



# Pushpak, ISRO's Reusable Launch Vehicle

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## Why in News?

Recently, [the Indian Space Research Organisation \(ISRO\)](#) successfully completed the third and final [Reusable Launch Vehicle Landing Experiment \(RLV LEX-03\)](#) for the **Pushpak vehicle**.

- This demonstrated the autonomous landing capability of the RLV under more challenging release conditions and severe wind conditions.

## What is RLV LEX-03 Mission?

### ▪ About:

- During the RLV LEX-03 mission, the **Pushpak vehicle** was released from an **Indian Air Force Chinook helicopter** at an altitude of 4.5 km.
- From this point, the winged vehicle autonomously executed cross-range correction manoeuvres approached the runway and performed a precise horizontal landing at the runway centerline.
- The high-speed landing, exceeding 320 km/h, was successfully slowed to around 100 km/h using the vehicle's brake parachute and landing gear brakes.

### ▪ Technologies and Capabilities Demonstrated:

- **Precise Landing:** LEX-03 used multisensor fusion to guide the vehicle for a controlled landing.
- **Autonomous Flight:** The Pushpak vehicle demonstrated its ability to land itself, including correcting its course during descent.
- **Reusable Design:** The mission reused key parts from a previous flight, highlighting the cost-saving potential of RLVs.

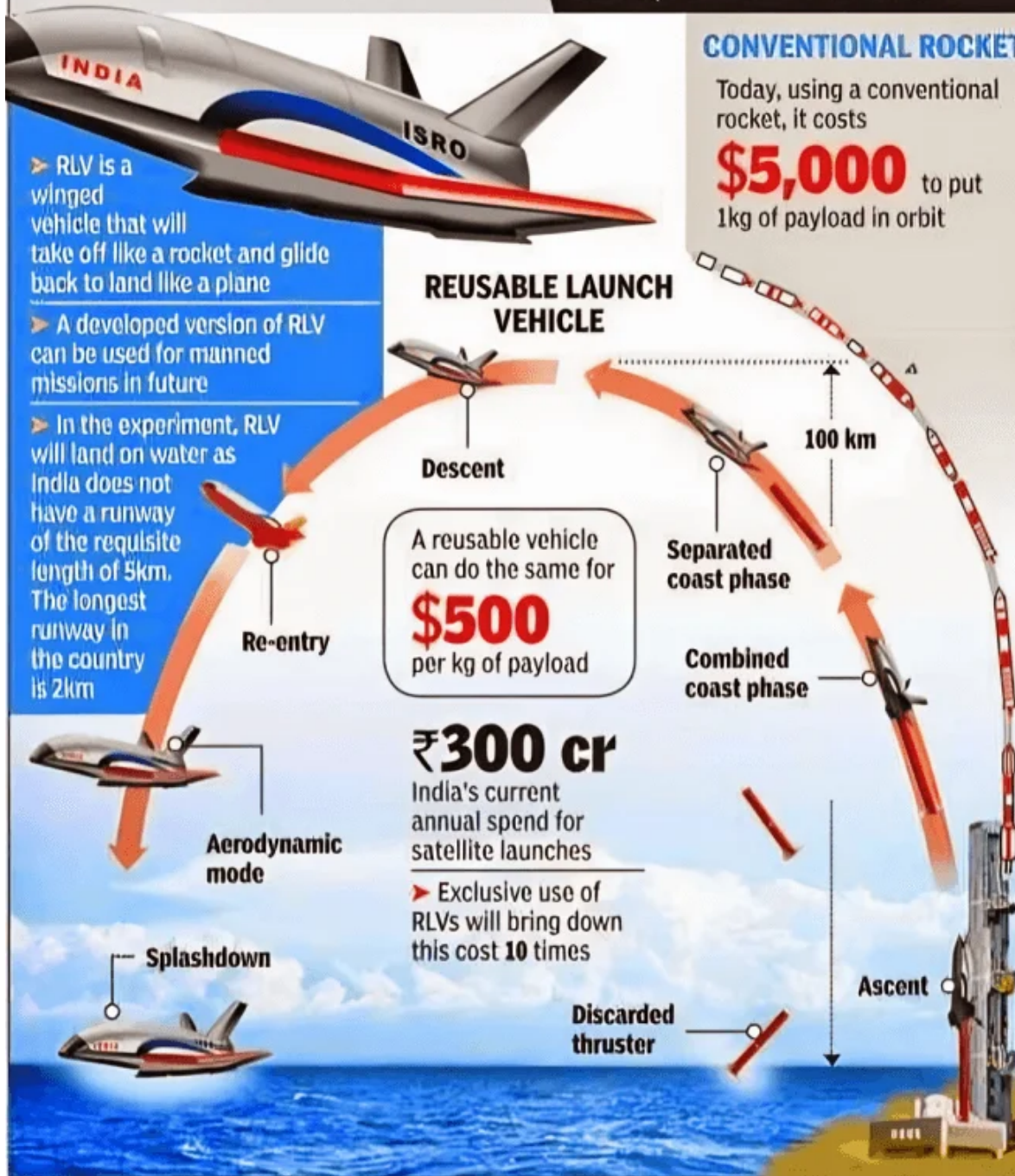
### ▪ Significance:

- This mission simulated the **approach and landing interface**, as well as the **high-speed landing conditions**, for a vehicle returning from space.
  - It validated **ISRO's advanced guidance algorithm** for longitudinal and lateral error corrections, which is essential for future **Orbital Re-entry Missions**.
- By testing key technologies like autonomous landing and reusable parts, it paves the way for a fully reusable launch vehicle. This could **cut launch costs** and make **space missions more efficient**.

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# WHAT THE FUTURE HOLDS FOR ISRO

The reusable launch vehicle (RLV) will touch Mach 5 (five times the speed of sound), re-enter atmosphere and land on water



## What are Reusable Launch Vehicles?

### ▪ About:

- **Reusable launch vehicles (RLVs)** are **rockets** that can be **used multiple times** for space missions, unlike **traditional expendable rockets** where each stage is **discarded after use**.

### ▪ Different from Multi-Stage Rocket:

- In a typical multi-stage rocket, the **first stage is jettisoned** (discarded to lighten the load) after its fuel is consumed, while the **remaining stages continue to propel the payload into orbit**.

- **RLVs recover and reuse the first stage** . After detaching from the upper stages, the first stage uses engines or parachutes to descend and land back on Earth.
  - It can then be **refurbished** for future launches, significantly **reducing costs**.
- **Space Agencies Currently Using or Developing RLVs.**
  - **SpaceX (USA): Falcon 9**, with over 220 launches, 178 landings, and 155 re-flights as of May 2023.
  - **Blue Origin (USA): New Shepard** performs suborbital flights and lands vertically.
  - **JAXA (Japan) and ESA (Europe):** Researching reusable launch systems to reduce space access costs.
  - **ISRO (India):** Developed the Reusable Launch Vehicle-Technology Demonstration (RLV-TD) and conducted a successful landing.

**Read More:** [Reusable Launch Vehicle-Technology](#)

### UPSC Civil Services Examination, Previous Year Question (PYQ)

**Q. With reference to India's satellite launch vehicles, consider the following statements: (2018)**

1. PSLVs launch the satellites useful for Earth resources monitoring whereas GSLVs are designed mainly to launch communication satellites.
2. Satellites launched by PSLV appear to remain permanently fixed in the same position in the sky, as viewed from a particular location on Earth.
3. GSLV Mk III is a four-staged launch vehicle with the first and third stages using solid rocket motors, and the second and fourth stages using liquid rocket engines.

**Which of the statements given above is/are correct?**

- (a) 1 only
- (b) 2 and 3
- (c) 1 and 2
- (d) 3 only

**Ans: (a)**

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