

A REVIEW OF SPACE TOURISM SERVICES: SUPPLY AND DEMAND CHALLENGES

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ABSTRACT

In recent years, services have become a major factor in the development of a particular economic unit, both in national and global aspect. The intensive diversification of services leads to the emergence of new and still unfilled niches in the sector, which are attractive markets for potential sellers and buyers. Expanding human needs stimulates a number of companies and research institutes to seek adequate proposals for the emerging demand. Technology developments and transport communications open new horizons in the services market. It is no longer enough to travel around the Earth with a ship, a plane or a balloon. A new need arises - a flight into space. In this regard, the aim of the research is to present the challenges of supply and demand in the space tourism services.

1. Introduction

Traveling out in the space is an entirely new service, therefore there is a great interest in it. It is realistic to say that space tourism is a new challenge in the international markets. The price of space tourism services is defined by the market mechanism, so the basic purpose of the paper is to review the supply and demand challenges in this field. It is obvious that some circumstances prevent the mass usage of the service. The objective of the paper is to review whether these circumstances are only connected with the price or depend on other factors. Meanwhile, a significant percentage of the financial support for such projects comes from the governments of the countries which have proved to be the leaders in the outer space investigations. Since this service is a priority of the more developed countries, it is also the sector with the newest technology, the most qualitative materials and well – prepared workers. This contributes to the success of space tourism as a service with a big percentage of retrieval of the invested money, which makes it one of the most promising ways for significant profits. Moreover, it will create opportunities for the realization of even more large-scale projects. At this stage, only the great prospects for entrepreneurs who are already developing large-scale projects like hotels, amusement parks and restaurants in outer space could be discussed.

According to the financial principles in business, there are two basic factors, which must be taken into consideration – incomes and expenditures, as well as supply and demand. One of the essential difficulties for the development of space tourism is that a big percentage of the investments are used

for manufacturing of the new technologies and their subsequent implementation. This fact repulses the private sector, which seeks quick returns and makes state governments the basic supplier of the service. The indisputable leaders in this sphere are the USA and the Russian Federation, whose constant competition takes a new course. The Cold War era has entered a phase of cooperation in the field of space exploration. Even the imposition of sanctions and tension after the following annexation of the Crimean Peninsula have not seriously affected their collaboration in this area.

2. Literature Review

Space tourism still seems a futuristic phenomenon, so there aren't many scientists writing about this issue, probably due to the limited exploitation of this type of service. Despite this, at the beginning of the 21st century, some authors start analyzing the future of space tourism. Most of their predictions are optimistic and often are connected with fast development. The conclusions of these forecasts are based on observations of the rapid development of technological capacity without realizing that this very soon will be the biggest obstacle to achieving massive supply in the field of space tourism services.

Though the limited volume of literature sources, some authors regularly review the topic of space tourism in their research. For example, Patrick Collins is a scientist whose constant works concern

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the aspects of space tourism. Other authors from different nationalities who have publications in the field are Dirk Gibson, Michael Belfiore, Robert Citron, Robert Goehlich, Manzoor Khan, Will Knight, Nadezhda Lusitsina, Lazovskaya, Sannikov, etc. It is noticeable that the main literature sources and scientific publications in the field are in English and Russian language. This is not surprising but rather logical given the huge technological base and capacity of the United States and the Russian Federation in the field of astronautics.

3. Research Process

The main objective of this paper is to examine whether the space tourism services have the future and the factors that will determine its development. Moreover, the manuscript analyzes if there are any prospects space travels to displace the standard tourism services and when it could be possible to happen. The hypothesis of the paper is based on Collins' (2002) study "Towards Space Tourism: The Challenge for British Space Policy¹", which claims that space services will become extremely widespread even in the next few decades. Furthermore, the research contains a review of the history of space tourism on the base of which a conclusion about the pricing of the service is made.

3.1. Sampling

The first phase of the research is data collection and it is fundamentally built on descriptive analyses. The information about the realized space flights and the price of each tourist space travel is summarized in Table 1. The data in the table is collected by other scientific papers within the scope of space tourism and its development. The quantitative information in the study is current for the period 2001-2009, in which tourist space flights were carried out. Although the paper has a theoretical aspect, the nature of the study is practical.

3.2. Measures and analysis

The second phase is constructed on the base of the method of analysis and synthesis of the primary information, connected with the price of

space tourism. The supply and demand challenges are considered and a conclusion about the pricing model is derived. The third phase is composed by logical causal relations between the theoretical and practical data, on the base of which the main conclusion for the future of space tourism comes up. The manuscript can be considered as a descriptive study.

4. Space Tourism Past to Present

According to the Cambridge dictionary, space tourism is defined as "the activity of travelling into space for pleasure and interest, rather than as a job¹". On the one hand, space tourism provides food and shelter for a certain period just like standard tourist vacations. But going into outer space differ from standard tourism excursion with the fact that comfort and recreation play no part in orbital space travel. On the other hand, space tourism creates emotions that no other service can provide. This makes space travel a unique service that has no equivalent. Despite this, there is one more distinctive difference between the traditional tourism and the space tourism - space tourism is limited only within the space flight, so the movement of the tourists is limited within the spaceship. At present, according to the limitation of scientific development and technologies, space tourism can be identified with space flight only.

The history of the space tourism is not long. The first tourist in the outer space is the American billionaire Denis Tito, who rushes out into the cosmos with the Russian shuttle "Soyuz" on April 28th, 2001. This event marks the beginning of this service sector, which was developing at an extremely fast pace, given the difficulties that accompany both users and vendors of the service. The hard physical training and the high prices are the main obstacles to the growth of space tourism business. The second space tourist is Mark Shuttleworth, who reaches for the International Space Station on 25th of April, 2002. There are only few more names left to be added to the list of people who have travelled into the space - Greg Olsen, Charles Simonyi, Richard Garriott, Guy Laliberte, and Anushe Ansary, who is the first woman

Table 1. List of Space Tourists (Pelt, 2005; Ross, Mills & Toohey, 2010; Shiryayevskaya, 2011)

| Name | Year | Duration of the Flight | Flight Type | Price |
|--------------------|------|-------------------------|--------------|---------|
| Dennis Tito | 2001 | 8 days (28.04 – 06.05) | Soyuz TMA-32 | US\$20m |
| Mark Shuttle Worth | 2002 | 11 days (25.04 – 05.05) | Soyuz TMA-34 | US\$20m |
| Greg Olsen | 2005 | 11 days (01.10 – 11.10) | Soyuz TMA-7 | US\$19m |
| Anousheh Ansari | 2006 | 12 days (18.09 – 29.09) | Soyuz TMA-9 | US\$20m |
| Charles Simonyi | 2007 | 15 days (07.04– 21.04) | Soyuz TMA-10 | US\$25m |
| Richard Garriott | 2009 | 14 days (26.03 – 08.04) | Soyuz TMA-14 | US\$35m |
| Richard Garriott | 2008 | 12 days (12.10– 23.10) | Soyuz TMA-13 | US\$30m |
| Guy Laliberte | 2009 | 11 days (30.09 – 11.10) | Soyuz TMA-16 | US\$35m |

¹<https://dictionary.cambridge.org/dictionary/english/space-tourism>

to travel into space. Anushe Ansary, the owner of a large private business, is an American citizen, but she is Iraqi by birth. Her journey began from the United States to the Baikonur Cosmodrome, which is located in the Republic of Kazakhstan and was carried out by the Russian Federal Agency "Roscosmos". The space flight began on 18th September 2006 and lasted three days.

An interesting issue is where the "space travel" service is positioned according to the international classifications of services. In the aforementioned cases, there is trade in services which has no national character. From the classification of the International Monetary Fund, this service is defined as "personal travel", while in the World Trade Organization classification, for example, it should be defined as a tourist trip. It is important to note that in this classification there is no subgroup of space tourism, due to the exceptional novelty of this type of supply. However, in the classifications, space travel should belong to the services that have an international aspect.

On the other hand, the space tourism service is connected with trade and is characterized by the mobility of both - the seller and the customer. Anushe Ansary is an American; still she uses the service provided by Russia, not by the USA, since the International Space Station is a Russian one. In order for the service to start operating, the seller has to leave the Russian Federation area and to move to the territory of the Kazakhstan Republic. As a matter of fact, the service is an international one by its very essence, since its accomplishment starts on the territory of the Kazakhstan Republic, and then continues in International Space Station, which, according to the international law, is a Russian territory, and is finally completed where it has started from - the Kazakhstan Republic.

In the world practice there is no example for such dynamic mobility concerning both the seller and the consumer of a given service. For the moment being only the Russian Federation has succeeded to prepare and send tourists into space. The execution of the service, which "Roscosmos" offers to the consumer, is accomplished through the Space Adventures Ltd² mediation. The idea of space tourism is quite popular in Japan. The Japanese customers accept each innovation very enthusiastically - they not only value the usage of high-technology products, but also seek for worldwide adventures.

This marks the beginning of a new era in the service, which provokes interest in the development of many other economic and social activities. Big corporations prepare themselves to satisfy the demand of goods and services, all of which are products of a great intellectual potential. Large corporations are preparing to meet the demand for goods and services, in the development of which is directed a huge intellectual potential. The advantage

of developed countries is in greater resource security. However, smaller countries can also get involved in the space tourist project by setting up training facilities, research institutes and staff ready to serve the sector. An example for this is the capacity of Bulgaria to provide the so-called "space foods", in the creation and development of which the country has traditions. Only because of the achievements of scientists from the Institute of Cryobiology and Food Technology at the Bulgarian Academy of Sciences, in the past Bulgaria managed to reach third place in the world ranking for production of special food for astronauts³.

Another important aspect is connected with the construction of an export producing base which is not only very expensive, but also too hard to accomplish. That is why all the monopolists in the sector are big countries with huge research institutes and experimental bases. Since the construction of a spaceport is so money-consuming initiative, there is no interest in it from the private businesses, which are looking for quick returns of the invested capital.

However, more and more large companies are setting up units that are developing large-scale projects to provide space travel services. One of the first entrepreneurs investing in space tourism was the businessman and the founder of Amazon - Jeff Bezos. In 2000 he founded the company Blue Origin, which aims to enable private access to space. The company changed several times the departure schedules of its first passengers and in 2018 Blue Origin promises 100 complete missions soon⁴. However, there are still no private flights with the company.

Another large-scale investment in the area was made by Elon Musk in 2002, when SpaceX was founded. Its main production is related with launch vehicles, rocket engines, spacecraft and other space systems. SpaceX was selected by NASA under the Commercial Logistics Services Program at the International Space Station. The first flight of the company is planned for 2021⁵. The approximate price of the flight will be £40 million and the name of the first tourist on the list is Yusaku Maezawa. Meanwhile, the company is launching a number of small satellites to boost 5G networks in 2020. Initially, SpaceX plans to provide high-speed Internet access to residents of the southern United States by the end of 2020. According to the company, launching into the orbit of 11 thousand satellites and putting them into operation will cost 10 billion dollars. This can be defined as one of the reasons for the delay and postponement of private tourist flights in space⁶.

³<https://www.economy.bg/lifestyle/view/36951/Hrana-za-kosmonavti-Made-in-Bulgaria>

⁴<https://www.cnn.com/2018/04/18/blue-origin-ceo-bob-smith-be-4-will-be-able-to-launch-100-missions.html>

⁵<https://fortune.com/2020/02/18/spacex-space-tourism-crew-dragon-elon-musk/>

⁶<https://www.space.com/spacex-launches-starlink-5-satellites-misses-rocket-landing.html>

²<https://spaceadventures.com/>

In 2004 the entrepreneur Richard Branson added to the family of Virgin Group the so called Virgin Galactic. Since its launch, the company has collected more than 7,000 requests for space flights at a ticket price of US\$200,000. Private space tour operators already exist. One of the projects for the creation of a space station for tourists is the "Las Vegas" project, which includes tourist station in space, where each traveller will be offered a two-room 60m³ apartment with separate kitchen, toilet and bathroom. For almost 10 years the company has been trying to create and test the perfect engine. As the tests failed after 2014 research shifted to another type of engine technology. Branson expects the first flights in 2020⁷.

The great interest which the companies have in this sector is due to consumers' interest. It is accepted to define this market as the "seller's market", but that is not the absolute truth. In contrast to many other goods and services offered on the international markets, space tourism requires a very precise preparation from its consumers. Many people who dream for a journey into space. However, there are many factors which determine whether a person is suitable for a space trip. Even if the considerable price is not an obstacle, the client will not be allowed to take the trip if s/he is not in a good physical and/or psychological condition. The specialists from the Star Town (Звездный городок) in the Russian Federation have come up with four obligatory requirements, which are:

- The height must not be more than 190 cm. It is inadmissible for the ratio between the length of the legs and the spine to be in favour of the spine
- The mass of the body must not overweight 100 kg
- Heart problems are unacceptable
- There must be no silicone implants in the body

Statistics show that the group of people meeting all these indicators is extremely small. It is an interesting fact that in 2007 the BBC provided an opportunity for people who do not have significant financial resources to take advantage of the "space tourism" service. This happens through participation in the TV competition "Astronaut Idle".

4.1. Pricing of space tourism services

One of the most important features of space tourism is connected with the pricing model of this unusual type of service. It was clarified that the definition of space tourism is framed within the limits of space flight. In order to carry out space flight with private individuals, a lot of investments for scientific and technological improvement are required. However, the pricing factors of private space flights are multicomponent so the price cannot be precisely determined due to the fact that the realization of

the service is associated with many different types of economic, logistical and technological operations. Extremely important elements are the production base, highly qualified personnel, compliance with a number of accompanying factors such as weather conditions, the health status of the buyer, etc. It follows that in order to determine the price it is necessary to create a new complex approach that has no analogy in the existing economic theories and practices. A major difficulty in deriving a clear mechanism is the lack of information on the exact price paid by space tourists so far.

In the short history of space tourism, it is noticeable that most passengers have made only one flight. Nevertheless, among them is a man who has travelled in space more than once. The only tourist who made a second trip was Charles Simonyi. He was declared as an absolute record holder. Simonyi is a co-founder of Microsoft and he travelled in the space two times in a range of 2 years - in 2007 and 2009⁸.

From Table 1 it could be concluded an approximate price paid by space tourists over the years. It is obvious that the price varies in the range of 20 to 35 million dollars and gradually increases over time. Although providing space tours is already a reality, it is unlikely this type of service to become widespread in the near future. Up to date the development of technology does not allow it.

Two main conclusions can be made by Patrick Collins' study from 2002. At the beginning of the 21st century, it seems the development of space tourism to the point of widespread use will happen in about 30 years. The analysis predicts that the estimated number of passengers who will use the service in 2030 will be 5 million. From the standpoint of time, it can be hypothesized that until this moment there are no indications the space tours to become a public available service for the next 10 years. Even more, by 2030 this target does not seem to be half reached. At the middle of 2011 the last space flight took place, after which the industry is stalled⁹.

In order to reach such a mass usage, it is extremely important not only to supply the service, but also the issue is related to demand. In this regard, it can be said that there are several pros and cons in targeting a potential buyer. In practice, the user profile, in this case, is more special than that of the average tourist. The target group of potential customers is many times smaller than the target group of most business activities. Potential users of the space travel service are individuals who are included in the rankings for the richest people in the world. When the restrictions and requirements for a certain health status are taken into account, the circle of potential buyers narrows significantly. In this way, the specific aspects of the user group can be summarized. On the

⁷<https://www.economic.bg/bg/news/11/virgin-galactic-shte-izprati-turisti-v-kosmosa-dogodina.html>

⁸https://blitz.bg/svyat/charls-simonyi-rekordor-sred-turistite-po-broy-poleti-v-kosmosa_news41571.html

⁹<https://spacetourismguide.com/history-of-space-tourism/>

other hand, there are certain psychological features connected with people who tend to travel in space and they are charged with positive potential.

The propensity for risk-taking is usually more inherent in males. From this point of view, if attention is paid to the ranking lists of the richest people in the world, it becomes clear that they are composed mainly of males. An additional advantage is the exclusivity of the trip, which gives a completely new experience - different from everything that one can afford and experience within the boundaries of the planet Earth¹⁰.

5. Findings and Discussion

Many reasons for assumptions and debates are caused by the fact that the space tourist flights were stopped before 11 years, regardless of the presence of potential customers. Despite the list of space tourists is not long, it is noticeable that the cost of space flights is constantly rising. If a comparison between the last paid ticket for a space flight in 2009 and the approximate price that SpaceX plans for the first private flight in 2021 is made, it makes an impression that the difference in the value is 8.6 million dollars. For a period of 12 years the price is rising, but there are still people willing to fly into space.

Despite inflation processes that make space tickets more expensive, it is clear that there is a demand for such services, even though the supply is stagnated over the last decade. No matter the serious development of the aeronautical industry and the IT sector in recent years, no real space tourism programs and projects have even been discussed. This issue should be seriously analysed, but the number of current scientific and journalistic publications on the subject is minimal.

Something more, apart from the price there are other important factors influencing the development of space tourism services, so specific attention should be paid on them. In the trends for development of this industry the problem of environmental pollution, which is getting worse, cannot be avoided. The passage through the atmosphere creates huge preconditions for the expansion of the ozone hole. This is a huge barrier to mass spaceflight. It is interesting to note that with each launch of a space rocket from the Baikonur Cosmodrome, the weather conditions in the capital Almaty change - for example, if the weather was cloudy, it becomes clear and sunny in a matter of minutes. There are too many unexplored effects of human activity in outer space to be able to say with absolute certainty that spaceflight will not contribute to climate change and pollution. Therefore, the cost of each space flight needs to include the cost of research and environmental protection.

6. Conclusion and Suggestions

All the aforementioned conclusions for the development of space tourism are at a very early stage. The potential of this type of economic activity is huge - not only because it is a very attractive service, but also because outer space provides a new and unlimited opportunity, both for scientific and research work, but also for possible new sources of raw materials.

In the meantime, though the constant technical tests, it is obvious that there are some obstacles for carrying out regular tourist space flights. The main suggestion arising from the analysis of the manuscript is connected with the debris circling. Figure 1 shows clear tendency of rising the number of space debris. The "space debris"¹¹ term refers to objects made by human which can be defined as "space junk". More than 500,000 pieces of debris are circling the Earth and this makes them a real threat for damaging not only the satellites but the space crafts, too. In this case, the problem of the choice between providing better telecommunications for humanity within the globe or providing opportunities for mass space tourism arises.

In the next few decades, space tourism is unlikely to become a priority at the expense of providing a good satellite connection, because at the moment a huge part of business and all human activities are

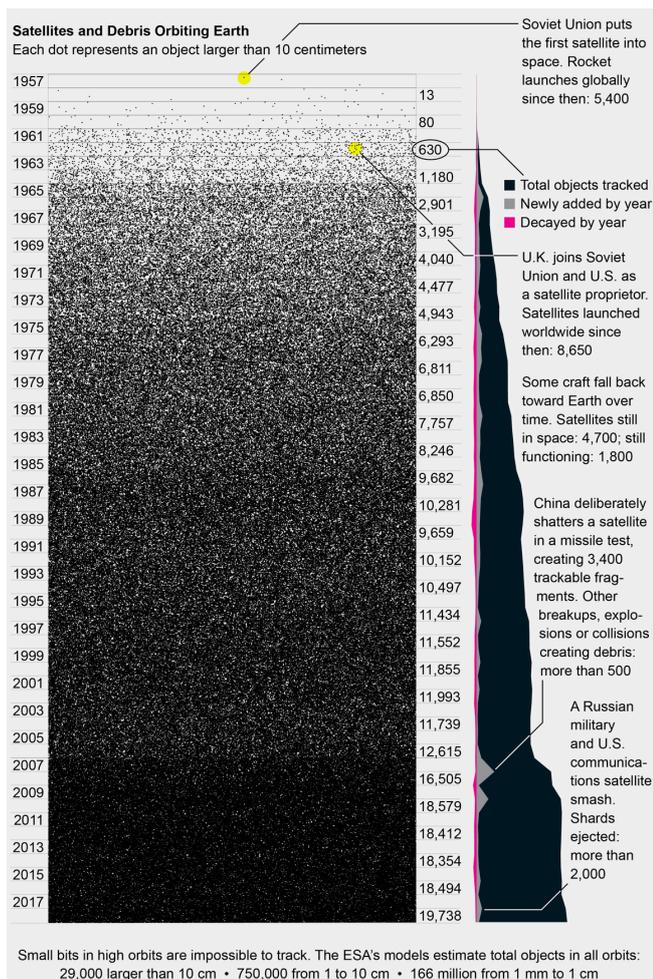


Figure 1. Debris circling the Earth – by years (Tulp, 2018)

¹⁰<https://www.businessinsider.com/richest-people-world-billionaires-list-2017-11#42-and-41-gerard-and-alain-wertheimer-9>

¹¹https://www.nasa.gov/mission_pages/station/news/orbital_debris.html

dependent on good telecommunications. Until space debris are not cleaned up, the space tourism won't be a safe experience and therefore makes it difficult to achieve mass usage of this service.

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