

GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA

UNSTARRED QUESTION NO. 3169

TO BE ANSWERED ON THURSDAY, MARCH 27, 2025

DEVELOPMENT OF REUSABLE LAUNCH VEHICLE TECHNOLOGY

3169. SHRI SANJEEV ARORA:

Will the PRIME MINISTER be pleased to state:

- (a) the progress of country's reusable launch vehicle technology;
- (b) whether private sector participation in lunar mining exploration is being encouraged;
- (c) the impact of Artificial Intelligence (AI) in optimizing satellite mission operations; and
- (d) whether India is collaborating with other nations on space debris mitigation?

ANSWER

**MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PUBLIC
GRIEVANCES & PENSIONS AND IN THE PRIME MINISTER'S OFFICE**

(DR. JITENDRA SINGH):

- (a) Towards the development of India's reusable launch vehicle technology, ISRO is developing a winged body Orbital Re-entry Vehicle (ORV), which will be launched into orbit using an ascent vehicle and subsequently re-enter into the earth's atmosphere for an autonomous approach & landing on a runway. Three Autonomous runway landing experiments on a Reusable Launch Vehicle- Technology Demonstrator (RLV-TD) have been successfully completed thereby validating the robustness of onboard autonomous navigation, guidance and control system.

ISRO is also designing and developing the critical technologies required for demonstrating booster stage recovery in Vertical Take-off and Vertical Landing (VTVL) mode, which will enable in recovery and reusing of the spent booster stages multiple times.

Government of India (GoI) has approved the development of a partially reusable Next Generation Launch Vehicle (NGLV). NGLV vehicle has been configured as a three-stage launch vehicle with a recoverable & reusable first stage.

- (b) The GoI has announced reforms, in June, 2020, in the space sector towards enabling the private players to provide end to end services and Indian National Space Promotion and Authorisation centre (IN-SPACe), will enable and regulate space activities for private sector. Further, the Department is finalizing the missions towards achieving the Indian landing on moon by 2040. It is envisaged that sufficient opportunities would be present for private sector and academic participation in various activities including lunar mining exploration.
- (c) AI is increasingly becoming an important tool that can be used in satellites and mission operations. It may be noted that thrust is given to AI based initiatives within the department. A recent example is the Autonomous sensor-based actuator system for capture, rigidization and retraction enabling sequence-based docking. For this purpose, approach profiles and relative position estimation using pattern matching is adopted. Further applications are in advanced stages of implementation in the Centre towards achieving Autonomous Mission Management, high volume on-board/Ground data processing & analysis and advanced space exploration.
- (d) The foundational principles for the responsible uses of outer space are enshrined in the Outer Space treaties. Several guidelines for space debris mitigation have been recommended by the Inter-Agency Space Debris Coordination Committee (IDAC) and the United Nations Committee on the Peaceful Uses of Outer Space (UN-COPUOS). The Department of Space contributes substantially to shaping the pertinent guidelines and recommendations for sustainable use of space as an active member of various international agencies dealing with safety and sustainability of outer space activities. The Indian Space Policy also mandates adhering to internationally accepted space debris mitigation requirements and emphasizes Space Situational Awareness capacity building.
