	TeLEOS-1	SINGAPORE	16-12-2015	400	PSLV-C29
53	Kent Ridge-1	SINGAPORE	16-12-2015	78	PSLV-C29
54	VELOX-C1	SINGAPORE	16-12-2015	123	PSLV-C29
55	VELOX-II	SINGAPORE	16-12-2015	13	PSLV-C29
56	Galassia	SINGAPORE	16-12-2015	3.4	PSLV-C29
57	Athenoxat-1	SINGAPORE	16-12-2015	-	PSLV-C29