



## Space Missions in 2024

**For Prelims:** Space Missions in 2024, [NASA's OSIRIS-REx Mission](#), [NASA's Artemis plan](#), [India's Chandrayaan-3 mission](#).

**For Mains:** Space Missions in 2024, Achievements of Indians in science & technology.

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### Why in News?

The year 2023 proved to be an **important one for space missions**, with [NASA's OSIRIS-REx mission returning a sample from an asteroid](#) and [India's Chandrayaan-3 mission](#), and 2024 is shaping up to be **another exciting year for space exploration**.

- Several new missions under [NASA's Artemis plan](#) and Commercial Lunar Payload Services initiative will target the moon.

### What are the Space Missions Planned for 2024?

- **Europa Clipper:**
  - NASA will launch **Europa Clipper**, which will explore one of Jupiter's largest moons, Europa.
    - Europa is **slightly smaller than the earth's moon**, with a surface made of ice. Beneath its icy shell, Europa likely harbours a saltwater ocean, which scientists expect contains over twice as **much water as all the oceans here on Earth combined**.
  - With Europa Clipper, scientists want to **investigate whether Europa's ocean** could be a suitable habitat for extraterrestrial life.
    - The mission plans to do this by **flying past Europa nearly 50 times** to study the moon's icy shell, its surface's geology and its subsurface ocean.
  - The mission will also **look for active geysers spewing out from Europa**.
- **Artemis II launch:**
  - Artemis II, part of NASA's Artemis program, is a **crewed lunar mission set to orbit the Moon, marking humanity's return since 1972**.
    - The Artemis programme is named after **Apollo's twin sister in Greek mythology**.
    - Planned for a 10-day journey, it aims to validate systems for sustained lunar presence.
  - This pivotal mission, including the **first woman and person of color**, follows Artemis I's success, testing an uncrewed lunar capsule in late 2022.
    - Artemis II underscores NASA's **commitment to lunar exploration**, preparing for extended space habitation, and laying the groundwork for future missions to Mars.
- **VIPER to Search for Water on the Moon:**
  - VIPER (Volatiles Investigating Polar Exploration Rover), is a **robot the size of a golf cart**

that **NASA** will use to explore the moon's south pole in late 2024.

- This robotic **mission is designed to search for volatiles**, which are molecules that easily vaporize, like water and carbon dioxide, at lunar temperatures.
  - These materials could provide resources for future human exploration on the moon.
- The VIPER robot will **rely on batteries, heat pipes and radiators throughout its 100-day mission**, as it navigates everything from the extreme heat of lunar daylight – when temperatures can reach 224°F (107 °C) – to the moon's frigid shadowed regions that can reach as low as -240°C.

#### ▪ **Lunar Trailblazer and PRIME-1 Missions:**

- NASA has **recently invested in a class of small, low-cost planetary missions** called **SIMPLEX**, which stands for **Small, Innovative Missions for Planetary Exploration**.
  - These missions save **costs by tagging along on other launches** as what is called a rideshare, or secondary payload.
- One example is the **Lunar Trailblazer**. Like VIPER, Lunar Trailblazer will look for water on the moon.
  - But while VIPER will land on the moon's surface, studying a specific area near the south pole in detail.
  - Lunar Trailblazer will orbit the moon, measuring the temperature of the surface and mapping out the locations of water molecules across the globe.
- Lunar Trailblazer's launch timing depends on **the primary payload's launch readiness**.
  - The PRIME-1 mission, scheduled for a mid-2024 launch, is Lunar Trailblazer's ride. PRIME-1 will drill into the moon – it's a test run for the kind of drill that VIPER will use.

#### ▪ **JAXA's Martian Moon eXploration Mission:**

- The JAXA MMX mission concept to study Mars' moons - Phobos and Deimos.
- The Japanese Aerospace Exploration Agency, or JAXA, has a robotic mission in development called the Martian Moon eXploration, or MMX, planned for launch around September 2024.
  - The mission's **main science objective is to determine the origin of Mars' moons**.
- Scientists aren't sure whether Phobos and Deimos are former asteroids that Mars captured into orbit with its gravity or if they formed out of debris that was already in orbit around Mars.
- The spacecraft will **spend three years around Mars** conducting science operations to observe Phobos and Deimos. MMX will also land on Phobos' surface and collect a sample before returning to Earth.

#### ▪ **ESA's Hera Mission:**

- It is a **mission by the European Space Agency** to return to the Didymos-Dimorphos asteroid system that [NASA's DART mission](#) visited in 2022.
  - But DART didn't just visit these asteroids, it collided with one of them to test a planetary defence technique called **"kinetic impact"**.
  - DART hit Dimorphos with such force that it actually changed its orbit.
- The kinetic impact technique smashes something into an object in order to alter its path. This could prove useful if humanity ever finds a potentially hazardous object on a collision course with Earth and needs to redirect it.
- Hera will launch in October 2024, making its way in late 2026 to Didymos and Dimorphos, where it will study the physical properties of the asteroids.

## What are ISRO's Space Missions set for 2024?

#### ▪ **PSLV-C58 with XPoSat:**

- [XPoSat](#), India's first X-Ray Polarimeter Satellite, was launched in January 2023 aboard the **Polar Satellite Launch Vehicle (PSLV-C58)**.
- This mission aims to investigate the polarization of intense X-ray sources in the universe, focusing on pulsars, black hole X-ray binaries, and other celestial objects.

#### ▪ **NASA-ISRO Synthetic Aperture Radar (NISAR):**

- The [NISAR](#), a collaborative mission between NASA and ISRO, is a dual-frequency synthetic aperture radar satellite designed for remote sensing, providing insights into various Earth systems including ecosystems, ice mass, vegetation biomass, and natural hazards.

#### ▪ **Gaganyaan 1:**

- The **Gaganyaan 1** mission is a critical step in India's Human Spaceflight Programme.
- This test flight, involving three crew members, is a collaborative effort between ISRO and Hindustan Aeronautics Ltd (HAL) to pave the way for **Manned Space Exploration**.
- **Mangalyaan-2 (MOM 2):** .
  - Mangalyaan-2, or **Mars Orbiter Mission 2** (MOM 2), is ISRO's ambitious sequel to its successful Mars mission.
  - This mission, aimed at studying the surface, atmosphere, and climatic conditions of Mars, will equip the orbiter spacecraft with advanced scientific instruments, including a hyperspectral camera, magnetometer, and radar.
  - MOM 2 is a testament to India's expanding prowess in planetary exploration.
- **Shukrayaan-1:**
  - Under the **Venus Orbiter Mission**, ISRO plans to launch Shukrayaan-1, a spacecraft destined to orbit Venus for five years.
  - It aims to study the atmosphere of Venus, marking India's first foray into exploring the mysteries of the second planet from the Sun.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

### **Prelims:**

**Q.1 In the context of space technology, what is “Bhuvan”, recently in the news? (2010)**

- (a) A mini satellite launched by ISRO for promoting the distance education in India
- (b) The name given to the next Moon Impact Probe, for Chandrayaan-II
- (c) A geoportal of ISRO with 3D imaging capabilities of India
- (d) A space telescope developed by India

**Ans: (c)**

### **Mains:**

**Q.1** What is the main task of India’s third moon mission which could not be achieved in its earlier mission? List the countries that have achieved this task. Introduce the subsystems in the spacecraft launched and explain the role of the ‘Virtual Launch Control Centre’ at the Vikram Sarabhai Space Centre which contributed to the successful launch from Sriharikota. **(2023)**

**Q.2** What is India’s plan to have its own space station and how will it benefit our space programme? **(2019)**

**Q.3** Discuss India’s achievements in the field of Space Science and Technology. How the application of this technology helped India in its socio-economic development? **(2016)**