

# Feasibility of Commercial Space Travel

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**Abstract.** With the fast development in exploring the space, travel in space is no longer an impossible idea for people like us. Especially these days with the private rocket companies showed up and successfully launched their own rockets, it is foreseeable that ordinary people will have the opportunity to explore the universe in the future. The purpose of this article is to introduce space travel through definitions, impacts, and evidence supporting aspects. The implications of space travel will be analyzed in terms of social, economic, and technological implications, as well as the prospects and current situation of space travel, and will be supported by an analysis of SpaceX's data.

**Keywords:** Commercial Space Travel; SpaceX; ISS; Tourism.

## 1. Introduction

With the innovation and development of technology, more and more new concepts and ideas, including all everything that is related in human lives, took place in order to satisfy human needs. For example, Artificial Intelligence, an innovation that training computers and machines to work like a human in order to make our life easier. We can use this technology to replace some dangerous or tedious work and get the “perfect” product in manufacturing. However, Artificial Intelligence is not the main character of this essay, the main point is the space travel.

Unlike concepts like AI which is mainly serves to make lives more convenient, space travel mainly focus on another characteristic of human: curiosity. With the fast development in exploring the space, travel in space is no longer an impossible idea for people like us. Especially these days with the private rocket companies showed up and successfully launched their own rockets, it is foreseeable that ordinary people will have the opportunity to explore the universe in the future [1].

The purpose of this article is to introduce space travel through definitions, impacts, and evidence supporting aspects. The implications of space travel will be analyzed in terms of social, economic, and technological implications, as well as the prospects and current situation of space travel, and will be supported by an analysis of SpaceX's data.

## 2. the Overview of Space Travel

Space travel, in particular commercial space travel, refers to space travel services provided by private companies or organizations aimed at enabling the public to experience the space environment, view extraterrestrial landscapes or conduct scientific research, among other activities [2]. The concept of commercial space travel originated in the late 20th century and has gone through several key stages of development, including private space flights, road trips, and trips to the moon. To date, many private companies, such as blue origin and SpaceX, have experimented with their own rockets with success.

On September 16, 2001, Space Exploration Technologies (SpaceX) launched the Falcon 9 launch vehicle from Launch Pad LC39A at the Kennedy Space Center on the first "all-civilian" mission, Inspiration4, to send four ordinary people into space for a three-day journey around the Earth. Inspiration4, sending four ordinary people into space for a three-day journey around the Earth. Following the suborbital commercial flights of Jeff Bezos' Blue Origin and Richard Branson's Virgin Galactic, Musk's Space Exploration Technologies is launching its first manned commercial flight this week. Unlike previous space flights, Space Exploration Technologies' ship will fly off the Earth

The growth of commercial space travel, with companies like SpaceX, Blue Origin, and Virgin Galactic leading the way, demonstrated the feasibility of offering space experiences to civilians.

While initial costs were high, there was optimism that increased competition and innovation would make space travel more accessible to a broader range of people.

### **3. the Meaning of Space Travel**

For space travel, the significance is not the instantaneous significance overnight, but the impact on people's future after a long period of development. Here, we will focus on three main perspectives: technological significance, economic significance, and social significance.

#### **3.1 Technological significance**

In scientific field, Space travel serves as a conduit for scientific exploration, enabling researchers to study celestial bodies, cosmic phenomena, and our own planet from unique vantage points. Space missions include telescopes like the Hubble Space Telescope, which has provided unparalleled insights into distant galaxies and nebulae. In addition, spacecraft like the Mars rovers have allowed scientists to analyze the Martian surface, searching for signs of past or present life. Moreover, space travel involves the development of sophisticated instruments and sensors that can withstand the harsh conditions of space, including extreme temperatures and radiation. These technologies advance our understanding of the cosmos while also influencing the development of remote sensing and data collection technologies on Earth.

In detail, a significant aspect of space travel is the downstream impact on technology development and innovation. The challenges of space exploration often drive the creation of breakthrough technologies with applications beyond space. For instance, the need for precise navigation in space led to the development of the Global Positioning System (GPS), which has transformed navigation and location-based services on Earth. Similarly, advances in miniaturization and reliability in space electronics have found their way into everyday products, from smartphones to medical devices.

Additionally, space travel has driven innovations in materials science. The development of lightweight and robust materials for spacecraft and astronaut gear has influenced industries like aviation and automotive manufacturing. These spin-off technologies not only improve product performance but also contribute to economic growth.

In conclusion, space travel represents the pinnacle of aerospace technology, fostering scientific exploration of the cosmos and driving innovations that have wide-ranging applications on Earth. It serves as a catalyst for advancements in propulsion, instrumentation, and materials science, benefiting not only the space industry but also various sectors of the global economy.

#### **3.2 Economic Significance**

Economically speaking, space travel has contributed greatly to the promotion of economic development. One of the main contributions to the economy is that it promotes the demand for employees in related industries, and with the development of space travel, many related industries have been created, such as space mining, and rocket repair, and space travel can receive investment and promote the flow of capital, which promotes the development of the economy.

Space travel presents a wealth of commercial opportunities. One of the most notable sectors is satellite technology. The deployment of communication, navigation, and Earth observation satellites has become a massive industry, supporting activities such as global telecommunications, weather forecasting, and remote sensing for agriculture and environmental monitoring. Companies like SpaceX, Boeing, and Airbus compete in the satellite manufacturing market, generating substantial revenues[3].

The concept of mining asteroids and extracting resources like precious metals, water, and rare minerals has gained traction. The abundance of such resources in space could revolutionize industries on Earth, reducing the need for terrestrial mining and addressing resource scarcity. The potential economic value of asteroid mining is enormous, attracting the attention of both established companies and startups.

Another substantial industry of space travel is the manufacturing. The microgravity environment of space offers unique opportunities for manufacturing products with superior qualities, such as purer crystals and advanced materials. Additionally, space-based research can lead to breakthroughs in pharmaceuticals, biotechnology, and other fields. The commercialization of such research can result in lucrative intellectual property and technology transfers.

Thirdly, the space industry contributes significantly to job creation, employing a diverse workforce of scientists, engineers, technicians, and support staff. It stimulates local economies in areas with space-related facilities, including launch sites, research centers, and manufacturing plants. Moreover, the space industry generates a ripple effect, supporting related sectors such as transportation, logistics, and tourism. And the prospect of space travel and exploration has attracted substantial investment from both public and private sectors. Governments worldwide allocate budgets for space agencies, while venture capital firms, corporations, and private individuals invest in space startups and projects. This infusion of capital drives innovation and economic growth.

### 3.3 Social Significance

Socially, space travel facilitates exchanges between nations and has important scientific, cultural, and educational implications.

Space travel often serves as a beacon of international cooperation [4]. Numerous space missions, including the International Space Station (ISS), involve collaboration among nations. The ISS, for example, is a testament to what can be achieved when countries put aside geopolitical differences to work together in the pursuit of scientific discovery and technological advancement. This spirit of cooperation in space exploration serves as a model for peaceful collaboration on Earth, fostering diplomatic ties and promoting unity on a global scale.

Space missions capture the public's imagination and serve as powerful educational tools. They inspire future generations of scientists, engineers, and explorers. The awe-inspiring images of distant galaxies, the thrill of watching rocket launches, and the stories of astronauts' journeys into space motivate students to pursue careers in STEM (science, technology, engineering, and mathematics) fields. Space travel fosters a sense of wonder and encourages critical thinking, problem-solving, and creativity in young minds, which are essential skills for the future.

Space travel has left an indelible mark on human culture. Iconic events such as the Apollo 11 moon landing in 1969 and the launch of the Hubble Space Telescope have become milestones in human history, celebrated through art, literature, film, and music. They have become symbols of human achievement and the enduring spirit of exploration. Space travel also fosters cultural diversity by showcasing the contributions of individuals from various backgrounds and nations who work together on space missions.

In summary, space travel encompasses not only the technological aspects of reaching and exploring space but also the social and economic dimensions that shape our world. It reflects our innate curiosity, drives technological innovation, fosters international cooperation, and presents economic opportunities that extend far beyond the boundaries of our planet.

## 4. The Current Situation of Space Travel

The commercial space sector, led by companies like SpaceX, Blue Origin, and Virgin Galactic, was making remarkable progress. SpaceX, for instance, had already launched astronauts to the International Space Station (ISS) under NASA's Commercial Crew Program, demonstrating the viability of commercial ventures in low Earth orbit. Virgin Galactic and Blue Origin had conducted successful suborbital space tourism flights, signaling the potential for space tourism as a new industry. Commercial space travel was becoming more feasible, with increasing private investment and competition in the sector. This had the potential to drive down costs and make space more accessible for both tourism and scientific research.

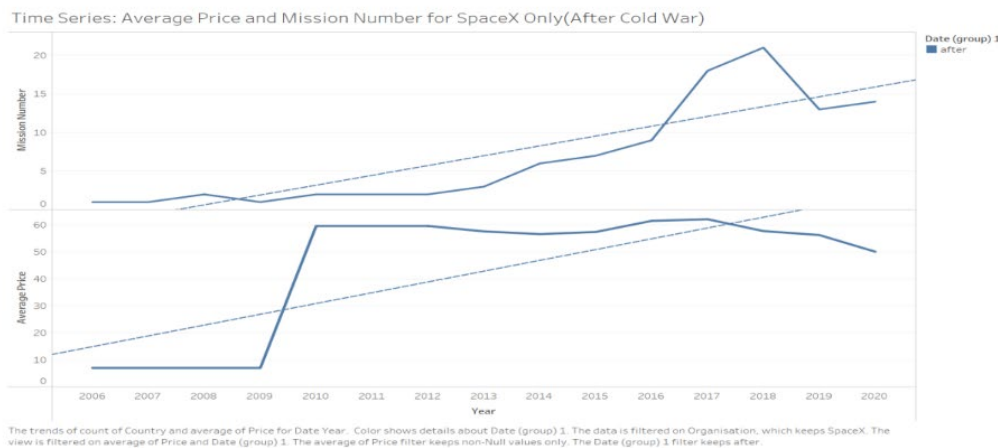


Fig.1 The change in average price and mission number of space missions over time(SpaceX Only)

For laws, Governments were actively working on space policy and regulation to manage the increasing commercial activity in space. Issues like space debris, space traffic management, and lunar and asteroid mining were becoming important topics for policymakers. As space activities increased, it was crucial to establish robust regulatory frameworks to ensure safety, sustainability, and responsible behavior in space.

For space sustainability, the issue of space debris and its impact on the long-term sustainability of space activities gained prominence. Efforts were underway to mitigate space debris and promote responsible space behavior. Space sustainability was a growing concern, with spacefaring nations and organizations recognizing the need to address the challenges posed by space debris and orbital congestion.

For technological advancement, advances in technology, such as reusable rockets (e.g., SpaceX's Falcon 9) and miniaturized satellites (CubeSats), were lowering the cost of space access and enabling new types of missions. Continued technological innovation was driving the evolution of space travel, making it more efficient and cost-effective.

In conclusion, space travel was in a dynamic phase of development, characterized by increased commercial activity, government-led exploration missions, growing interest in space tourism, and a focus on sustainability and regulation. The future of space travel held promise, but it also faced challenges related to cost, safety, and the responsible use of space resources. To gain a more current understanding of space travel developments, I recommend consulting up-to-date sources and news in the field of space exploration and technology.

## 5. Conclusion

Space travel has evolved from a distant dream to a tangible reality, and its feasibility is increasingly evident when considering the interplay of social, technological, and economic factors. From a social perspective, the human spirit of exploration and curiosity remains unwavering, inspiring generations to venture beyond our planet's boundaries. This unwavering support fuels educational initiatives and international collaboration, reinforcing the social underpinnings of space travel.

On the technological front, remarkable advancements in aerospace engineering, materials science, and rocket technology have opened doors to space exploration. Reusable launch systems and innovative solutions are making space more accessible and cost-effective. Moreover, the societal benefits of space-related technology development extend far beyond the cosmos, enhancing industries here on Earth.

Economically, space travel has transformed into a burgeoning industry with potential for substantial growth. Commercial ventures within the space sector, including satellite communications and the prospect of space tourism, offer significant economic opportunities. However, while the feasibility of space travel is increasingly within reach, challenges such as cost reduction, sustainability,

and responsible resource management must be met to ensure that this extraordinary frontier remains accessible and sustainable for all of humanity.

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