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Space Tourism: From Early Ventures to Future Horizons

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Abstract:
This article aims to give an overview and introduction into space tourism. Therefore, a selection of this field's literature represents the field's beginnings, major figures, and potential futures. Overall space tourism refers to the opportunity to experience space flights for non-professionals for leisure or recreational purposes. Established in the early 2000s when private individuals first ventured into space through collaborations with the Russian space agency, it becomes more popular today, with new companies entering the market. Since the beginning, major companies such as SpaceX, Blue Origin or Virgin Galactic have led the development of space tourism, with several nations also investing in the industry. Initially accessible only to wealthy individuals, the target group may expand as costs decrease due to reusable rocket technology. Especially suborbital space tourism which in contrast to orbital space is less expensive and will therefore become more easily available to the general public. Also, the increasing competition on the market, the development from infrastructure in the Low Earth Orbit, as well as evolving regulatory frameworks will further shape the industry's growth in the coming years. Future trends suggest a broader market with the potential for commercial space stations, space hotels, and even lunar or interplanetary travel.

Keywords: space tourism, orbital space, lunar space
JEL Codes: L83, O33, L93

1. Introduction

In 1492 the sailor Christopher Columbus thought he had discovered America (Semyanchuk, 2023). Even though he presumed until his death that he had discovered India, this inner need to travel beyond human knowledge, to discover new horizons and to travel to places where no one has gone before are more present today than ever before (Slater & Stone, 2024). Humans have had this need to know where they came from and what else is out there to discover (Dredge, 2022). They want to go beyond horizons, travel on great adventures and discover new knowledge about humankind (Harrison, 2003). This is especially visible in the space industry with the rising sector of space tourism (Davidian, 2020). The topic of space tourism is controversial, being divided into supporters and opponents (Cohen, 2017). Supports claim that the cast amount of sums invested in space tourism can be used to create jobs, partially finance the space sector and fund investments in the space tourism industry which will therefore benefit the development of space technology like e.g. the reusability of rockets (Baiocco, 2021). Opponents however fear the environmental impact of space tourism (Peeters, 2018) and are criticizing the cost efficiency of individuals that want to fly into space (Markard et al., 2023).

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As space tourism is one of the most debatable topics of today's time it is critical to have up to date-research in this rapidly changing field. Especially significant is defining the correct terminology used in space tourism as this has been problematic in recent years (Seedhouse, 2024a). The misuse of terminology and the mix up of terms like space flight participant, space traveller, space tourist and the differentiation of private and citizen astronauts to professional astronauts can lead to misunderstandings. Furthermore, as space tourism is such a gigantic field of research it is firstly imperative to have an overlook on the origins, key aspects and major players involved in this industry to gain insights on the research range. Additionally, it is essential to look back into the past, to be able to understand nowadays target group as well as future outlooks and developments in space tourism.

Therefore, this article's main goal is to provide researchers with an understanding of the correct terminologies in space tourism to enable researchers in navigating the field of space tourism which has been missing from research until now. Furthermore, this article will help the reader by providing an overlook on the origins and history of space tourism, the different categories of space tourism and how to differentiate between them. Additionally, major companies and countries involved in the field of space tourism are presented. As space is not a place where people can go without the right equipment and a huge amount of human effort, the timeframe of humans having been able to travel to space is relatively small (Balistreri & Umbrello, 2023). Finally, the target groups that are flying into space will be presented closing with further trends and developments in the field. The article finishes with the presentation of the results and conclusion showing limitations of this work.

2. Methods

This expository article uses selected literature to give an overview on space tourism. It is supposed to give an introduction into the field of space tourism and summarizes the state of the field by using existing research. In total seventy articles have been used to conduct this research. The most significant will be introduced briefly. Firstly, the book "Commercial Astronauts: The Next Generation of Spacefarers" by E. Seedhouse gives a great overlook on the changes due to privatisation within the space industry and looks at the training and roles of commercial astronauts (Seedhouse, 2024a) . Secondly, the "Overview Effect" by Yaden et. al. is a cognitive shift known by astronauts which fosters a renewed sense of responsibility for the Earth by looking at it from above (Yaden et al., 2016). As space tourism grows this effect will also be experienced by future space tourists. Thirdly Erik Kulu is providing significant data for the space tourism sector through the presentation of the in-space economy's present situation as well as potential future developments (Kulu, 2021; Kulu, 2023). Lastly regarding the environmental impact of space tourism Peeters article "Why space tourism will not be part of sustainable tourism" argues that space tourism could not be part of sustainable tourism because of the carbon emissions and resource consumption required (Peeters, 2018). For a general overview the book astronautical space fare by Rupert Gerzer was used (Gerzer, 2022). For an insight into sustainability in space tourism the book sustainability in space tourism by Anette Toivonen was used (Toivonen, 2021). For legal aspects the book space law by Marcus Schladebach (Schladebach, 2020) has been used. Furthermore, articles about the topic have been researched using Web of Science and Google Scholar by entering the key words "space tourism", "orbital space" and "lunar space tourism".

3. A Brief History of Space Tourism

Space tourism is a concept that was firstly invented a quarter of a century ago. Between 1940 and 1960 the first concepts of space stations emerged (Neufeld, 2018). Before launching humans however, it was central to test the space equipment without crew inhabitants first. Therefore, in 1957 the Soviet Union launched its first artificial satellite into space called Sputnik I

(Tiwari, 2021). Four years later, in 1961 the first human Yuri Gagarin (Yang, 2024) flew into space, surrounded the Earth and landed again after 108 minutes (Srivastava & Srivastava, 2010). Because of these events the United States of America were under pressure to successfully launch as well. Therefore, three weeks after Yuri Gagarin's first space flight the NASA astronaut Alan Shepard became the first American in space (Spiller, 2023). After that humankind has accomplished remarkable infrastructural development in outer space. 1971 the first ever space station called Salyut 1 was launched by the Soviet Union followed in 1973 by Skylab, the first American space station (Sasikumar & Aravind, 2023). As both space stations had some technical challenges, the Soviet Union later launched a different space station model named Russian Space Station(MIR) in 1986 (Holton, 2023). This space station was the first space station to be modular, which means that it was build using different modules interconnected together. However, in 1998 the International Space Station (ISS) was launched (Jeevendrampillai et al., 2023) marking the first collaboration between countries for space travel. Nowadays the ISS is the largest outpost of humans in space (Dempsey, 2017) and consists of parts from National Aeronautics and Space Administration (NASA) (United States), European Space Agency (ESA) (Europe), Japan Aerospace Exploration Agency (JAXA) (Japan), Canadian Space Agency (CSA) (Canada), and Russian Federal Space Agency (Roscosmos) (Russia) (Kumar, 2022). The ISS can inhabitate up to eleven people (Lynch et al., 2024) and is supposed to fly until 2030 when it will be deorbited (Kulu, 2023). Lastly in 2020 China launched a space station called Tiangong (Gao et al., 2022) which can hold up to six crewmembers at the same time. In summary humankind has different options to travel into space nowadays making it more accessible for non-professionals to reach space as well. The following *Figure 1* shows the development of space tourism history including the first male and female space tourist as well as the youngest ever tourist in space Oliver Daemen (18 years) and the oldest ever space tourist William Shatner (90 years old) which has been surpassed by Ed Dwight in 2024 (Chang & Goldberg, 2024; Li, 2022).

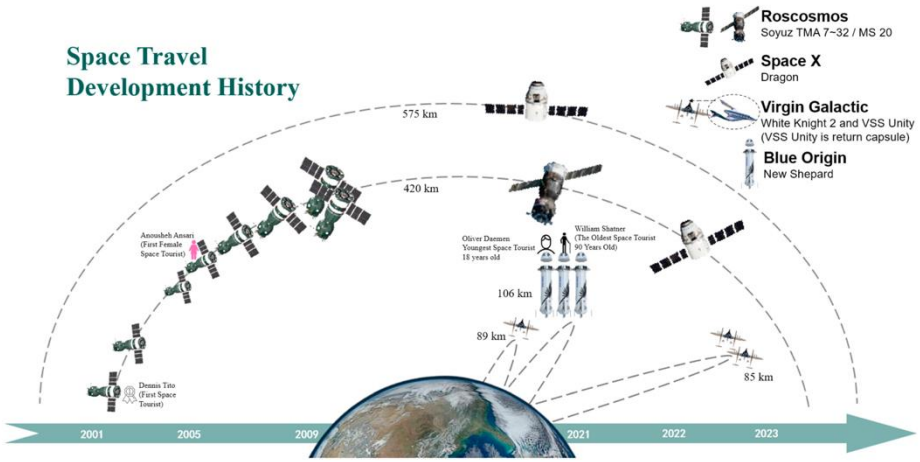

Figure 1: Development in Space Tourism
Source: Taken out of Wu et al. (2024)

4. Origins and Terminology in Space Tourism

Due to the increasing opportunities for people to fly into space, the demand for space tourism is also increasing (Azmi et al., 2023). The Soviet Union was the first country to realize the potential of space tourism missions (Dewily & Michael, 2021). During 2001 and 2009 Roscosmos gave one of their three seats in the Soyuz space craft to a total of eight paying space tourists, with seat prices between 20 and 35 million US$ (Seedhouse, 2024a) (Wu et al., 2024). Altogether the term space tourism usually refers to the commercial activity of sending private individuals into space for recreational, leisure, or adventure purposes (Harrington, 2017). Space

tourism is a term that has been used since 2001 with Dennis Tito (Mesa-Arango et al., 2023) being the first ever private individual to pay for flight and accommodation in the Low Earth Orbit (LEO) and traveling to the International Space Station without having the extensive training of a professional astronaut (Zhang, 2024). To avoid the mix up of different terms in the terminology of space tourism *Table 1* will be presented shortly.

Table 1: Terminology in Space Tourism

astronaut	a person that is trained to travel and work in a space craft (Langston & Pell, 2015)
citizen astronaut	a space flight participant that is funded by a program for a mission (Langston & Pell, 2015)
commercial astronaut	a person that is trained for a commercial space mission (Seedhouse, 2024a)
cosmonaut	synonym for astronaut or taikonaut (Dickson, 2009)
crew	astronauts and/or space tourists that travel together in a space craft (Martin & Freeland, 2022)
payload specialist	a non-professional selected for a specific mission or item operation (Burgess, 2000)
private astronaut	a person that travels into space through private ventures/ companies (Rubin & Hong, 2024)
space flight participant	a person traveling into space without being professional astronaut (Hobe, 2007)
space tourist	a person that travels into space for recreational purposes (Harrington, 2017)
space traveller	a person achieving an altitude higher than 100km (Krishna & Guha)
taikonaut	synonym for astronaut or cosmonaut (Dickson, 2009)

Source: Own creation

Usually an astronaut is defined as a person that is trained to work and travel in a space craft (Langston & Pell, 2015). Synonyms for the term astronaut are cosmonaut or taikonaut. Cologne's commentary on space law even defines astronauts as "human beings traveling into outer space for professional reasons" (Popova et al., 2017). One example for an astronaut is the American Neil Armstrong who landed 1969 on the Moon (Yang, 2024). Secondly, a commercial astronaut is an astronaut that is trained for a commercial space mission (Seedhouse, 2024a). Third the term crew defines a group of people which can be either astronauts or space tourists or both which are traveling together on a spaceship (Martin & Freeland, 2022). TV personality William Shatner marks an example for a space tourist (Landon, 2024) as well as the first female space tourist Anousheh Ansari who flew into space in 2006 even though she prefers the title expedition member (Seedhouse, 2024a). A space flight participant is a person traveling into space without being a professional astronaut. An example for a space flight participant would be the Japanese billionaire Yusaku Maezawa who is planning to fly around the Moon with SpaceX (Rubenstein, 2021). Therefore, the term can be used similar with the term space tourist and space traveller. Space travellers need to reach the Kármán line at 100km (Clark & Parazynski, 2024) to be called as such since there have been discussions about the altitude that people must reach to be in space in 2021 (Krishna & Guha, 2024). An infamous example of a payload specialist is the teacher Christa McAuliffe who died during the flight of the Space

Shuttle Challenger in 1986 (Burgess, 2000). Additionally, two examples for citizen astronauts are Hayley Arceneaux and Christopher Sembrowski who flew on the SpaceX Inspiration 4 mission in 2021 (de Zwart & Lisk, 2024). Lastly, the Canadian Mark Pathy is an example for a private astronaut as he joined the crew on the ISS in 2022 (Seedhouse, 2024b).

5. Different kinds of Space Tourism

The term space tourism is overgeneralized and therefore needs to be differentiated by the usage of tourism and the location of different kinds of space tourism. Every activity involving space activities on the surface of the Earth, including visits to the museum, launch spectating, visiting space centres or launch sides is included in the term earth-bound space tourism (Koellner, 2024). The next differentiation will be suborbital space tourism. Suborbital space tourism allows participants to experience weightlessness for a few minutes and gives them a look on the Earth from above. Suborbital tourism is available from 450.000 US$ (Peng et al., 2024). The operator brings the paying tourist to the edge of space which is at a height of 100km, when the so-called Kármán Line occurs (Clark & Parazynski, 2024; Rabsahl, 2023). After entering space there is a short period of time which the tourists will stay in space, where they can experience weightlessness and experience the overview effect (Yaden et al., 2016). After 3,5-5 minutes the aircraft returns to Earth. *Figure 3* shows the flight plan of a suborbital space tourism flight during Blue Origins New Shepard System (Chang, 2020). Suborbital tourism also includes parabolic flights and high-altitude ballon rides (Peng et al., 2024). At the limits of suborbital tourism orbital space tourism continues. In orbital space tourism the tourist will reach an orbit by traveling 28,000 km/h to be able to move within the low earth orbit LEO (Tasci et al., 2021). Orbital space tourism is divided into two different sub-categories. First there is the opportunity to stay inside the capsula for the entire stay of the touristic flight, which also means, that all activities will be located in and around the space flight vehicle, e.g. during the Inspiration 4 or Polaris Dawn Mission (Jones et al., 2024). Secondly, there is the opportunity as a tourist to use the space flight vehicle to reach an orbit and then stir towards a given structure in space, which can be for example a space station, like the international space station or a future space hotel. Lastly in the future there is space tourism planed around the Moon which will then be called lunar space tourism and will focus on the surface of the Moon and the Low Lunar Orbit (LLO) (Balistreri & Umbrello). Further research suggests that humans will engage in interplanetary tourism in the future as well, including trips to the Mars (Holt, 2023).

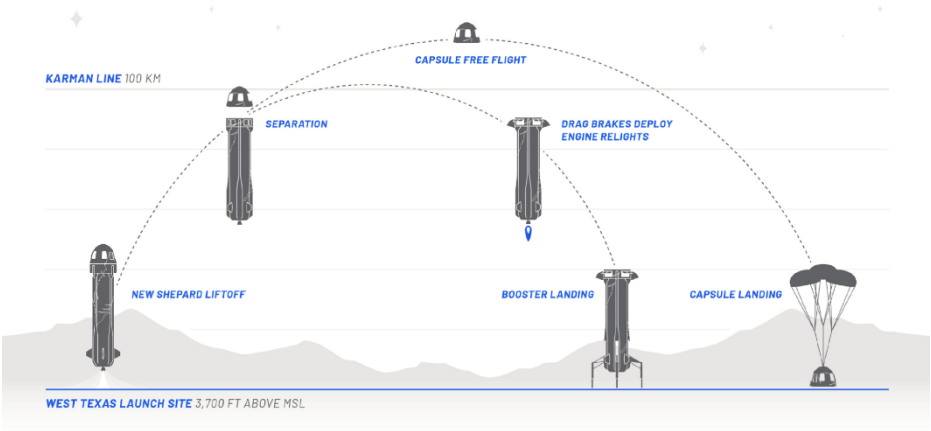

Figure 3: Flight plan of the New Shepard System
Source: Taken out of Chang (2020)

6. Major players in the field of space tourism

In the past the main player in space tourism has been the Soviet Union (Dewily & Michael, 2021). Initially the first flight of first ever space tourist Dennis Tito to the International Space Station happened in 2001 with the Space Agency Roscosmos supporting their space program financially (Vidal & Privalov, 2023). Since then, space tourism has gained in popularity especially following the space race of commercial companies in 2021 (Peeters, 2021). Commercial companies involved in space tourism include Space Adventures, SpaceX, Blue Origin, Virgin Galactic, AXIOM Space and VAST (Seedhouse, 2024a). By collaborating with privately owned companies like SpaceX, space agencies hope to outsource e.g. cargo activities or crew flights to be able to focus on new missions and space stations, e.g. Gateway (Venkataraman et al., 2020). Also due to technical innovation like the invention of reusable rockets and rocket boosters (Watson, 2024) the cost of space flight is decreasing, making space flights cheaper for space agencies and private individuals. Nowadays the major agencies in the space industry include the United States, Russia, the United Arab Emirates, Japan, Canada and China, as well as associates of the European Space Agency ESA (Kulu, 2021). As the United States and China are the two leading countries in launch rates (Denis et al., 2020), as of 2024 space tourism is more popular in the US than in China. Additionally, operators like AXIOM Space are pushing the limits of space tourism with missions like Inspiration 4 or Polaris Dawn (Jones et al., 2024).

7. Target groups on space tourism

Regarding target groups of space tourism, there is a mix between sponsored tourists and high-net-worth individuals which are the focus group of space tourism today. This is because of the high-ticket prizes of space tourism, especially regarding suborbital, orbital and lunar space tourism. Correspondingly, PR tourists are often used to gain popularity in the field. An example for a PR tourist is the TV personality William Shatner (Li, 2022) (Landon, 2024). Looking at the future of space tourism from a medical point of view there are only very few reasons why a tourist could not fly into space, providing the same target group able to fly with an airplane. First and foremost, a person with any circulatory problems would be critical as it would endanger the tourist suffering a circulatory collapse during take-off and landing (Krittanawong et al., 2022). These are the two most critical phases for a space tourist because of the increase of G-forces on the body. Secondly, a problem could occur with tourists afraid of confined spaces. Therefore, it is not advisable for people who have problems with claustrophobia to fly into space as tourists (Roman et al., 2022). In conclusion the target group of space tourist includes high-net-worth individuals, PR tourists and sponsored tourist, however there cannot be a clear differentiation between the last two.

8. Trends and Developments in Space Tourism

Space tourism is one of the sectors in the space industry that will make space travel cheaper in years to come. This is because of the investments paid by individuals through high-ticket prices which will help the invention of new technologies to help evolving the reusability of space devices like space crafts, rocket boosters, etc. (Reed et al., 2020). Due to these vast investments a return of investment has not happened to any of the companies involved in space tourism yet (Badikov & Lapteva, 2021). However, there is a market potential for these touristic activities and growing interest in the area of space tourism will ensure further investment in this tourism sector. Predictions on future developments suggest that in the following years due to Artemis missions of NASA humankind will return to the Moon which will then later resolve in the first tourist on the surface of the Moon. Also, first ever space tourist Dennis Tito has already booked a flight for a touristic trip around the Moon. With the rise of lunar space tourism, orbital space is facing the issue that the “touristic destination” ISS will not be available after 2030. Therefore,

it is likely that in the future orbital space tourists will travel to commercial space stations, like e.g. Heaven 1. As there are many startups on the market of low earth orbit LEO and low lunar orbit LLO space accommodation, it is inevitable that there will be commercial space stations which will fly on a distance of 300-1000km from the Earth in the low earth orbit before accommodations will be launched in the Low lunar orbit (Impresario et al., 2020). Regarding interplanetary tourism space tourists as well as astronauts must deal with additional risks, such as increased radiation dosages and the loss of the Earth's geomagnetic field's influence when planning deep space missions to places like Mars (Hart, 2023). As space tourism is evolving rapidly it will be fascinating to see especially how the tourism sector will evolve within the next few years.

9. Results

Since the first human in space, a few hundred people have flown into space with only a small margin of these people being space tourists. All in all, the number of flights to space is increasing. This is because of the rising interest from countries and individuals around the word to use space for scientific and touristic activities. Different kinds of space tourism include earth-near, suborbital, orbital, lunar and multiplanetary space tourism. With rising launch numbers, the opportunities to fly into space for touristic purposes are also rising. Due to the commercialization of the space tourism market with companies like SpaceX, VAST, Blue Origin or Virgin Galactic, space tourism will continue to be a growing market in the future. All in all, it is likely that the market of space tourism will grow in the future.

10. Conclusion

In conclusion this article considered the origins, key players and history of space tourism. With defining different terminologies used in space tourism as well as giving an overview on different kinds of tourism like earth-near, suborbital, orbital, lunar or multiplanetary space tourism. Furthermore, the article summarized the major companies and countries invested in this space sector as well as explaining the target group of space tourism. Lastly further trends and possible future developments have been described.

The limitations of this work are that as this article is only based on secondary literature research, there is a lack of primary insights which could be achieved by interviewing experts in the field. First, a major problem in space tourism is that the field is evolving so fast, that the information given is changing rapidly and it is hard to keep track (e.g. number of launches, numbers of people in space). Secondly, the analysis is restricted by the sources used and the problem of overgeneralizing appears. Thirdly, the reliability and quality are dependent on the credibility of the used literature. Additionally, without empirical verification or original data, the article cannot comprehensively address emerging issues or provide innovative analysis.

Implications for future research should include a primary data collection through e.g. in-depth expert interviews which will allow to close the gaps that occur when only doing secondary research and it would enhance the reliability in total (Karunarathna et al., 2024). Additionally, the topic of sustainability in space tourism should be looked at more thoroughly as this paper does not have the layout to provide further insights into the emerging topic of green space tourism (Toivonen, 2021). Lastly, changes in international space law policies like the Artemis Accords (Bartóki-Gönczy & Nagy, 2023) need to be included into further research. Furthermore, there is a need for empirical studies, e.g. surveys and case studies which would be desirable in the future. All in all, space tourism is a rapidly evolving new field of research giving researchers around the world the opportunity to investigate different directions of this research area.

References

Azmi, E., Che Rose, R. A., Awang, A., & Abas, A. (2023). Innovative and competitive: A systematic literature review on new tourism destinations and products for tourism supply. *Sustainability*, *15*(2), 1187. https://doi.org/10.3390/su15021187

Badikov, G. A., & Lapteva, M. S. (2021). Investment project to create a suborbital space tourism system. *AIP Conference Proceedings. 2318*(1), 180003. https://doi.org/10.1063/5.0036010

Baiocco, P. (2021). Overview of reusable space systems with a look to technology aspects. *Acta Astronautica*, *189*, 10–25. https://doi.org/10.1016/j.actaastro.2021.07.039

Balistreri, M., & Umbrello, S. (2023). Modifying the environment or human nature? What is the right choice for space travel and Mars colonisation? *NanoEthics*, *17*(1), 5. https://doi.org/10.1007/s11569-023-00440-7

Bartóki-Gönczy, B., & Nagy, B. (2023). The Artemis Accords. *International Legal Materials*, *62*(5), 888–898. https://doi.org/10.1017/ilm.2023.17

Burgess, C. (2000). *Teacher in Space: Christa McAuliffe and the Challenger Legacy*. University of Nebraska Press.

Chang, E. Y.-W. (2020). From aviation tourism to suborbital space tourism: A study on passenger screening and business opportunities. *Acta Astronautica*, *177*, 410–420. https://doi.org/10.1016/j.actaastro.2020.07.020

Chang, K., & Goldberg, E. (2024, March 22). NASA Is Recruiting a New Class of Astronauts. *The New York Times*. https://www.nytimes.com/2024/03/22/science/nasa-astronauts-victor-glover-elon-musk.html

Clark, J., & Parazynski, S. (2024). Disasters in Space Travel: From Earth to Orbit, and Beyond. In G. Ciottone (ed.), *Ciottone's Disaster Medicine* (3rd. ed., pp. 1002–1005). Elsevier. https://doi.org/10.1016/B978-0-323-80932-0.00194-4

Cohen, E. (2017). The paradoxes of space tourism. *Tourism Recreation Research*, *42*(1), 22–31. https://doi.org/10.1080/02508281.2016.1239331

Davidian, K. (2020). Space tourism industry emergence: description and data. *New Space*, *8*(2), 87–102. https://doi.org/10.1089/space.2019.0040

De Zwart, M., & Lisk, J. (2024). The Effect of Space Tourism on the Concept of "Astronaut" Under International Law. In B. Sandeepa Bhat (Ed.), *Space Tourism* (pp. 28–41). Routledge India. https://doi.org/10.4324/9781032617961-3

Dempsey, R. (2017). *The International Space Station: Operating an Outpost in the New Frontier*. National Aeronautics and Space Administration (NASA). https://www.nasa.gov/wp-content/uploads/2018/04/iss-operating_an_outpost-tagged.pdf

Denis, G., Alary, D., Pasco, X., Pisot, N., Texier, D., & Toulza, S. (2020). From new space to big space: How commercial space dream is becoming a reality. *Acta Astronautica*, *166*, 431–443. https://doi.org/10.1016/j.actaastro.2019.08.031

Dewily, R. D. A., & Michael, T. (2021). Space tourism activities overview of international law. *Journal of International Trade, Logistics and Law*, *7*(1), 8–12. https://www.jital.org/index.php/jital/article/view/210

Dickson, P. (2009). *A Dictionary of the Space Age*. Johns Hopkins University Press. https://doi.org/10.1353/book.3338

Dredge, D. (2022). Regenerative tourism: Transforming mindsets, systems and practices. *Journal of Tourism Futures*, *8*(3), 269–281. https://doi.org/10.1108/JTF-01-2022-0015

Gao, M., Zhao, G., & Gu, Y. (2022). Recent progress in space science and applications of China's space station in 2020–2022. *Chinese Journal of Space Science*, *42*(4), 503–510. https://doi.org/10.11728/cjss2022.04.yg29

Gerzer, R. (2022). Geschichte der astronautischen Raumfahrt. In R. Gerzer, *Astronautische Raumfahrt: Beginn eines neuen Zeitalters* (pp. 1–26). Springer. https://doi.org/10.1007/978-3-662-64740-0_1

Harrington, A. J. (2017). Legal and Regulatory Challenges to Leveraging Insurance for Commercial Space. *Journal of Space Law, 41*(1), 29–56. https://airandspacelaw.olemiss.edu/wp-content/uploads/2020/07/JSL-41.1.pdf

Harrison, J. D. (2003). *Being a Tourist: Finding Meaning in Pleasure Travel*. UBC Press.

Hart, D. A. (2023). Homo sapiens—A Species Not Designed for Space Flight: Health Risks in Low Earth Orbit and Beyond, Including Potential Risks When Traveling beyond the Geomagnetic Field of Earth. *Life*, *13*(3), 757. https://doi.org/10.3390/life13030757

Hobe, S. (2007). Legal Aspects of Space Tourism. *Nebraska Law Review*, *86*(2), 439–458. https://digitalcommons.unl.edu/nlr/vol86/iss2/6/

Holt, S. (2023). Virtual reality, augmented reality and mixed reality: For astronaut mental health; and space tourism, education and outreach. *Acta Astronautica*, *203*, 436–446. https://doi.org/10.1016/j.actaastro.2022.12.016

Holton, G. (2023, July 17). *Tereshkova first woman in space: Eradicating Soviet scientific achievements*. Guardian (Sidney), 2061. https://cpa.org.au/guardian/2061-2/tereshkova-first-woman-in-space/

Impresario, G., Parrella, R. M., Colucci, A., Albano, M., & Pizzurro, S. (2020). Prospect Commercial Routes in the Earth–Moon System's Service Volume. *New Space*, *8*(4), 220–233. https://doi.org/10.1089/space.2020.0024

Jeevendrampillai, D., Buchli, V., Parkhurst, A., Kozel, A., Bunch, G., Gorbanenko, J., & Tereshin, M. (2023). An Ethnography of an Extraterrestrial Society: The International Space Station. In J. F. Salazar, & A. Gorman (Eds.), *The Routledge Handbook of Social Studies of Outer Space* (pp. 413–426). Routledge. https://doi.org/10.4324/9781003280507-38

Jones, C. W., Overbey, E. G., Lacombe, J., Ecker, A. J., Meydan, C., Ryon, K., Tierney, B., Damle, N., MacKay, M., & Afshin, E. E., … & Mason, C. E. (2024). Molecular and physiological changes in the SpaceX Inspiration4 civilian crew. *Nature*, *632*(8027), 1155–1164. https://doi.org/10.1038/s41586-024-07648-x

Karunarathna, I., Gunasena, P., Hapuarachchi, T., & Gunathilake, S (2024). The Crucial Role of Data Collection in Research: Techniques, Challenges, and Best Practices. *Uva Clinical Research*, 1–24.

Koellner, E. (2024). *Navigating the New Frontier: Ethical, Societal, and Legal Challenges in the Space Economy*. AIAA Aviation Forum and ASCEND 2024. https://doi.org/10.2514/6.2024-4825

Krishna, T., & Guha, S. K. (2024). The Kármán Line Controversy and Boundaries of Outer Space: Implications for Space Tourism. In B. Sandeepa Bhat (Ed.), *Space Tourism* (pp. 16–27). Routledge India. https://doi.org/10.4324/9781032617961-2

Krittanawong, C., Singh, N. K., Scheuring, R. A., Urquieta, E., Bershad, E. M., Macaulay, T. R., Kaplin, S., Dunn, C., Kry, S. F., & Russomano, T., Shepanek, M., Stowe, R. P., Kirkpatrick, A. W., Broderick, T. J., Sibonga, J. D., Lee, A. G., & Crucian, B. E. (2022). Human Health during Space Travel: State-of-the-Art Review. *Cells*, *12*(1), 40. https://doi.org/10.3390/cells12010040

Kulu, E. (2021). In-Space Economy in 2021–Statistical overview and classification of commercial entities. *72nd International Astronautical Congress (IAC 2021)*. IAC.

Kulu, E. (2023). In-Space Economy in 2023-Statistical Overview and Trends. *74th International Astronautical Congress (IAC 2023)*. IAF. https://www.researchgate.net/publication/374557816_In-Space_Economy_in_2023_-_Statistical_Overview_and_Trends

Kumar, B. R. (2022). Case 5: International Space Station. In *Project Finance: Structuring, Valuation and Risk Management for Major Projects* (Management for Professionals, pp. 111–116). Springer. https://doi.org/10.1007/978-3-030-96725-3_9

Landon, B. (2024). Science fiction tourism. In M. Bould, A. M. Butler, & S. Vint (Eds.), *The New Routledge Companion to Science Fiction* (pp. 457–464). Routledge.

Langston, S., & Pell, S. J. (2015). What is in a name? Perceived identity, classification, philosophy, and implied duty of the 'astronaut'. *Acta Astronautica*, *115*, 185–194. https://doi.org/10.1016/j.actaastro.2015.05.028

Li, A. S. (2022). Touring Outer Space: The Past, Present, and Future of Space Tourism. Cleveland State Law Review, *71*, 743. https://ssrn.com/abstract=4449587

Lynch, C. S., Owens, A. C., Piontek, N. E., Cirillo, W. M., Stromgren, C., Vega, J., Kulikowski, J., & Drake, A. (2024). A Historical Review of Logistics Mass and Crew Time Demands for ISS Operations. *53rd International Conference on Enviromental Systems*. ICES-2024-132 ISS Review Press. https://ntrs.nasa.gov/api/citations/20240008337/downloads/ICES2024_132_ISSReviewPres.pdf

Markard, J., Wells, P., Yap, X.-S., & van Lente, H. (2023). Unsustainabilities: A study on SUVs and Space Tourism and a research agenda for transition studies. *Energy Research & Social Science*, *106*, 103302. https://doi.org/10.1016/j.erss.2023.103302

Martin, A.-S., & Freeland, S. (2022). A round trip to the stars?: Considerations for the regulation of space tourism. *Air and Space Law*, *47*(2), 261–284. https://doi.org/10.54648/AILA2022014

Mesa-Arango, R., Pineda-Jaramillo, J., Araujo, D. S., Bi, J., Basva, M., & Viti, F. (2023). Missions and factors determining the demand for affordable mass space tourism in the United States: A machine learning approach. *Acta Astronautica*, *204*, 307–320. https://doi.org/10.1016/j.actaastro.2023.01.006

Neufeld, M. J. (2018). *Spaceflight: a concise history*. MIT Press. https://doi.org/10.7551/mitpress/11232.001.0001

Peeters, P. (2018). Why space tourism will not be part of sustainable tourism. *Tourism Recreation Research*, *43*(4), 540–543. https://doi.org/10.1080/02508281.2018.1511942

Peeters, W. (2021). Evolution of the space economy: government space to commercial space and new space. *Astropolitics*, *19*(3), 206–222. https://doi.org/10.1080/14777622.2021.1984001

Peng, K.-L., Kou, I. E., & Chen, H. (2024). Space Travelers. In P. K.-L. Peng , I. E. Kou, H. Chen, *Space Tourism Value Chain: When East Meets West*, (Contributions to Management Science, pp. 49–62). https://doi.org/10.1007/978-981-97-1606-7_3

Popova, R., Reynders, M., Hobe, S., Schmidt-Tedd, B., & Schrogl, K.-U. (2017). *Cologne Commentary on Space Law-Outer Space Treaty*. Berliner Wissenschafts-Verlag. https://doi.org/10.35998/9783830522195

Rabsahl, A. (2023). *Herausforderungen des Weltraumtourismus - Forschungsanalysen zur Customer Journey eines Touristen im orbitalen Bereich* [Master thesis]. Internationale Hochschule. https://elib.dlr.de/196945/

Reed, J. G., Holguin, M., Cheatwood, N., & Dinonno, J. (2020). *Leveraging SMART Reuse Technologies for the Cislunar Marketplace*. Presented at the ASCEND 2020, Virtual Event. https://doi.org/10.2514/6.2020-4122

Roman, M., Kosiński, R., Bhatta, K., Niedziółka, A., & Krasnodębski, A. (2022). Virtual and space tourism as new trends in travelling at the time of the COVID-19 pandemic. *Sustainability, 14*(2), 628. https://doi.org/10.3390/su14020628

Rubenstein, M.-J. (2021). Above us, only sky. In M. C. Taylor , M.-J. Rubenstein, & T. A. Carlson, *Image: Three Inquiries in Technology and Imagination* (pp. 117–188). University of Chicago Press.

Rubin, A., & Hong, M. (2024). Operational challenges of facilitating medical care for the first all private crew to the ISS. *Aerospace Medicine & Human Performance*, *95*(8), 498.

Sasikumar, P., & Aravind, B. (2023). *Sky Riders (The Story of Human Space Flight)*. Bharathi Puthakalayam.

Schladebach, M. (2020). *Weltraumrecht*. Mohr Siebeck. https://doi.org/10.1628/978-3-16-158267-7

Seedhouse, E. (2024a). *Commercial Astronauts: The Next Generation of Spacefarers*. Springer. https://doi.org/10.1007/978-3-031-55604-3

Seedhouse, E. (2024b). Orbital Missions. In E. Seedhouse, *Commercial Astronauts: The Next Generation of Spacefarers* (pp. 187–208). Springer. https://doi.org/10.1007/978-3-031-55604-3_9

Semyanchuk, P. (2023). Types of journeys in th modern history. In *Conference Proceedings: The X International Scientific and Practical Conference «Trends and prospects for the development of modern education» November 20-22, 2023, Munich, Germany* (pp. 406–412). European Conference. https://eu-conf.com/wp-content/uploads/2023/10/TRENDS-AND-PROSPECTS-FOR-THE-DEVELOPMENT-OF-MODERN-EDUCATION.pdf

Slater, D. A., & Stone, P. (2024). 'Looking Up': Exploring Night Skies and Astro-Tourist Sensory Experiences. In I. S. Jenkins, & R. S. Bristow (Eds.), *Sensory Tourism: Senses and SenseScapes Encompassing Tourism Destinations* (pp. 84–93). CABI. https://doi.org/10.1079/9781800623606.0006

Spiller, J. A. (2023). America's "space frontier" in an era of space tourism. In J. B. Bennington, & R. F. Hill (Eds.), *After Apollo: Cultural Legacies of the Race to the Moon* (pp. 159–180). University of Florida Press. https://doi.org/10.2307/jj.3079216.13

Srivastava, M., & Srivastava, S. (2010). Space Tourism: The Future Tourism. *Management Insight*, *6*(2), 43–48. https://journals.smsvaranasi.com/index.php/managementinsight/article/view/344

Tasci, A. D., Fyall, A. D., & Fu, X. (2021). Social representations of space travel: Modeling the antecedents and outcomes. *International Journal of Tourism Research*, *23*(4), 611–635. https://doi.org/10.1002/jtr.2430

Tiwari, S. (2021). Space Tourism: An Initiative Pushing Limits. *Journal of Tourism Leisure and Hospitality*, *3*(1), 38–46. https://doi.org/10.48119/toleho.862636

Toivonen, A. (2021). *Sustainable Space Tourism: An Introduction*. Multilingual Matters & Channel View Publications. https://doi.org/10.2307/jj.22730470

Venkataraman, A. S., Leslie, L., Anderson, R., & Vidmar, M. (2020). Knowledge and Technology Building Blocks for Space Access Architectures. Paper presented at 71st International Astronautical Congress, IAC 2020, Virtual, Online. IAC-20-A5-D2.8.6. International Astronautical Federation (IAF). https://www.pure.ed.ac.uk/ws/portalfiles/portal/278306494/IAC_20A54_D2.86x60658.pdf

Vidal, F., & Privalov, R. (2023). Russia in Outer Space: A Shrinking Space Power in the Era of Global Change. *Space Policy*, *69*, 101579. https://doi.org/10.1016/j.spacepol.2023.101579

Watson, D. (2024). *Reusable launch vehicles: business & societal interest* [Master thesis]. Universitat Politècnica de Catalunya. http://hdl.handle.net/2117/419551

Wu, Y., Peng, K.-L., Yao, Y., & Guo, Y. (2024). Sustainable Space Travel: What Can We Do in Education from Economic and Environmental Perspectives? *Sustainability*, *16*(2), 684. https://doi.org/10.3390/su16020684

Yaden, D. B., Iwry, J., Slack, K. J., Eichstaedt, J. C., Zhao, Y., Vaillant, G. E., & Newberg, A. B. (2016). The overview effect: awe and self-transcendent experience in space flight. *Psychology of Consciousness: Theory, Research, and Practice*, *3*(1), 1–11. https://doi.org/10.1037/cns0000086

Yang, M. I. C. (2024). The Sociological Shaping of Space Tourism. In Yang, M.I.C. (2024). The Sociological Shaping of Space Tourism. In A. Ojala, & W. W. Baber (Eds.), *Space Business* (pp. 291–308). Palgrave Macmillan. https://doi.org/10.1007/978-981-97-3430-6_12

Zhang, Y. (2024). Space tourism: a new frontier of tourism experience. In J. S. Chen, N. K. Prebensen, & M. S. Uysal (Eds.), *Handbook of Experience Science: Tourism, Hospitality, and Leisure* (Chapter 17, pp. 237–248). Edward Elgar Publishing. https://doi.org/10.4337/9781803926902.00025

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