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Prospects of Space Tourism: A New Realm and Need for International Legal Framework

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Abstract

A time was there when hardly one could imagine to go beyond the vastness of the sky which one can see by naked eyes. The time has however change with the advancement of science and technology and the progress made in the field of outer space activities by various States and space agencies. The result is that a new concept of space tourism has made advancement in the history of mankind. This paper is an attempt to captivate the field of space tourism which has gain much prominence since 2001. It analysis the domain of space tourism in the sub-orbital space and orbital space. The paper insights regarding the development of the field of space tourism which is estimated to be a billion dollars market in future where private companies such as SpaceX, Virgin Galactic, Blue Origin and Orion Span have marked their presence through successful tours to earth's orbit. Space tourism though appears to be a thrill concept has also various challenges as pointed out in the paper. The paper focuses on the concept of space tourism and the challenges accompanying it. The study of the paper is based on secondary data related to articles published in journals, documents and websites. The outcome of the paper is the need for an international legal framework regarding principles of space law concerning issues relating to space tourism.

Keywords: Space Tourism, Sub-Orbital Space, Space Travel, Challenges, Space Law.

Introduction:

A travel to space beyond earth's surface was a kind of fiction which one can imagine during the early phase of outer space activities. The development of science and technology paved way for astronauts to venture into the domain of outer space. Infact, space tourism is not a new concept, but has its notion deeply embedded way back in 1969 with the success of Apollo 11 when for the very first-time human landed on the Moon surface. The advancement of space technology over the decades have paved way for the growth of space tourism for human exploration and travel in outer space.

At this juncture, it is essential to understand the concept of space tourism. The term "space tourism" has been defined as "any commercial activity offering customers direct or indirect experience with space travel" Annadurai et al. (2011) defines space tourism as travelling to space for sporting or leisure reasons. Chang (2017) and Cohen and Spector (2019a) has defined space tourism as "a segment of commercial space travel for purposes of leisure and recreation, with the weightlessness experience and celestial observation." Space tourism implies the concept of traveling by individuals or groups beyond the earth's atmosphere to experience the opportunity of space travel exploring the realm of outer space primarily for recreational, leisure, or business purposes.

Space tourism is an area that is mainly concerned with travel of human beings to outer space beyond earth's orbit for recreational purpose which has emerged from the desire of human beings to fly in space and touch the stars. State governments, private companies and individuals have shown keen interest for the development of space

tourism. Space tourism in the 21st century has developed as an emerging industry with private players like SpaceX, Virgin Galactic, Blue Origin and Orion Span showing interest to launch space vehicles to transport individual persons to space.

The very first space tourism activities began in 1984 when Charles D. Walker by paying US $40,000 for flight became the first non-government astronaut to fly. Christa McAuliffe in July 1985 was selected as the first civilian teacher in NASA Space Flight Participant program which allowed citizens without scientific or governmental roles to fly. However, commercial space tourism began in April 2001 when Dennis Tito, an American entrepreneur paid US $20 million to become the first space tourist to travel to the International Space Station (ISS) on Soyuz-TM32 spacecraft. Thereafter, seven space tourists travelled to International Space Station during the period from 2001-2009 and the costs of per trip range from US$20–25 million. Anousheh Ansari, an Iranian-American engineer and entrepreneur became the first woman to travel in space as a tourist to the International Space Station (ISS) in September 2006 on a self-funded trip. However, orbital space tourism flights were suspended for private citizens till 2020.

Sir Richard Branson of Virgin Galactic and Jeff Bezos of Blue Origin in July 2021 completed the first commercial sub-orbital flights with an 'Overview Effect' of Earth view as a fragile blue marble. SpaceX's Inspiration 4 Mission in September, 2021 send four private citizens namely, Jared Isaacman, Sian Proctor, Hayley Arceneaux and Christopher Sembroski to low earth orbit for 3 days. Since then, the advent of space tourism has increased with missions such as NS-18 (October, 2021), NS-19 (December, 2021), NS-20 (March, 2022), Axiom-1 (April, 2022), NS-21 (June, 2022), NS-22 (August, 2022), Axiom-2 (May, 2023) and NS-25 (May, 2024) have carried private individuals as space tourists.

The sector of space tourism is in its emerging phase of development in India. Gopichand Thotakura is the first Indian civilian to venture into space as a tourist on board of NS-25 Mission of Blue Origin along with five other space tourists on 19th May, 2024. India which is marking its dominance as a space nation in outer space activities too has the potential for the growth of the sector of space tourism. Indian Space Research Organisation (ISRO) is on the verge of moving forward through Gaganyaan program technology to develop the Indian space tourism by 2030. Further, private players such as Skyroot Aerospace, Agnikul Cosmos and Bellatrix Aerospace have shown keen interest to venture in the field of space tourism in India.

Domain of Space Tourism:

Space tourism involves the exploration of outer space through reusable spacecrafts by private individuals. Now, the question arises regarding the extent to which space tourism be carried out in outer space. The boundary determining the domain of space tourism is the Karman line which assumes an attitude of 100 kms (62 miles) above sea level as an imaginary demarcation of outer space from air space. The domain of space tourism relates to suborbital and orbital space. The domain of space tourism in future plans to extend its scope to lunar tourism with tours to Moon and deep space tourism with long term tours to Mars and beyond.

A suborbital space is one where a spacecraft reaches outer space but its trajectory intersects the surface of the gravitating body from which it was launched. An orbital space is one where a spacecraft is placed on a trajectory where it could remain in space for at least one orbit. The aspect of space tourism relates to suborbital space tourism and orbital space tourism.

Suborbital space tourism is the most prominent sector of space tourism. It is one where a spacecraft reaches an altitude beyond the edge of space exceeding 100 kms (62 miles) referred as Karman line. Suborbital space tourism offers individuals while flying to the edge of space an experience of about few minutes of weightlessness.

Suborbital space tourism flights have been successfully carried out by private players such as Scaled Composites, Blue Origin and Virgin Galactic.

Orbital space tourism is one where a spacecraft travels into an orbit around the earth to provide an experience of weightlessness for a longer duration of time. It provides an opportunity for individuals to view planets and other heavenly bodies from space. Orbital space tourism involves tour to International Space Station (ISS) which has been successfully carried out by Space Adventure Ltd., SpaceX and Axiom Space.

Prospects of Space Tourism:

Space tourism industry, a technological niche proto market is presently in the intermediate stages of the innovation process. Space Tourism is seen as one of the most potential sectors to mark its prominence by the end of the 21st century. Spacetourism.com explains that "Like any other business, once space tourism gets started it will develop progressively. It can be helpful to think of it as going through several phases. Starting with a relatively small-scale and relatively high-priced 'pioneering phase', the scale of activity will grow and prices will fall as it matures. Finally, it will become a mass-market business, like aviation today."

Space tourism is not a new concept. The data of an opinion poll carried out in United Kingdom in 1980s highlighted that more than 50% of persons below 45 years of age and 60% of persons below 25 years of age preferred to spend a holiday in space. A similar survey study in United States of America in 1980s also analysed that 40 million people express desire to travel on space shuttle for a trip to space and 55 million people desired for a cruise ship for travel to space. Likewise, a survey by Japanese National Aerospace Laboratory in 1993 of 3030 Japanese people indicated that more than 70% under 60 years of age and more than 80% under 40 years of age have express view to visit space.

Spacetourism.com sees "an enormous unsatisfied demand for space travel […] market research has revealed that most people, at least in the industrialized countries, would like to take a trip to space if it was possible." An article on Spacetourism.com (from the 1999 50th International Astronautical Congress in Amsterdam) says that "According to current reports in the media, traveling to outer space should become possible for everyone by the beginning of the next century. Developing low-cost passenger launch vehicles is not just to create an expensive pastime for the wealthy but develop a large 'middle-class' market rich."

The travel to outer space by private individuals which open the sector of space tourism in 2001 has now gain much prominence with companies such as SpaceX, Virgin Galactic and Blue Origin launching commercial spaceships for tour to suborbital and orbital space. There is a demand for growth of the sector of space tourism as reported in a survey result held in mid-2011 in Southern England where 55% out of which 38% male and 17% female showed interest in participating in space tourism. Collins (2014) projects that, by 2100, there could be annually 30 million sub-orbital, 40 million orbital, and 10 million lunar surface travellers. The sector of space tourism is expected to expand by 40.2% from 2023 to 2030.

The space tourism sector is expanding day to day as keen interest have been shown for pre-booking of space tours. Howell (2019) reported that 100 of tickets has been pre-sold by Virgin Galactic for USD 250,000 for suborbital flights. A new was reported by BBC, 2018 that an undisclosed sum was paid by a Japanese billionaire to SpaceX for a ticket to Lunar fly-by mission. A sum of $400 million has been raised by Virgin Galactic in October 2023 to develop the Space Ship III vehicle for enhancing its commercial spaceflight. Similarly, Blue Origin's has acquired a fund of $1 billion led by BlackRock in order to advance its suborbital tourism programs and lunar exploration initiatives. SpaceX, another key player in the field of space tourism has secured $750 million from substantial private investments to support its Starship development and expand the Starlink satellite network.

The global interest and potential in space tourism was highlighted in the Space Summit held at Dubai in December, 2023 taking into account the current developments and future opportunities the sector of space tourism. It has been projected that the global space tourism which is on the verge of growth since 2022 may have a substantial value of USD 17,742 million by 2032 which could further reach a market value of $1 trillion by 2040.

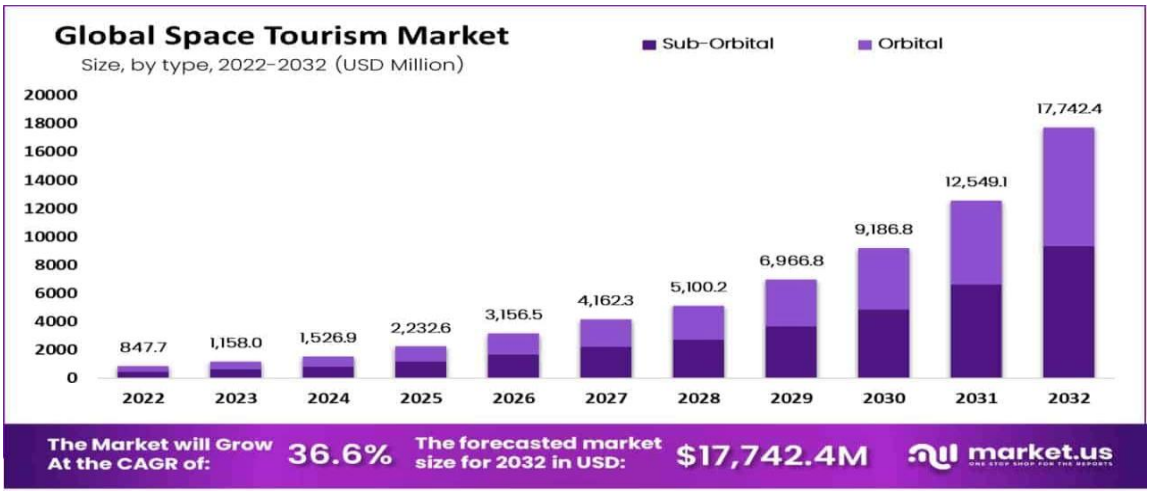

Fig. No. 1: Market Value in USD Million in Global Space Tourism at sub-orbital space and orbital space

Source: https://market.us/report/space-tourism-market

The segment of sub-orbital flight has reported to occupy a dominant position in 2022 having a share of 52.7% with CAGR of 37.8%. Further, the commercial players in space tourism reported a share of 57.3% whereas the government segment had a share of 36.7%.

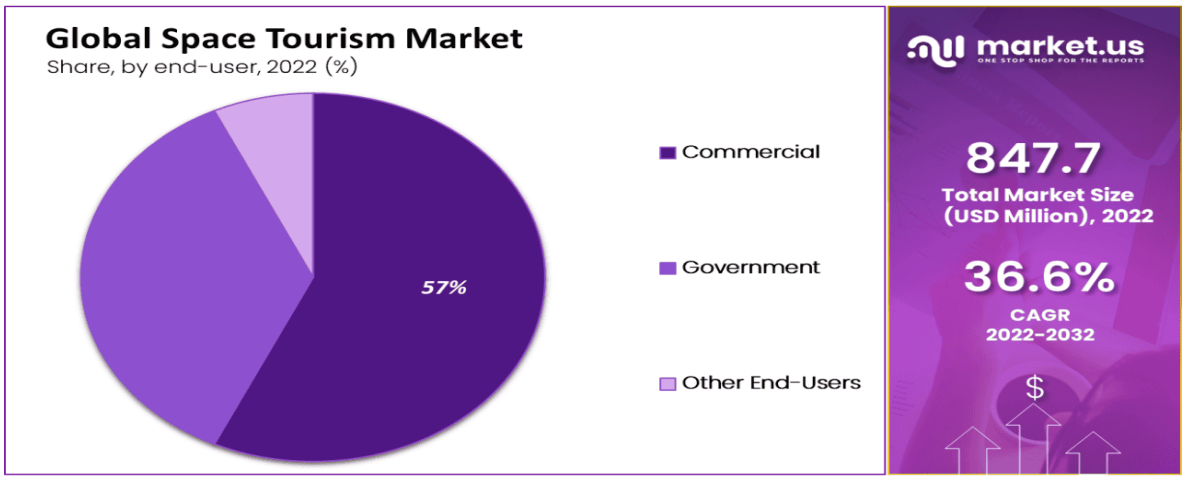

Fig. No. 2: Market Share of Government and Private Commercial Entities in Global Space Tourism

Source: https://market.us/report/space-tourism-market

Friel (2020) and Spector (2020a) predict that space tourism will benefit terrestrial tourism destinations in the launching countries, facilitating all types of space flights and (Webber, 2013) becoming a pivotal sector of the economy due to economies of scale.

Challenges of Space Tourism:

The sector of space tourism which is emerging as one of the most prominent areas is not devoid of any challenges. The question regarding regulation and governance of space tourism is a major challenge as there is no specific international treatises and agreements regarding the same. There is no legal framework governing space tourism under the five international treatises regarding the use of outer space by States prepared by the Committee on the Peaceful Uses of Outer Space (COPUOS). Article VI of the Outer Space Treaty, 1967 states that all activities which are conducted by government or non-government entities in space shall bear direct responsibility of State as government activities. It casts upon the State the liability and responsibility regarding any activities carried out by private entities in outer space. The Liability Convention, 1972 casts upon State the absolute liability to pay compensation for damages caused by spacecraft and space objects which are launched from its territory even though it may be of a different State or of a private entity. There is a significant risk of liability as operators may be prone to accidents in space which can have catastrophic consequences. There is also varying national laws and regulations governing space activities amongst States along with numerous international treaties and agreements. There is a need for a specific regulation of international laws to bring within ambit the liability of private entities for space tourism related activities in outer space in accordance with the international principles of space law.

Space tourism poses significant challenges which must be addressed in order to ensure the safety and sustainability of the industry. There is a risk of injury to human life and damage to spacecraft equipments due to hazardous physical, chemical and biological factors in the space environment. The launching of sophisticated spacecraft for space tourism may result in emission of air and noise pollution which may pose a threat to sustainability of the environment in outer space. There is also a concern for climate change due to emission by launching spacecraft of greenhouse gases. The growth of space tourism has the potential to create significant environmental impacts such as the generation of space debris, the disruption of ecosystem and the contamination of celestial bodies. A travel to space may pose a threat to depletion of non-renewable resources such as energy, fuel and materials upon which it depends having a negative impact upon the environment along with long term consequences regarding availability for future generation of such resources. The question regarding the legal status of space tourists and their rights and responsibilities under international law is another important challenge of the space tourism sector. Further, the question regarding addressing of liability and insurance issue along with norms for a common safety and operational standard for space tourism is an important issue to address.

Conclusion:

Space tourism has captured the imagination of people for many decades and significant progress has been made in recent years to turn this dream into a reality. Space tourism is an emerging sector in the field of tourism industry. Space tourism encompasses within its ambit the experience of a lifetime to view the amazing beauty of cosmos accompanied by galaxy and other heavenly bodies virtually through one own eye. The concept of space tourism reflects the advancement of science and technology along with the concept of a lifetime adventure of space travel which was beyond human imagination till the end of the 20th century. Space tourism generally relates to recreation activity of an individual to explore the beautifulness of the universe. The domain of space tourism in the field of scientific, educational and commercial purposes in the near future cannot be overlooked.

Private companies in the field of space tourism such as SpaceX, Virgin Galactic and Blue Origin have already invested billions of dollars to launch spacecraft for tour of private individuals to explore and view the universe. The market of space tourism has a positive prospect as individuals have shown keen interest for a tour to outer space shedding out billions of dollars. Further, the sector of space tourism is expected to have a market value of $1 trillion by 2040. The role of private companies will be vital for the growth and sustaination of the sector of

space tourism. Space tourism has also provided an opportunity the growth and expansion of capitalist business and economy.

The biggest challenge in the field of space tourism is the absence of any legal framework governing issues relating to outer space, environment and safety of individuals. The safety and sustainability of space tourism thrives in the framing of international norms to regulate the uncertainties and liability risks associated with operators and passengers involved in space tourism. The active participation of private players to launch sophisticated spacecraft and the idea of setting up space stations for leisure may be jeopardised in the absence of any specific regulatory law. The Outer Space Treaty, 1967 and the Liability Convention, 1970 casts upon the State the entire sole responsibility for any outward incident due to outer space activities, even though it may be of private entities.

The study of the paper finds the need for establishment of an international legal framework governing principles of space law to address various issues and challenges concerning space tourism. The legal framework must firstly, determine the obligations, rights and duties of private players engaged in space tourism; secondly, ensure the safety of private individuals and operators on tour to space; thirdly, determine the boundary of liability of State government and commercial private entities in the field of space tourism; fourthly, protect the environment of outer from hazardous emissions due to launch of space tourism vehicles and space debris; and lastly, ensure that the present norms of international agreements, treaties and conventions relating to outer space activities are followed by commercial private entities involved in space tourism. The United Nations along with various international forums and States must come forward under the umbrella of United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) to draft an international treaty concerning issues which may be the outcome of space tourism.

References:

[1] Stephan Hobe and Jurgen Cloppenburg, “Towards a New Aerospace Convention? -Selected Legal Issues of Space Tourism (A Paper presented at 47th Colloquium of the International Institute of Space Law, 2004)

[2] Shekhar, C., Kumawa, H. and Yadav, D. Kumar (April-June,2022). Space Tourism- A New Dimension of Future Hospitality. Journal of Management and Entrepreneurship, 16 2(I).

[3] Zhang, Y. and Wang, L. (2022). Progress in space tourism studies: A systematic literature review Tourism Recreation Research. 47(4), 372-383.

[4] Explore the Space with Space Tourism, https://spacetourism.co.in/index.html. Retrieved September 10, 2024.

[5] Sub-orbital spaceflight, https://en.wikipedia.org/wiki/Sub-orbital_spaceflight. Retrieved September 10, 2024.

[6] Orbital spaceflight, https://en.wikipedia.org/wiki/Orbital_spaceflight. Retrieved September 10, 2024.

[7] Davidian, K. (2020). Space tourism industry emergence: description and data. New Space, 8(2), 87-102.

[8] Cole, S. (2015). Space Tourism: Prospects, positioning and planning. Journal of Tourism Futures, 1(2), 131-140.

[9] Dabhade, O., Patil, A. S., Jumale, A., and Warke, H. (2024). The Future of Space Tourism: An In-depth Literature Review.

[10] https://market.us/report/space-tourism-market.

[11] Ghanbahadur, Aditya N and Shinde, Varsha “Legal Challenges in Regulating Space Tourism: Investigating the Legal Implications of Space Tourism and The Challenges of Regulation” Journal of Emerging Technologies and Innovative Research, 10 (4), April 2023.