



Mains Practice Question

Q. How does the development of reusable launch vehicles align with the objectives of India's Space Policy 2023? Discuss its implications for the commercialization of India's space sector. **(250 words)**

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Approach

- Introduce the answer by mentioning India's Space Policy 2023
- Delve into Reusable Launch Vehicles Alignment with Indian Space Policy 2023
- Give its Implications for Commercialization of India's Space Sector
- Conclude suitably.

Introduction

India's Space Policy 2023 outlines ambitious goals for the country's space program, including enhancing **space-based applications, promoting international cooperation, and ensuring sustainable space activities.**

- The development of **reusable launch vehicles (RLVs)** aligns closely with these objectives.

Body

Reusable Launch Vehicles Alignment with Indian Space Policy 2023:

- **Technological Advancement:** The Indian Space Policy 2023 emphasizes India's commitment to developing cutting-edge space technologies. The RLV program exemplifies this objective:
 - **ISRO's Pushpak- Reusable Launch Vehicle Technology Demonstrator (RLV-TD) project** showcases India's progress in complex aerospace technologies.
 - The **LEX-03 mission** simulated landing conditions for a vehicle returning from space, with **landing velocities exceeding 320 km/h** – faster than commercial aircraft or typical fighter jets.
- **Cost-Effectiveness:** A key goal of the Indian Space Policy 2023 is to **reduce the cost of access to space**. RLVs directly contribute to this objective:
 - Reusability significantly **lowers launch costs** by eliminating the need to build new vehicles for each mission.
 - The RLV-TD program aims to develop technologies for a **fully reusable two-stage orbital launch vehicle**, potentially revolutionizing launch economics.
- **Commercialization of the Space Sector:** The Indian Space Policy 2023 seeks to **enhance private sector participation** in space activities. RLV technology has significant commercial implications:
 - The development of RLV technologies creates opportunities for **technology transfer and spin-offs to the private sector.**
 - The policy could lead to partnerships similar to **NASA's Commercial Crew Program**, where private companies like SpaceX and Boeing develop and operate spacecraft for government and commercial use.

- **Enhancing Launch Capabilities:** The policy aims to expand India's space infrastructure and launch capacity:
 - RLVs can potentially increase launch frequency and payload capacity.
 - The ability to quickly refurbish and relaunch vehicles enhances overall space access.
 - **ISRO's RLV-TD program** includes testing hypersonic flight, autonomous landing, and powered cruise flight – all critical for developing a **versatile, reusable space transportation system**.

Implications for Commercialization of Indian Space Sector :

- **New Business Models:** RLVs enable more flexible and responsive launch services, allowing companies to offer "**space-on-demand**" solutions.
- **Reduced Entry Barriers:** Lower launch costs make it easier for startups and smaller companies to enter the space market with **innovative satellite and payload concepts**.
- **Increased Launch Frequency:** Quicker turnaround times for RLVs can support the deployment and maintenance of large satellite constellations for communications, Earth observation, and other applications.
- **Domestic Manufacturing:** The development of RLVs will **drive demand for specialized components and materials**, potentially boosting India's aerospace manufacturing sector.
- **Space Tourism:** While not an immediate focus, mastering RLV technology lays the **groundwork for potential future space tourism** opportunities.

Conclusion

The development of reusable launch vehicles is strongly aligned with **India's Space Policy 2023**, supporting goals of technological advancement, cost-effectiveness, and sector commercialization. This alignment promises to enhance **India's position in the global space economy** while fostering domestic innovation and economic growth in the space sector.

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