

## PSLV-C45 - EMISAT and 28 Customer Satellites


### Why in news?

The Indian Space Research Organisation (ISRO) recently launched the PSLV-C45 rocket carrying one Indian (EMISAT) and 28 international satellites.

### What is the mission for?

- ISRO launched the country's first electronic surveillance satellite, EMISAT, from Sriharikota in coastal Andhra Pradesh.
- EMISAT was built by the Defence Research Development Organisation (DRDO).
- It will gather information on enemy radar positions from a sun-synchronous orbit at an altitude of about 750km.
- EMISAT will achieve this through electromagnetic spectrum measurement.
- So the spacecraft carries a payload of DRDO's prestigious Kautilya system for electromagnetic intelligence (ELINT) gathering.
- Space-based electronic intelligence (ELINT) will add to the situational awareness of the Armed Forces.
- This will provide location and information of hostile radars placed at the borders.
- This will be another dimension to the current land or aircraft-based ELINT.
- Besides this, as many as 28 small satellites of international customers were also put in space as secondary riders.
- These include 24 satellites from the US, two from Lithuania, and one each from Switzerland and Spain.

PHOTO: S.R. RAGHUNATHAN



### Pride of place

PSLV-C45, carrying EMISAT and 28 international satellites, marked the first mission of PSLV-QL, a new variant of PSLV with four strap-on motors

**EMISAT:** It is a satellite built around ISRO's Mini Satellite-2 bus. It is intended for electromagnetic spectrum measurement

<b>436</b> kg <small>Lift-off weight</small>	<b>748</b> km <small>Altitude</small>	<b>800</b> W <small>Power</small>
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**NEXT MISSION**

PSLV-C46 will launch RISAT-2B in May 2019

**PAYLOADS**

The payloads carried by PSLV-C45 are Automatic Identification System from ISRO, Automatic Packet Repeating System from AMSAT, India, and Advanced Retarding Potential Analyzer for ionospheric studies from the Indian Institute of Space Science and Technology

CUSTOMER SATELLITES		
Country	Name	No. of satellites
Lithuania	BlueWalker1	1
	M6P	1
Spain	Aistechsats-3	1
Switzerland	Astrocast-2	1
U.S.	Flock-4A	20
	LEMUR	4

## What are the unique features of PSLV-C45?

- **Orbits** - ISRO holds the world record for carrying a number of satellites on a single launch vehicle.
- It carried 104 satellites on PSLV C-37 in 2017.
- However, so far, these satellites have been ejected in two different orbits at the most.
- PSLV-C45 is the first time that ISRO has launched a rocket that injected satellites in three different orbits.
- **Satellites** - The fourth and last stage of the rocket will function as a satellite itself for some time.
- The fourth stage is what remains of the rocket after most of it is discarded in the three stages after ejecting the payloads.
- **Strap-on motors** - This flight marked the first mission of PSLV-QL, a new variant of PSLV with four strap-on motors.
- [Strap-ons are booster rockets attached externally to the main rocket.
- They provide additional thrust, or energy, by firing themselves midway during the flight.]
- In earlier flights, ISRO has used two or six strap-on motors.
- The four extra-large strap-ons used this time reduced the overall weight while still delivering the power equivalent to six motors.

## What was the earlier procedure?

- On most previous occasions, the primary satellite of the rocket was taken to its orbit.
- Meanwhile, the others were ejected, or sprayed in quick succession either before or after that into different trajectories.
- There used to be only a marginal difference in the vertical distances between the satellites.
- Also, the entire operation used to be over in a few minutes.

## How is PSLV C-45 different from this?

- EMISAT is the primary satellite in PSLV C-45, which is a piece of surveillance equipment to be used by the DRDO.
- PSLV C-45 placed this primary satellite to the 748 km sun-synchronous polar orbit.
- It then made one complete revolution around Earth, over the poles, while lowering its orbit to 504 km height.
- After this, it deposited the 28 international customer satellites.
- It then made a further round of Earth while attaining an even lower orbit of

485 km.

- At this level, the fourth stage of the rocket will continue for some time.
- The entire operation took a little over three hours.
- For enabling each of the two revolutions around Earth, the fourth-stage engines were reignited, which is a unique feature of PSLV C45.
- Earlier missions used to be “single-shot” operations in which the engines used to fire just once.

### **What is the significance?**

- **Orbit** - Reaching three different orbits gives ISRO a new technological edge.
- The mission will help ISRO pack its future rockets with multiple satellites even if they have to be placed in diverse but precise orbits.
- Earlier, this could be done only in multiple missions.
- It also showed that the guidance and navigation systems aboard the rocket could be used for much longer times than in earlier missions
- **Fourth stage as satellite** - The rocket, or the launch vehicle, is only a carrier.
- Once it places its passenger, or satellite, to its designated orbit in space, it becomes practically useless, adding to the space debris.
- But for the last few years, ISRO had been planning to give some life to the rocket.
- It was planning this at least to the uppermost part, or the last stage, which remains with the satellite till the ejection.
- So significantly, in PSLV-C45, ISRO demonstrated its capability to reuse the fourth-stage engines multiple times.

### **What purpose will the fourth stage serve?**

- The fourth stage is carrying three kinds of equipment to carry out some measurements and experiments; each of them to be used -
  1. to capture messages transmitted from ships
  2. by amateur radio operators' use for tracking and monitoring position data
  3. to study the structure and composition of the ionosphere
- It also carries a solar panel to provide power to these equipment and enable communication with ground stations.
- The fourth stage will not have the usual life of a satellite as it can remain alive only for a few weeks or a few months.
- As, it is not equipped with a lot of other things that enable a satellite to exist for longer duration in outer space, like a radiation shield.
- However, this is still good enough time to carry out shorter duration

experiments and data collection.

- In future, such an “orbital platform”, as it is being described, can also be used to inject smaller satellites into orbits.

**Source: The Hindu, Indian Express**

