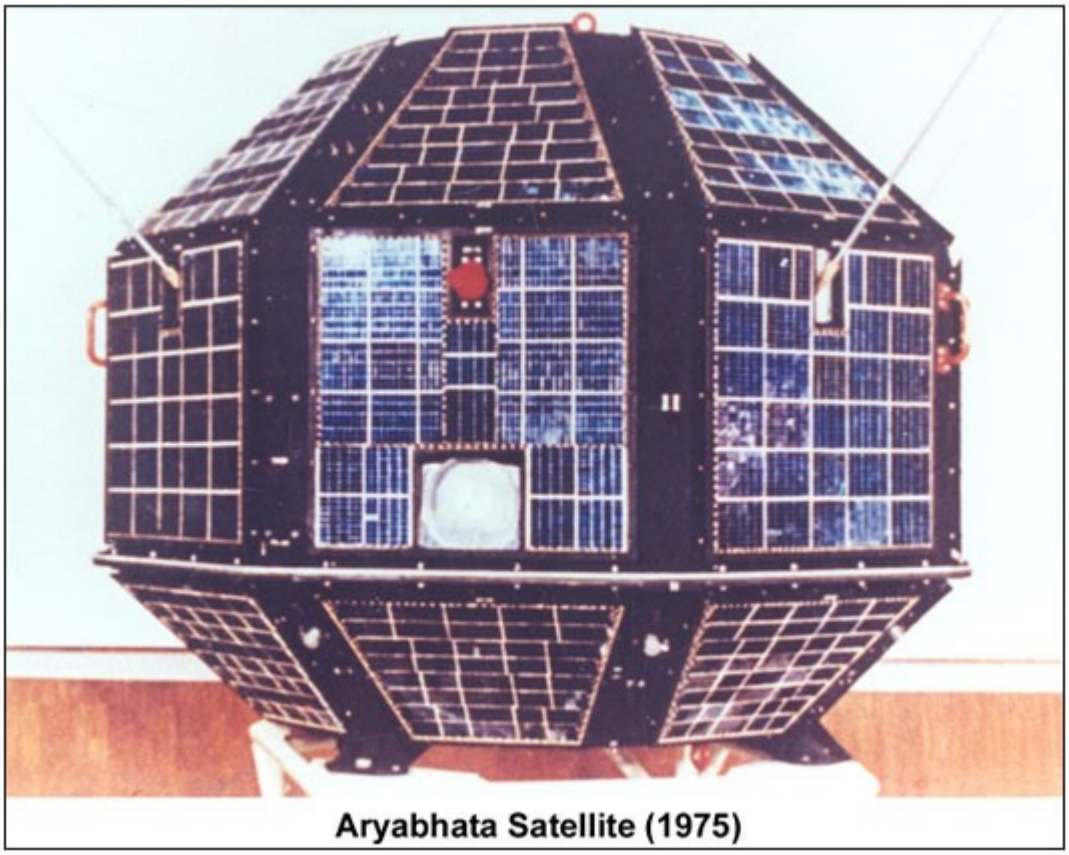
ARYABHATA SATELLITE – SCIENCE & TECHNOLOGY

NEWS: April 19, 2025 marked the **50th anniversary** of the launch of Aryabhata, **India's first indigenously built satellite.**

- **It laid the foundation of India's space communication, scientific research, and satellite technology ecosystem.**
- **As of 2025,** ISRO has launched **131 satellites**, with **51 currently operational** in orbit.

WHAT'S IN THE NEWS:

1. **Name and Inspiration**
    - The satellite was named **"Aryabhata"**, after the renowned **ancient Indian astronomer Aryabhata I**.
    - Aryabhata I lived during **476 to 550 CE**, and was one of the earliest Indian mathematicians and astronomers, known for his groundbreaking contributions in these fields.
2. **Developer**
    - The **Indian Space Research Organisation (ISRO)** developed the satellite.
    - This marked one of the earliest milestones for ISRO, showcasing its technical capabilities in satellite design and development.
3. **Launch Date**
    - The satellite was launched on **April 19, 1975**.
    - This date is celebrated as a major turning point in India's space journey.
4. **Launch Vehicle and Site**
    - Aryabhata was launched using the **Soviet Kosmos-3M rocket**, a two-stage launch vehicle known for deploying satellites into low Earth orbit.
    - The launch took place from **Kapustin Yar**, a well-known Soviet space and missile test site located in what is now **Russia**.
    - Though the launch vehicle and site were foreign, the **satellite itself was wholly Indian-made**, a significant national achievement.


Aryabhata Satellite (1975)

II. Aryabhata Satellite Mission Details

5. **Shape and Structure**

    - The satellite featured a **26-sided quasi-spherical shape**.
    - This geometric design was likely chosen for structural efficiency and to house various scientific instruments uniformly.

6. **Scientific Objectives**

    - The satellite carried out several **scientific missions** aimed at expanding India's capabilities in space research:
        - **X-ray astronomy experiments**: These aimed to study celestial X-ray sources, contributing to our understanding of stars and black holes.
        - **Detection of solar neutrons and gamma rays**: The satellite measured high-energy emissions from the Sun to study solar activity and radiation.
        - **Upper atmospheric studies**: It collected data on Earth’s upper atmosphere, helping scientists analyze its structure and behavior under different solar influences.

7. **Notable Milestone**

    - Aryabhata was **India's first satellite to be entirely designed and built within the country**, reflecting a high level of indigenous technical expertise.

    - However, since India lacked launch capability at the time, the satellite was **launched with the assistance of the Soviet Union**, marking a significant international collaboration.

Aryabhata I (476–550 CE)

8. **Birth and Era**

    - Aryabhata I was born in **Pataliputra**, an ancient city that corresponds to modern-day **Patna in Bihar, India**.

    - He lived during the **Gupta period**, often referred to as the "Golden Age of India" due to its achievements in science, mathematics, art, and culture.

9. **Key Scientific and Mathematical Contributions**

    - **Heliocentric Model**: Aryabhata proposed that the **Earth rotates on its axis**, a revolutionary idea at a time when the geocentric (Earth-centered) model was dominant.

    - **Accurate Calculation of π (Pi)**: He calculated the value of **π as approximately 3.1416**, which is remarkably close to its actual value.

    - **Concept of Zero and Sine Functions**: Aryabhata was among the first to use **zero as a placeholder**, and introduced **trigonometric sine functions**, which later played a foundational role in both Indian and Islamic mathematics.

    - **Eclipse Calculations**: He accurately computed **solar and lunar eclipses**, using a scientific understanding of the relative positions of the Sun, Moon, and Earth.

    - **Sidereal Rotation**: He correctly calculated the **sidereal rotation** of the Earth—the time it takes for Earth to complete one rotation relative to fixed stars.

10. **Book: Aryabhatiya**

    - His major work, **Aryabhatiya**, is a **comprehensive treatise** written in Sanskrit verse and divided into **four chapters**:

        - **Gitikapada**: Deals with **large units of time**, astronomical constants, and cosmology.

- **Ganitapada**: Focuses on **algebra, arithmetic, and number theory**, including operations with zero and negative numbers.
- **Kalakriyapada**: Covers **calendar-related calculations**, timekeeping, and methods for determining planetary positions.
- **Golapada**: Discusses the **celestial sphere**, astronomical instruments, and **planetary motions** in a geocentric as well as quasi-heliocentric framework.

Source: https://www.etvbharat.com/en/!technology/satellite-technology-day-2025-celebrating-50-years-of-aryabhata-india-first-satellite-in-space-enn25041902713