Science & Technology · GS - III

Reusable launch vehicle technology has the potential to transform the economics of space exploration. Examine its significance for global space activities and India's emerging space economy.

EXAM YEAR	PAPER	SUBJECT
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MARKS	WORD LIMIT
10	~150 words

Answer Hint

Launch cost reduction, rapid reusability, private space sector, space commercialisation, Mars exploration, ISRO, technology transfer, safety and environmental concerns.

Model Answer

Introduction

Reusable launch vehicles are designed to recover and reuse major rocket components, reducing dependence on expendable launch systems and potentially lowering space transportation costs.

Significance for Global Space Activities

Technologies such as SpaceX's Starship recovery system demonstrate the potential for rapid turnaround and repeated launches. Reusability can improve launch affordability, support large satellite constellations and enable ambitious missions, including human exploration of Mars. It can also expand commercial access to space.

Opportunities for India

India can strengthen its space economy through ISRO's reusable launch vehicle programme, private-sector participation and indigenous propulsion technologies. Lower launch costs can improve India's competitiveness in the global satellite-launch market and support scientific missions.

Challenges

Repeated recovery requires advanced thermal protection, precise landing systems and rigorous safety validation. High initial development costs, environmental impacts and technological dependence remain important concerns.

Conclusion

Reusable launch technology can reshape space exploration, but sustained research, indigenous innovation and public-private collaboration will determine its long-term benefits for India.

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