

Is the development of space tourism a worthwhile investment?

The Interest in Space has seen a rather large boom in popularity in recent years, with many private company's started up in the space sector by very wealthy billionaires. Such as Elon Musks Space X, Jeff Bezos' Blue Origin or Richard Branson's Virgin galactic. These companys aim to provide a private and therefore cheaper means of either sending sending payloads in to space or even paying to travel to space as a tourist. So far space tourism in the private sector has only been available with sub orbital flights, meaning they do not orbit the earth, they essentially go stright up and come back down, refered to as a balistic flight experience. (Masson-Zwaan & Moro-Aguilar, 2013) The interest and investments into space tourism is a market that until recently has been a very exclusive club. The first paying tourist to travel to space was Denis Titto. Titto traveled onboard a russian soyuz spending 8 days onboard the International space station after he payed \$20M. (Randolph, 2003) Furthermore in July 2001 a bill was passed in the United States promoting the development of space tourism, paving the way for modern companies to profit from. (Crouch, 2001) The global space economy according to the US non-profit Space Foundation (2022) reportedly hit \$469B in 2021, so it makes sense that these private investors would want a cut of that money in any way they can see fit.

The Impact on the environment that rockets can cause can be catastrophic to the planet, tons of Carbon dioxide are released into the atmosphere each launch. Tourism into space will only further increase the use of large rockets that cause more pollutants, as more and more people decide to travel to space, further accelerating the climate emergency. (Fawkes, 2007) This means the more accessible space travel is, in both frequency of flights and price of a seat and even if only for a short suborbital flight, the space tourism has a large carbon footprint, even greater than that of a large passenger jet. (Carbajales-Dale & Murphy, 2023) As space tourism grows in popularity and destinations inevitably grow further from earth, the launches are also contributing to the growing space debris issues, this issue is mass amounts of space junk surrounding the earth. According to the European Space agency the planet is surrounded by over 34,000 of pieces of space junk which are over 10cm in size (Mohammed, et al., 2022), this debris can cause damage to necessary satellites that may provide GPS service to everyone with a connected device or an internet connection to remote places where satellite is the only option, or even in a worst case scenario put astronauts on board the international space station in danger. There have already been close calls with space debris, as recently as June 2021. A piece of space debris punctures a 0.2" hole in the space stations Canadarm2. The puncture has not damaged the functionality of the arm but highlights how close astronauts have been to direct hits from small pieces of debris.

Space tourism can effect people around the world economicaly, the economies of some small countries rely solely on tourism (Damayanti, et al., 2018), the rise in space travel could possibly steal usual big spenders, who would usually travel to these such countries, usually small islands with not other export. The economic impact could cause these countries to lose masses of money as the usual tourists will now choose to spend their money on being able to travel to space, rather than on tourism on earth. Future potencial of a space hotel could also keep them away for longer as the cost of a hotel in space would be presumed only withing the budget of someone who may usually travel to the expensive to reach micronations. (Madanoglu & Ozdemir, 2016) Space Tourism is of course quite a new industy and it's full effects are not yet known, it's impacts on these countires and the global economy is not yet fully understood.

Safety for those on board the ship and those who maybe on the ground could be risked, A rocket launch is a dangerous endeavour as proved evident by the loss of life in the Space Shuttle Challenger and Colombia accidents as well as Virgin Galactic crash in 2014. The Virgin Galactic crash, while it was

only a practice run, was the first crash and loss of life of a crash designed specifically for tourism. Further highlighting how dangerous space travel is. (Witze, 2014) Safety for all involved must be sufficient and thorough otherwise a repeat of tragic events could reoccur. Although all safety measures will have been assessed at the time of launch and all precautions to prevent accidents will have been implemented, it cannot be guaranteed that there will not be any complications during the flight. During a rocket launch, debris is ejected from the rocket and falls back to earth, the trajectory of debris cannot be estimated but not guaranteed, this has been proven before in China when the debris from a rocket launch fell on a nearby village, where luckily no one was injured. (Sheetz & Li, 2019)

The investment into space tourism has been going on for the past few years, various research has been done that shows 35% of a British sample shows interest in going to space and even 12% expressed that they would pay a year's salary to do so. (Barrett, 1999) Space flight is expensive and risky, as the cost of launching and maintaining a spacecraft is much higher than the revenue generated by a few wealthy customers. However, any return on space travel is profit that will go back to the wealth investors, due to the reusability of space craft's very little cost is needed for each flight. So as more and more flights take place the more profit as a result, not benefiting the greater population and further expanding the wealth divide. However, Ormrod and Dickens suggest as of 2019 the space tourism sector has yet to emerge as viable, considering that the launches are a rarity and not on a mass scale. (Ormrod & Dickens, 2019)

One of the main challenges of space tourism is its accessibility and affordability for the public. Currently, only a few wealthy individuals can afford to participate in this activity, which creates a sense of elitism and exclusion. For this reason, Space travel at its current state is only being aimed at those who possess a massive wealth. This further highlights the wealth divide in the world showing how the uber-wealthy choose to spend their money. Ormrod and Dickens describe space tourism as a pilgrimage to justify how space tourism is described in its current state. (Ormrod & Dickens, 2019) Space tourism isn't being sold in a way that promotes research and development, it has so far only being used marketed as rich people being able to be among the first to try something. Evidence of this is in September 2021, 18 Year old Oliver Daemen became the youngest person to ever travel to space, after winning the auctioned off seat for an estimated \$28Million. (Ciaccia, 2021) Which was funded by his father, the CEO of Somerset Capital Partners. This achievement of youngest person can only have been achieved by being the child of someone such as Joes Daemen, who evidently has the disposable income to fund his son's expeditions.

To conclude, the current space tourism phenomenon may look appealing to a specific wealthy market, as well as lucrative investment, the ethics, safety and impact on the global environment both on earth and in space must be evaluated to determine if there is any benefit to be gained in pursuing something that is at present being viewed as a means for rich people to spend their money on a short "pilgrimage" to space. Space tourism can be a stimulant that raises the interest and further innovation in space exploration sector as well as providing a unique and thrilling experience for the wealthy travellers. it poses serious environmental and economic challenges that need to be addressed and mitigated. Space tourism can contribute to the global climate emergency that is currently being faced. Therefore, it is important to balance the benefits and costs of space tourism, and to ensure that it is done in a responsible and if possible, a sustainable way.

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