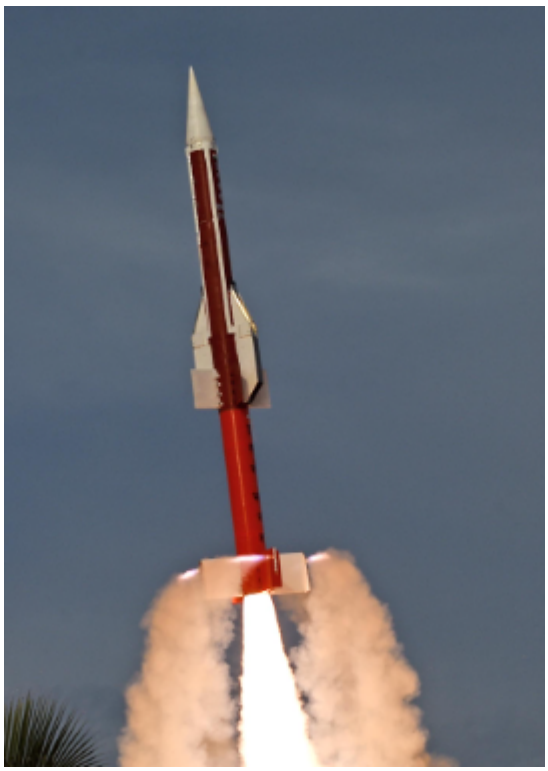
ISRO Missions

Why in News?

Recently ISRO finished its 2024 launch schedule with PSLV C60 mission.

What were the significant missions of ISRO in 2024?

- In 2024, ISRO successfully launched 15 missions, including high-profile projects like the Aditya L1 solar mission and INSAT-3DS mission.
- **PSLV C58** – The year 2024 began with the launch of XPoSat using PSLV C58 mission
- PSLV Orbital Experimental Module-3 (POEM-3) experiment was also conducted using the PS4 stage of PSLV C58.
- **Aditya L1 solar mission** – In January 2024, Aditya-L1 spacecraft, India's first solar mission, has successfully entered its final orbit around the first Sun-Earth Lagrangian point (L1).
- **INSAT-3DS** –GSLV-F14 launched this meteorological satellite into the Geosynchronous Transfer Orbit (GTO).
- **ABPS** - ISRO successfully carried out the second experimental flight for the demonstration of Air Breathing Propulsion Technology.



- **Reusable Launch Vehicle** - RLV LEX-02 and 03 were demonstrated the autonomous landing capability of the RLV under more challenging release conditions and more severe wind conditions.

"Pushpak" is the reusable test launch vehicle developed and used by ISRO.

- **HLVM 3** – In December 2024, ISRO began assembling the human-rated LVM-3 (HLVM-3) for its first uncrewed mission.
- This marked the official launch campaign for the HLVM-3 G1/OM-1 mission.

'G1' stands for the first Gaganyaan mission and 'OM-1' for the first orbital module mission.

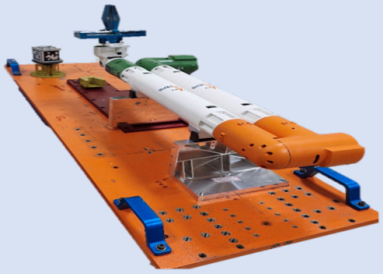
The experimental flight of the Launch Vehicle Mark 3 (LVM-3) X was conducted in 2014.

- **Axiom-4 mission** - India selected 2 crew members Shubhanshu Shukla and Prasanth Balakrishnan Nair to this private spaceflight to the International Space Station.
- **PSLV C59** - It placed the European Space Agency's (ESA) Proba-3 spacecrafts — 'Project for Onboard Autonomy' (Proba)— into a highly elliptical orbit of 600 km x 60,500 km as planned 18 minutes after liftoff.

What is PSLV C60 Mission?

- **PSLV C60 Mission** – It consists of SpaDeX and PSLV Orbital Experimental Module (POEM-4).
- **SpaDex** - Space Docking Experiment is a predecessor to ISRO's Bharatiya Antariksh Station (BAS) and the Chandrayaan-4 missions todemonstrate in-orbit docking.
- **POEM 4** – It is the set of 24 payload experiments conducted using the fourth stage of PSLV-C60.

Payloads of POEM-4	
Module	**Description**
Walking Robotic Arm	• It is the Relocatable Robotic Manipulator-Technology Demonstrator developed by ISRO Inertial Systems Unit (IISU). • It is expected to demonstrate a robotic arm that can move to defined targets on the POEM using an inch-worm walking technique.

Debris Capture Robotic Manipulator	• It is developed by Vikram Sarabhai Space Center (VSSC) to capture tethered space debris with a robotic manipulator. 
Compact Research module	• It was built by VSSC for orbital plant studies to study the germination and growth of eight cowpea seeds in a five- to seven-day experiment in a controlled environment.
Amity Plant Experimental Module in Space (APEMS)	• Developed by Amity University, Mumbai, It will compare growth-related changes in plant callus cells using spinach plants (*Spinacia oleracea*) in microgravity and earth gravity.
RVSat-1	• Developed by R.V. College of Engineering Bengaluru, It will measure the growth of the gut bacterium *Bacteroides thetaiotaomicron* in space. • The experiment will provide data to understand human physiology in space and astronaut health during crewed missions.
Multi-Sensor Inertial Reference System (MIRS)	• Developed by IISU to demonstrate and evaluate the performance of newly developed miniaturised inertial sensors in space. 
Electron Temperature Analyser (ETA)	• Developed by SPL for in-situ measurement of electron temperature and electron density of planetary ionospheres.
Electron Density and Neutral Wind (ENWi)	• To measure ion and electron drifts in two perpendicular directions along the orbit.
Langmuir Probe (LP)	• To measure various ionospheric properties, such as electron temperature using 1-LP in sweep mode to derive the electron density, estimating the electric field using a 2-LP configuration
RUDRA 1.0 HPGP	• To demonstrate a high-performance Green Propulsion System.

Swetchasat	• To demonstrate the operational capability of the onboard UHF transmitter by establishing a reliable communication link with the ISRO Telemetry and Tracking Command (ISTRAC) ground station. 
MOI-TD	• It is a technology demonstrator AI lab in space.

What are the upcoming ISRO missions in 2025?

- **Uncrewed HLVM 3** - The 3 stage Human rated Launch vehicle 3 will be tested for the Gaganyaan mission.
- **NISAR Mission -** NASA-ISRO Synthetic Aperture Radar satellite is set for launch around March 2025.

NISAR is considered the world's most expensive earth imaging satellite that will provide high-resolution data, scanning land and ice every 12 days, with a focus on global environmental changes.

- **Advanced NVS-02 satellite** – It is part of India's NavIC (Navigation with Indian Constellation) system.
- **Deployment of Vyommitra** - Indian humanoid robot Vyommitra will be launched along with uncrewed test mission of Gaganyaan.

References

1. The Hindu | All eyes on PSLV-C60 mission
2. ISRO | POEM 4
3. ISRO | Timeline