



Reusable Launch Vehicle

Description

Theme:

- The Indian Space Research Organisation (ISRO) is currently engaged in the development of a fully reusable launch vehicle, with the aim of making space exploration more affordable. A recent milestone in this pursuit was achieved on the 2nd March 2023, through the successful landing experiment of the Reusable Launch Vehicle-Technology Demonstration (RLV-TD) programme, which took place at the Aeronautical Test Range in Challakere, Karnataka.

What is a Reusable Launch Vehicle?

- A Reusable Launch Vehicle (RLV) is a type of spacecraft designed to be used multiple times for launching payloads into space. Unlike traditional launch vehicles that are designed for one-time use, RLVs are intended to be reusable, with the aim of reducing the cost of space exploration. RLVs are made using advanced materials and technology that allow them to handle the high temperatures and pressures associated with space travel.

ISRO's RLV-TD successful mission:

- The test was done under the mission name Reusable Launch Vehicle Autonomous Landing Experiment (RLV LEX).
- The vehicle, called RLV, was carried by helicopter to an altitude of 4.5 km and released mid-air for an autonomous landing on a runway.
- The landing achieved precise parameters that simulate the landing of a space re-entry vehicle.
- The mission used several indigenous systems developed by ISRO, including localized navigation systems, instrumentation, and sensor systems.
- The technologies developed for RLV LEX have been integrated into other operational launch vehicles of ISRO, making them more efficient and cost-effective.

REUSABLE LAUNCH VEHICLE

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Advantages of RLV:

- Cost Reduction: The primary benefit of RLVs is the significant cost reduction compared to single-use launch vehicles. A traditional launch vehicle can only be used once and must be built from scratch for each launch. In contrast, RLVs are designed to be reused multiple times, reducing the cost of manufacturing and assembly.
- Access to Space: Reusable launch vehicles can provide more access to space by reducing the cost of space missions. This increased access to space can facilitate research and

development in various fields.

- Technological Advancements: Developing reusable launch vehicles requires significant technological advancements in materials, manufacturing, and propulsion systems. These advancements can have applications beyond space exploration, leading to technological advancements in other industries. Therefore, ISRO's successful RLV launch represents a significant milestone not only for space exploration but also for the wider technology industry.
- Environmental benefits: Reusable launch vehicles are also more environmentally friendly than traditional launch vehicles. By reducing the number of rocket stages and other components that are discarded after each launch, reusable launch vehicles reduce the amount of debris that accumulates in space and on Earth.

Future Opportunities:

- Currently, only the US and China possess RLV technology, which means that India has become a member of an elite club. This achievement will benefit our global standing as a leader in science and technology.
- RLVs can lead to the development of new space-based services, such as satellite maintenance, repair, and refuelling. These services can be provided more efficiently and cost-effectively with reusable launch vehicles, leading to new opportunities for India in the field of space-based services.
- The deployment of a successful RLV will enhance ISRO's reputation as a leader in space technology and exploration. This will attract more global attention to ISRO, potentially leading to more international collaborations and orders.
- India can also benefit from the potential of space tourism, as RLVs can make frequent and more affordable trips to space possible.

Conclusion:

The successful launch of the RLV is a testament to the technological prowess of ISRO and the potential for India to become a leading player in the global space industry. It opens up new avenues for exploration, research, and commercial opportunities in space, which can benefit not only India but also the international community. Moreover, the development and deployment of RLVs can lead to cost-effective space missions, space tourism, and space debris management, among other advantages. Continued investment in RLV technology can lead to a bright future for India's space program and its contributions to the world of science and technology.

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