Science & Technology · GS - III

Repeated launch vehicle failures highlight the importance of technological reliability in India's space programme. Examine the significance of propulsion-system improvements for launch vehicle performance and India's strategic space capabilities.

EXAM YEAR	PAPER	SUBJECT
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MARKS	WORD LIMIT
10	~150 words

Answer Hint

Launch vehicle reliability, solid and liquid propulsion, stage separation, payload injection accuracy, failure analysis, indigenous technology, commercial launch market, strategic autonomy, space sustainability.

Model Answer

Introduction

India's space programme depends on reliable launch vehicles for placing satellites into different orbits. Improvements in propulsion systems are therefore essential for ensuring mission success and technological advancement.

Significance of Propulsion-System Improvements

- **Mission reliability:** Improved propulsion performance reduces the probability of launch failures and enhances mission confidence.
- **Orbital precision:** Accurate thrust and controlled burn duration help achieve the desired payload orbit.
- **Technological advancement:** Testing modified stages strengthens indigenous capabilities in materials, propulsion and flight control.

- **Commercial competitiveness:** Reliable launch vehicles improve India's position in the global satellite-launch market.
- **Strategic autonomy:** Indigenous launch capabilities reduce dependence on foreign launch providers for critical space missions.

Challenges and Way Forward

Launch vehicles involve complex interactions among propulsion, guidance, navigation and stage separation systems. Failures require systematic investigation, transparent technical assessment and repeated validation under realistic conditions. ISRO should strengthen quality assurance, simulation, component testing and redundancy wherever technically feasible.

Conclusion

Continuous innovation and rigorous testing are vital for transforming launch vehicle improvements into dependable operational capabilities. This will strengthen India's scientific, commercial and strategic position in space.

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