



Space Tourism

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?

Recently, Gopi Thotakura, an India-born commercial pilot based in the US, became the first space tourist from India. She, along with five other space tourists, made a short recreational trip to space.

What is Space Tourism?

▪ About:

- Space tourism is a niche segment of the **aviation industry** that seeks to give tourists an experience of space travel for recreational, leisure, or business purposes.
- Space travel begins at about **100 km** altitude from Earth, after crossing the **Karman line**, which is widely accepted as the boundary line separating the Earth's atmosphere from outer space.
 - Anything flying **below** this altitude is called an **aircraft** while those **crossing this line** get classified as a **spacecraft**.

▪ Types:

- **Suborbital:** Here, flights take passengers to the **edge of space**, where they can experience weightlessness for a few minutes.
- **Orbital:** Here, flights take passengers into orbit around the Earth. This gives them a chance to see the planet from space and experience weightlessness for a longer period of time.

▪ Entry of Private Space Players:

- In 2021, Virgin Galactic's founder Richard Branson and Blue Origin's founder Jeff Bezos first rocketed into space on brief suborbital flights.
- More recently **NASA** funded three companies to develop **commercial space stations**, totaling USD 415M.
 - Blue Origin received USD 130 million, Nanoracks received USD 160 million, and Northrop Grumman Systems Corporation received USD 125.6 million. These developments help support growing demand for space tourism, providing the necessary infrastructure to support it.

▪ Market Size:

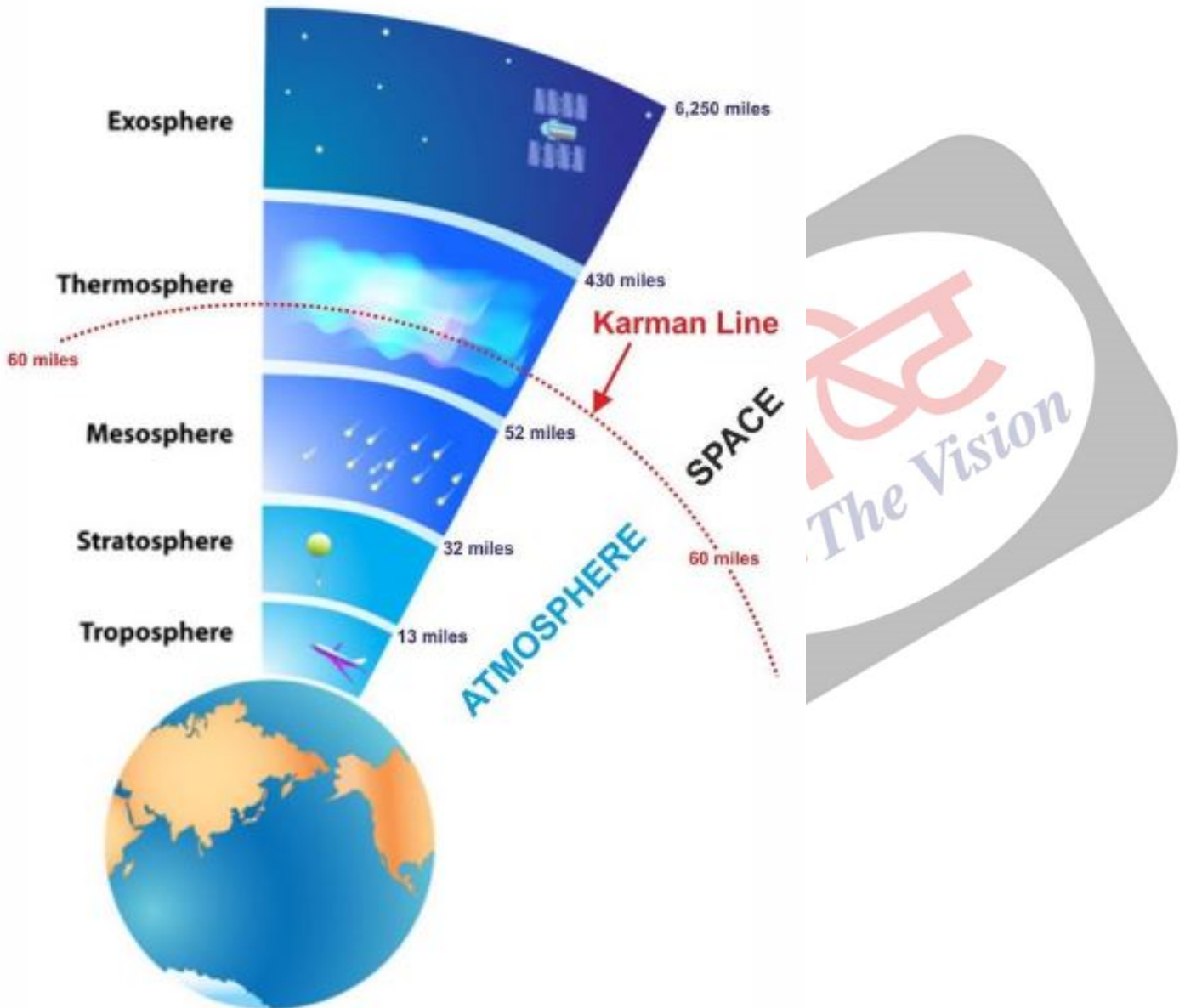
- While the industry is still in its infancy, it is rapidly growing as the demand for space travel is growing, and it is expected to continue to expand at an **annual growth rate of 40.2%** from 2023 to 2030.
- In 2022, the global space tourism market was valued at **USD 695.1 million**, and it is projected to reach **USD 8,669.2 million by 2030**.

- The **sub-orbital segment** dominated the market in 2022, accounting for **49.3%** of the overall market share.
 - The orbital segment, on the other hand, is expected to witness the fastest growth of 41.0% throughout the forecast period.

Karman Line

- The Karman line is the internationally recognised boundary of space.

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- The line is named after **Theodore von Kármán** (1881–1963), a Hungarian American engineer and physicist, who was active primarily in aeronautics and astronautics.
 - He was the first person to calculate the altitude at which the atmosphere becomes too thin to support aeronautical flight and arrived at 83.6 km himself.
- The **Fédération Aéronautique Internationale (FAI)** defines Karman Line as the altitude of 100 kilometres above Earth's mean sea level.
 - **FAI** is the world governing body for air sports, and also stewards definitions regarding human spaceflight.
- However, other organisations do not use this definition. There is no international law defining the

edge of space, and therefore the limit of national airspace.

What are Challenges to Space Tourism?

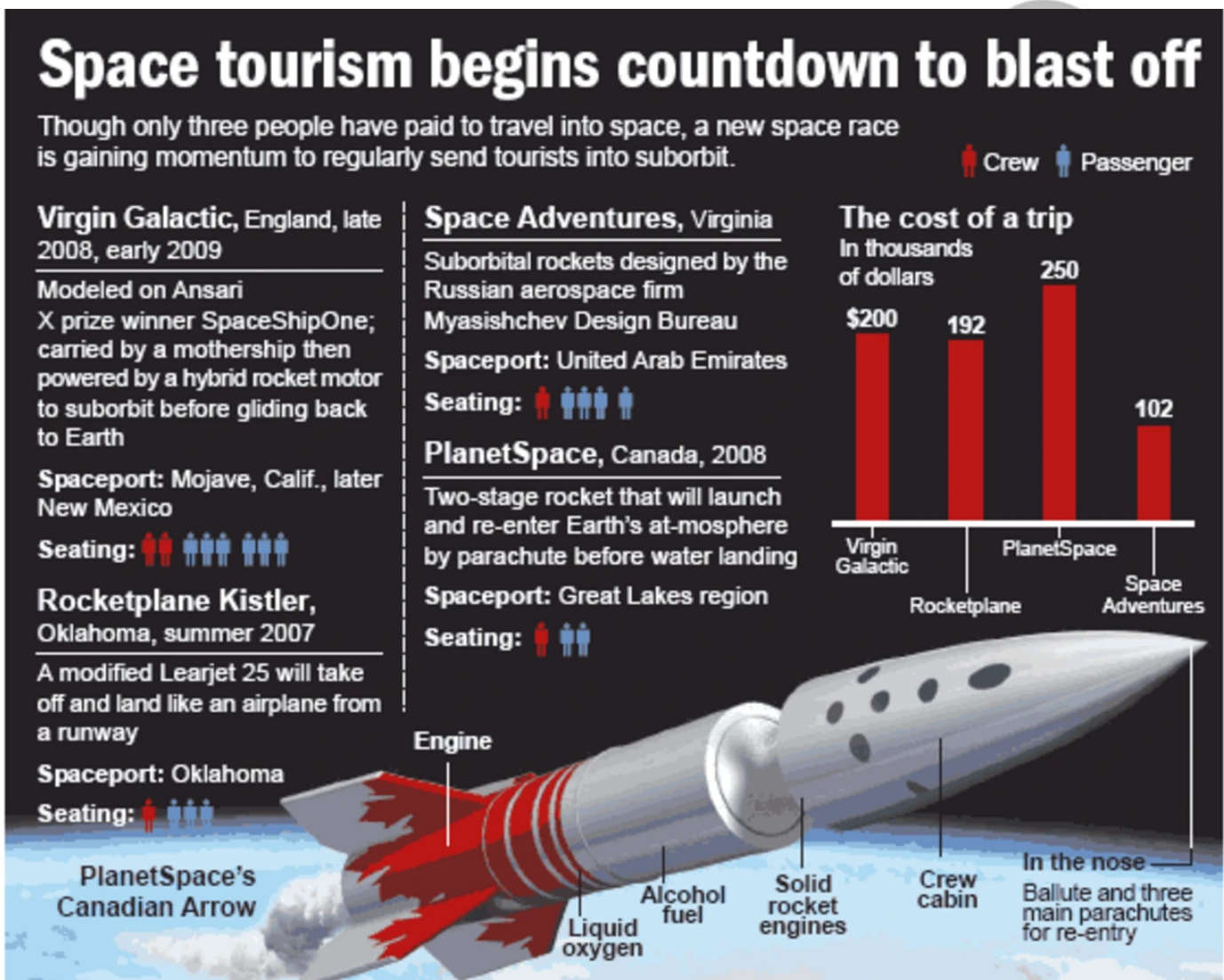
- **Environmental Impact:**
 - Launching spacecraft and rockets require a lot of energy and can produce significant amounts of air and noise pollution.
 - These emissions can contribute to climate change and harm the atmosphere.
- **Safety Concerns:**
 - Despite safety protocols, there is always a risk of a mishap the consequences for which could be catastrophic.
- **Cost:**
 - At present, space tourism is an expensive venture that is accessible only to the wealthy. As a result, many people will not be able to experience space travel, which can create feelings of inequality and elitism.
 - A recent NASA paper mentions that space companies SpaceX and Space Adventures were planning to offer a journey around the Moon for about USD 70 to 100 million (about Rs 600 to 850 crore).
- **Space Debris:**
 - Every launch of a spacecraft generates debris that can stay in orbit for many years, and as the number of space launches increases, the amount of debris grows.
 - This debris can cause problems for other spacecraft, and even small debris can cause damage.
- **Resource Depletion:**
 - Space travel requires a vast amount of resources, including energy, fuel, and materials.
 - The depletion of these resources could have long-term consequences and could negatively impact the environment and the availability of resources for future generations.
- **Legal Issues:**
 - The legal framework for space tourism is still in progress, creating uncertainty about liability if any issues arise.
 - There are also concerns about the impact of space tourism on international space laws and the **Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies**.
 - It is also called **the Outer Space Treaty**. It is a multilateral treaty that forms the basis of international space law, signed in 1967.

What are the Opportunities for India in the Space Tourism Sector?

- **Leveraging ISRO's Expertise:**
 - The ISRO has a successful history in space missions, including the Mars Orbiter Mission (MOM), demonstrating its **technological capabilities**. This inspires confidence for future human space endeavours.
 - ISRO's **cost-efficient space programs** could lead to competitive pricing for future space tourism, increasing accessibility for a wider range of participants.
- **Fostering a Thriving Public- Private Space Partnership:**
 - The Indian government is actively **encouraging private participation** in the space sector. Initiatives like **New Space India Limited (NSIL)** by ISRO and supportive policies are attracting investments and propelling innovation.
 - Eg: **PSLV-C53** is the first official public-private collaboration for a space launcher in India.
 - Private firms like SpaceX and Blue Origin have demonstrated the viability of such partnerships.
- **Future Plans:**
 - **The ISRO** is also developing a reusable space tourism module for an estimated cost of **Rs 6 crore per trip**, which is expected to be launched **by 2030**.

What is the Future of Space Tourism?

- **Accessible to Wealthy:**
 - By 2030, ISRO predicts that space tourism will be accessible to the wealthy with an average ticket cost of around 6 crores. ISRO is working towards commercialising space tourism in India in the near future.
- **Beyond Earth's Orbit:**
 - The current focus on suborbital and orbital flights is just the beginning.
 - Companies are already setting their sights on lunar adventures and, ultimately, deep space exploration like missions to Mars such as Mangalyaan (India), Mariner 4(NASA), ExoMars (ESA), Tianwen-1 (China), Hope(UAE).
- **Space Staycations:**
 - The concept of space tourism is expanding beyond brief trips with companies now designing modules for space tourists to stay in for longer periods.
- **Focus on Sustainability:**
 - Greater emphasis will likely be placed on developing fully reusable rockets to minimise space debris and make space travel more environmentally friendly.



Drishti Mains Question:

Discuss the potential benefits and challenges of space tourism as an emerging industry. What are the implications for countries like India in participating in and regulating this sector?

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)**

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