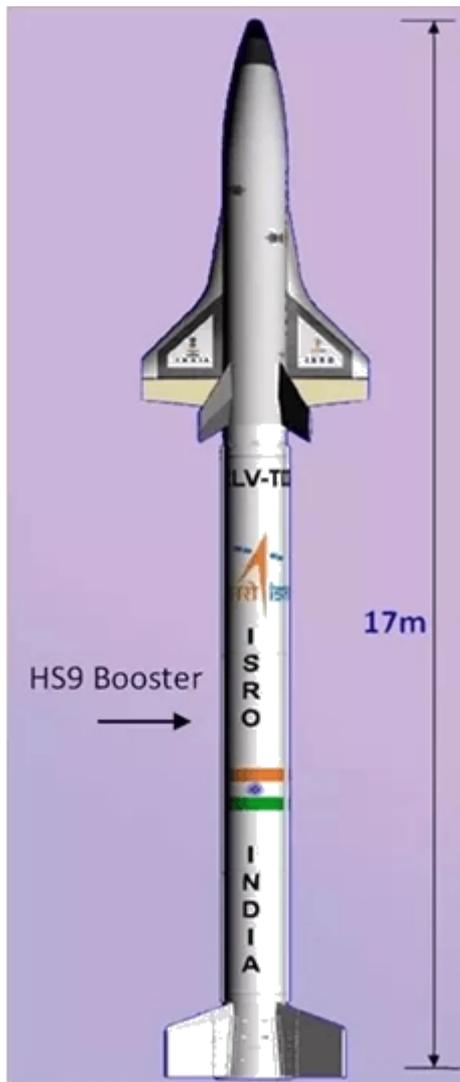


## Reusable Rocket Technology (Download PDF)

(February 4, 2019)

ISRO is working on reusable technology for reducing the cost of access to space including the development of a winged body unmanned reusable launch vehicle (RLV) for launching payloads into low earth orbits.



*Image Of Launching Payloads Earth*

### **Concept for this Reusable Rocket Technology:**

- Reusable Launch Vehicle also known as RLV.
- The figure is the diagrammatic representation of ISRO's RLV earlier called as AVATAR vehicle.

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- The concept is much simpler wherein an initial stage rocket will launch the RLV (here RLV is nothing but a Double Delta wing aircraft mounted on the initial booster rocket) to the stratosphere wherein the RLV will be detached and will rotate around orbit.
- After acquiring enough centrifugal force the RLV will launch the satellite to the required mission orbit.
- The RLV after completing the mission will return to earth and will land most probably in the oceans so that it can easily recovered by naval vessels without causing any collateral damag

- *Image Of Figure Of RLV Mission*

  - The figure is the diagrammatic representation of RLV mission
  - Development of Reusable Launch Vehicles is a technical challenge and it involves the development of many cutting edge technologies. A series of technology demonstration missions would be required to validate these technologies. In the next phase, an autonomous runway landing experiment is planned releasing the RLV-TD vehicle from a helicopter to demonstrate the runway approach and landing capability. This will be followed by an end-to-end orbital re-entry mission demonstration using a Technology Demonstration Vehicle boosted by propulsion systems.

## **Various Types of Challenges for RLV**

1. Enhanced Thermodynamic property of the RLV structure so that it does not get damaged due to high earth reentry temperature.
  2. Development of an indigenous Hypersonic Scramjet engine (Scramjets are engines having Mach no. more than 5 in order to operate in the outer space orbit where conventional aircraft engine won't work since there is no air in outer space.
  3. RLV should be able to launch heavier satellites and return to earth autonomously.
- The disadvantage of RLV is that the initial stage rocket will fall off and cannot be used for further operation. Thus improvement is needed to make the initial stage rockets reusable thus making RLV or AVATAR an 100 % reusable vehicle
  - ISRO has successfully developed a scaled down (1: 5) technology demonstration version of Reusable Launch Vehicle – Technology Demonstrator (RLV-TD) vehicle and successfully carried out the first experimental mission on May 23, 2016 from Satish Dhawan Space Centre, Sriharikota. In this mission, critical technologies such as autonomous navigation, guidance & control and reusable thermal protection system have been successfully demonstrated.
  - ISRO believes that RLV will reduce the satellite cost by \$2000 per kg of launch. Indian government has believed to invest 95 crores for initial development, this funding may go further high in near future.
  - ISRO has undertaken the development & qualification of Semi-Cryogenic engine. Further development activities are planned to realise a Semi-cryogenic stage and updated version of the high thrust GSLV Mk III cryogenic stage, in order to increase the payload capacity of GSLV Mk III from 4 tonnes to 6.5 tonnes.
  - This was stated by the Minister of State in Ministry of Personnel, PG & Pension, Dr. Jitendra Singh in a written reply to question in the Lok Sabha.

## About ISRO

- The Indian Space Research Organisation is the Space Agency of the Government of India Headquartered in the City of Bengaluru.
- Its Vision is to “Harness Space Technology for National Development While Pursuing Space Science Research and Planetary Exploration. “
- Headquarters: Bengaluru
- Founder: Vikram Sarabhai

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